A Comprehensive Review and Architecture of a Decentralized Automated Direct Government System Using Artificial Intelligence and Blockchain

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Abstract—The current state of Blockchain and Artificial Intelligence technology has ushered in a new age of governance and government. Human inconsistencies and limits can be eliminated from governance and government systems. This article examined the feasibility of constructing a Decentralized Automated Direct Government system using Blockchain and Artificial Intelligence and various political and legal ideas through an exhaustive analysis of the literature. It is then transformed into an architectural model of a Decentralized Automated Direct Government System. Stakeholders or people vote, propose, and make decisions without the participation of a management body or representatives. Numerous machine learning techniques are used to organize and analyze data. Finally, the analysis and development of this system are explored from the viewpoints of implementability, automaticity, transparency, decentralization, security, and performance.

Index Terms—Artificial intelligence, Governance, direct democracy, DAO, Blockchain

1 Introduction

The technological advancement of Blockchain and Artificial intelligence opens up new possibilities to redefine all traditional institutions and systems. This research is designed to evaluate, redefine and model the direct governance and government system by combining blockchain and artificial intelligence.

1.1 Research Overview

'Implicit Bias' refers to unconscious attitudes or preconceptions that influence understanding, behaviors, and decisions. These unconscious biases, including positive and negative judgments, are triggered without the individual's knowledge or control [1]. These unconscious prejudices are distinct from acknowledged biases that people seek to hide for social or political propriety reasons. No, implicit biases are not revealed through self-reflection. Implicit connections in the subconscious lead us to feel and behave toward others depending on race, ethnicity, age, and attractiveness [1]. These connections form during a lifetime of exposure to direct and indirect signals. The media and news programs are often considered as sources of implicit connections.

This bias has a far greater impact on everyone's lives more than we can comprehend. With a myriad of psychological studies that have been conducted over the years to help us better understand it more and with many institutions employing ways to overcome it with means such as unconscious bias training programs, we are still left with a preconceived realisation that even with these means it would not truly eliminate 'bias.' Therefore, this pa- per realises that with the current advancements made in

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the Blockchain and Artificial Intelligence technologies, it would be possible to try instead to circumvent the influ- ence of bias from They are having an impact in the current, traditional form of the governance system, into one that is bias-free while also bringing further improvements to the current systems.

In this paper, the areas impacted and the consequences that ensue after that that this research will be focusing on are governments, corporations, and communities, in gen- eral—observing the events that take place before elections. Trends are seen in the voting made by minorities, tran- spired by the policy changes and reforms community can- didates bring forward. In contrast, campaigning - as the treatment of minorities is seen as an ethical concern. These differences can be seen in numerous news outlets' polls, categorizing their data by race, religion, age, educational divisions, gender, ethnicity, spoken language, etc. This data is then usually studied, examined, and discussed to under- stand why such a trend transpired—taken as a competitive tool by the different parties, taken advantage of and win overvotes, and a well-known strategy in politics and gov- ernment. And throughout this entire scene, there is that psychological phenomenon that is taking place that is ar- guably bringing about this difference in the preference of the voters, not just amongst minorities but throughout all participating, and that is 'bias.' The more a minority is a present, the more antagonistic attitude towards the minor- ity among the majority. which produces racially conserva- tive policies and their support for liberal policies [2]. Forc- ing minorities to face more resistance in passing favorable policies regardless of benefits for the majority.

Bias is also a factor that affects large corporations and communities alike. Traditional hierarchies exist, between shareholders, directors, managers, and employees, along with its centrally designated authority that makes and en- forces those decisions, which, as research shows, leads to suboptimal outcomes with its vertical information flow systems. On top of which unconscious biases exist within the companies and communities, such as racial, gender, religion, tattoos, body piercings, weight, political affiliation, clothing style, diet, accent, socioeconomic status, alma mater, family lineage, etc. All affect a corporation's or community policy-making decisions alike.

It is worth noting that regardless of whether or not the central governing body in either of these three cases, i.e., government, corporations, and communities, are unbiased, they may experience High pressure regarding the policy choices they wish to enact. Secondly, they may also experience even more pressure from their communities regarding the accountability for those passed policies in case of a negative event occurring due to the passed policies.

This study recognizes the need to decentralize and automate the present governance structure utilizing artificial intelligence and distributed ledger technologies, including the blockchain [3]. It's better information processing, an absence of prejudices, and a lack of side inter-organizational. It would promote transparency and eliminate censorship, fraud, third-party meddling, and downtime. Notes:As a distributed ledger, the blockchain excels in efficiency, cost-effectiveness, irreversibility, transparency, auditability, and censorship resistance [4].

Using AI technology, it is possible to automate data exchange, processing, and security. These technologies offer self-governing communities with enforced norms of interaction without a centralized, hierarchical power structure. Birth and death certificates, marriage licenses, deeds and titles of ownership, educational degrees, bank accounts, medical treatments, insurance claims, political votes, food and goods inventories, and anything else can be described in code [5]. The capacity to form networks and bind potentially endless individuals makes it simpler for everyone connected to exercise their voting rights [5]. Federico et al.(2019) Taking responsibility and trust away from persons in organizations and authorities who would be unsuitable for executing such jobs and putting it on code, machines, and algorithms [6].

1.2 Research aims and objectives

1.2.1 Aims:

Aims of this research are spread out into two modules. This paper has a lengthy discussion about digital, analog, centralized, decentralized governance systems and their limitations and possibilities in the first module. It will also briefly discuss AI, Blockchain, and DAO technologies and their limitations and possibilities in the second module. The last module then succeeds it. A fully functional model of a Decentralized Automated Direct Government System (DADGS) is created with various benefits and improvements that it would bring over the current traditional implemented systems.

Module 1: Reviewing Literature

This paper will define and analyze the historical evolution of blockchain, Ethereum, Decentralized Automated Organization (DAO), artificial intelligence, machine learning, governance systems, Commons-Based Peer Production (CBPP) communities, and different kinds of organizational, legal, and political theories. It scrutinizes the current governance systems in place to identify voids where technological interventions could be applied. It would then discuss pre-existing technological interventions in the current governance systems to look through the possibilities and limitations of existing AI, Blockchain, and DAO technologies that could intertwin into those governance systems. This paper then attempts to discover different kinds of theories, propositions, suggestions, and implementation on AI-based governance systems, blockchain-based governance systems, and AI blockchain-based automated governance systems.

Module 2: Designing a fully-featured Decentralized AI-Blockchain-based governance system

This paper classifies the different kinds of agents participating within the governance system. Define the different kinds of scenarios probable to arise in the governance system and define the structures and features of the proposed AI-based decentralized automated governance system which is the Decentralized Automated Direct Government System model (DADGS model). This paper will then model one or several technological solutions and propositions for each agent as well as exhibit data flows among the agents. Furthermore, the paper will also show processes establishing connections among the distinct agents. The final design would be represented graphically to make it more intelligible.

1.2.2 Objectives:

The objectives of the research are also divided into two modules related to the two modules mentioned in the 'Aims' section above respectively.

Module 1: Reviewing Literature

In this paper literature is reviewed about the historical evolution of blockchain, Ethereum, Decentralized Automated Organization (DAO), artificial intelligence, machine learning, governance systems, Commons-Based Peer Production (CBPP) communities, and different kinds of organizational, legal and political theories and assimilate them together. This paper then gathers information from research on the governance systems for technological intervention on it to later obtain knowledge via the literature review of existing technological intervention in the governance systems. This paper will then distinguish the possibilities and limitations of existing AI, Blockchain, and DAO technologies To intertwin those into governance systems and search different kinds of theories, propositions, suggestions, and implementation on AI-based governance systems, blockchain-based governance systems, and AI blockchain-based automated governance systems. It will lastly document all the information gathered from the different papers, websites, and books, including observations about the topics mentioned above.

Module 2: Designing a full feature of Decentralized AI blockchained based governance system

This paper will conduct a feasibility study for designing full features of governance system backed by artificial in-

telligence and further studies on various literature reviews about these topics to gather more information. A design would then be modeled for a decentralized governance system mentioning its strength and weakness and proposals for features and structures for future development. This paper will have graphical representations of the complete model's prototype architecture and design for the decen- tralized automated governance system backed by artificial intelligence.

1.3 Research Rationale

Because AI learns from previous data, it is unlikely to forecast every future scenario and is far more rigid than present human-based systems. In addition to their superior ability to process information, AI algorithms are free of biases and side interests, allowing companies to respond to the increasing complexity of the external environment by processing analysis and information in real-time and making more reliable forecasts. Institutional investors are already investing in AI development (above all in compliance and risk management applications). Blackrock's Aladdin system, which gets sensitive data from banks, insurance firms, and other significant organizations, is without a doubt the most visible illustration of this trend.

It is improbable that an AI could foresee every future event. Still, it would be considerably more rigid than present human-based systems if it relied on previous data to learn. Companies may respond to the growing complexity of the external environment by processing analysis and information in real-time and making more reliable forecasts using AI algorithms, which may be better on average governance of decision-making for individuals. Institutional investors are already investing in AI (above all in compliance and risk management applications). The Blackrock Aladdin system, which gets sensitive data from banks, insurance firms, and other significant organizations to undertake risk assessments for its customers, is without a doubt the most visible illustration of this trend.

One of the known advantages of Blockchain technology is the creation of decentralized networks that may poten- tially include all participants. As long as many unrelated nodes participate in the network, there can be no central power or authority. So, in a sense, sovereignty is spread technologically rather than openly on the blockchain [7]. In this way, "decentralized autonomous organizations" (DAOs) — organizations like firms or governments that are administered by decentralized, blockchain-based interactions – may be (re) organized and managed.However, decentralized network access through the Internet provides the strongest security against fraud. The distributed net- work's interconnectedness makes numerous versions of the blockchain accessible to all members. Due to the blockchain's decentralized and distributed structure, it is almost difficult to reverse, edit, or delete data. Node verifi- cation of transactions and votes is possible without sacrific- ing party privacy. Traditional transaction and vote mod- els requiring third-party validation are safer and (much) slower than blockchain. Because of blockchain security fea- tures, decentralized validation systems are also less prone to mistakes and corruption [8]. Blockchain proponents emphasize immutability, transparency, persistency, resilience, and openness at this infrastructure level [9].

Blockchain technology can accelerate decision-making and shareholder engagement. The key challenges with existing intermediary chains and remote voting systems are transparency, verification, and identity, all of which are directly related to the benefits of blockchain technology.Anne & Christopher (2018) Distributing voting rights to beneficial shareholders is also simplified, and voting procedures are quicker and cheaper [10]. Also, the chance of beneficial shareholders losing their voting rights (due to errors or delays) is reduced, particularly as crucial deadlines (such as the record date) approach. It may also help them participate more in corporate decisions. Higher investor turnout benefits the market. They increase shareholder control of boards and decrease agency issues, lowering equity capital costs and enhancing equity capital liquidity. Federico et al.

Due to the nature of blockchain technology, it may be difficult (or perhaps impossible) to backdate stock options or engage in related party transactions. Also, blockchain technology may "remove" numerous financial middlemen in global securities markets. Disintermediation would boost liquidity by simplifying transaction execution and settlement [3].

Using blockchain for governance has three advantages:

(a) lower voting costs,

(b) more valid ballots and judgments, and

(c) improved stakeholder openness. Federico et al.

disempower institutions by stressing consensual forms of self-government, direct public engagement in decision-making processes, and decentralizing hierarchical systems. Strong encryption would increase people's freedom and privacy. Even with enhanced anonymity, the Blockchain would allow users to verify precisely how, where, and by whom votes were cast, preventing fraudulent voting. These shared ledgers benefit from typical databases. They may be controlled by one or more organizations – e.g. a government agency– to ensure proper network coordination, dependability, and security via human involvement.

ID cards and driver's licenses; land, school, and medi- cal records; birth, marriage, and death certificates; tamper-proof and auditable e-voting systems; tax collection, and other applications may be possible with permission blockchain [4].

1.4 Feasibility study:

1.4.1 Obstacles faced in this research:

Inadequate research papers on Blockchain and DAO: Blockchain is the 21st centuries phenomenon. Governance on the blockchain is a new idea. This idea came when the Ethereum blockchain represented smart contracts. The idea of Decentralized automated organization came from when multiple smart contracts worked for doing multiple related tasks. First, DAO came to light in 2014. Now the literature for those topics is few to get insightful suggestions.

A fewer platforms for implementing prototypes: There are no other options without the Ethereum blockchain capable to work with. Other technologies rather than Etherium blockchain are still in their infancy. There are some limitations faced when working in the Ethereum blockchain.

No technology for putting machine learning models in a decentralized way: Blockchain and artificial intelligence are the technologies working in opposite manners, like for compiling models of artificial intelligence, it needs to run on a centralized server, whereas blockchain works in a decentralized way.

Framework system is highly complex: Age-old governance systems are complex and multi-diversions. And they are involved differently according to the different cultures. Segmenting different kinds of agencies of a governance system is also a tough issue. Then framing them into a universal model is also difficult.

Challenge for integrating AI and blockchain: Connecting and flowing data between Centralized machine learn- ing models and decentralized blockchain, there are no ro- bust technologies that support integrating both technolo- gies.

Incomplete documentation and framework for DAO: DAO is a new concept, yet there is no complete frame- work to work on. Furthermore, documentation for DAO democracy is not adequate that is given by The Ethereum blockchain documentation website.

1.4.2 Overcoming strategies of those above obstacles:

Though blockchain is a new technology, it has created huge enthusiasm among tech communities. There have been many outstanding research papers written on it. Various types of literature on blockchain and AI have been found. Those research papers are adequate for conducting the discussion phase. Another limitation is that it is bound to use the Ethereum blockchain platform for implementation. But Ethereum is a strong enough platform for implement-

ing the prototypes. Ultimately, Ethereum could be used to run countries. Therefore this enables us to suggest their blockchain platforms for final modelling. This research has to compromise for not implementing machine learn- ing models decentralized. In this case, the google app en- gine is the solution. Models can be put up in a central- ized google cloud. This paper will carefully choose dif- ferent features and agencies from various governance sys- tems and corporate governance systems to make it a lin- ear simplified model. This paper tries to choose the best features from different governance systems. For integrat- ing AI and blockchain, this paper will use a centralized server and a decentralized server. The centralized server will hold machine learning models, and the decentralized server will hold the entire blockchain. However, Slockit is a DAO open-source framework. It is reusable and adaptable. And It has a strong community behind it. This paper will use Slockit to develop the prototype and suggest Slockit for final modelling.

2 Literature Review

In this section, there is a literature review about blockchain, smart contracts, decentralized automated organizations, artificial intelligence, and machine learning. Then it is tried to find blockchain and AI convergence in the case of DAO. After that, a discussion about governance, government, democracy, direct democracy, and democracy innovation is given. Then, the blockchain, AI, and direct democracy convergence and its existing implication are examined.

2.1 Blockchain

Blockchains are immutable and resistant to tampering with digital ledgers that are often executed in a distributed form and without the intervention of a central author- ity [11]. Blockchain technology generally refers to a fully distributed system for cryptographically capturing and storing a consistent, immutable, linear event log of transactions between networked actors. It is functionally similar to a distributed ledger maintained, updated, and validated by all parties involved in all transactions within a network, ensuring transparency and eventually achieving system-wide consensus on the validity of an entire hiatus. As a result, it allows a community of users to record transactions in a shared ledger within that community. No transaction can be altered after being published [11]. Furthermore, blockchain can be defined in simple terms as a distributed database of records, or public ledger, of all transactions or digital events that have been executed and shared among participating parties, where each transaction in the public ledger is verified by a majority of the system's participants [12].

2.2 History of blockchain

Leslie Lamport developed the Paxos protocol in 1989 and published a paper on Computer Systems entitled Part- Time Parliament by Lamport (1998) to ACM transactions in 1998 Blockchain technology's second key notion is a signed chain of information used as an electronic ledger for digi- tally signing documents, established in 1993 [13]. Together, Satoshi Nakamoto and others produced a paper titled "Bitcoin: A Peer-to-Peer Electronic Cash System" [14]. This article outlines a decentralized peer-to-peer electronic currency system that flows freely between parties. This idea was first realised in Bitcoin. It's also the blockchain's first app [9]. Bitcoin is a cryptocurrency because it functions by solving encryption algorithms to produce unique hashes.

Smart contracts are another blockchain technology. Sz- abo proposed smart contracts in 1994 [15]. Its main role is to transfer wealth cheaply or automatically based on a decentralized global consensus record. Smart contracts are digi- tal contracts that are tamper-proof and often self-enforcing via automated execution [16].As of November 2013, the Ethereum blockchain platform aims to provide a more generalized blockchain platform by combining the notion of public economic consensus through Proof of Work (or eventually proof of stake) with the abstraction power of a state-

ful Turing-complete virtual machine [17].

2.3 Evolution of blockchain

Swam (2016) divided blockchain into four generations. Summarisation of those four generations of blockchain is below:

Blockchain 1.0: Blockchain 1.0 was launched in 2009 with the bitcoin network. This generation saw the birth of the first cryptocurrencies [18]. The concept was to use the payment to produce bitcoin [19].

Blockchain 2.0: In 2010, smart contracts and financial services for different blockchain applications were established [19]. This generation advocated building blockchains using Ethereum and Hyperledger [18].

Blockchain 3.0: The generation of This blockchain brought convergence decentralized applications [18]. Decentralized applications were evaluated for health, governance, IoT, supply chain, business, and smart city [19]. This level uses Ethereum, hyper ledger, and other platforms to create smart contracts for various decentralized apps.

Blockchain 4.0: This generation focuses on real-time distributed databases and public ledgers. This level integrates Industry 4.0 applications seamlessly [19]. It employs smart contracts to remove paper contracts and control agreements inside the network [18].

2.4 Blockchain Working Mechanism

Node, transection, block, chain, mainer, and consensus are key blockchain components [20]. The system relies on a global peer-to-peer network with thousands of 'nodes' (computers) [21]. The network's nodes may come and leave at will [14]. New blocks are created by special- ized nodes, or anonymous miners, who solve mathemat- ical riddles [9]. This invention isn't as easy as it seems. A new block requires numerous stages to complete. Mul- tiple miners oversee currency transactions to ensure that everything is in order and that the individual initiating the transaction has the funds available [9]. If the transaction is genuine, the miners confirm it. Similar transac- tions are then grouped into a block, which generates a chain of blocks [22]. The chain includes all approved transac- tions from the blockchain's inception [16], and the infor- mation is always accessible to anyone. According to Peters and Panayi (2015), a blockchain is a chronological ledger or database that records transactions by a computer net- work [16].Moreover, Smart contracts, tokenization, data se- curity, decentralized data storage, immutability consensus, typed blocks, sharding, access rights management: stan- dards used to administer permissioned blockchains; stan- dard data formatting; updatability; and UX and develop- ment operation.

2.5 Smart contracts:

The introduction of blockchain technology has revived Szabo's 1994 notion of smart contracts [15]. A smart contract executes a contract's terms. To remove intentional and accidental exceptions while removing the need for trustworthy intermediaries, lowering transaction costs, fraud losses, arbitration, and enforcement costs [13].

It is also utilized to contract on decentralized consensus and algorithmic execution. A self-executing distributed ledger is required [23]. Automated execution of smart contracts (including property and control rights distribution) should be formalised to reduce enforcement costs [24]. Considering the above, we may define smart contracts as follows: Smart contracts are digital contracts that are self-enforcing and tamper-proof due to automated execu- tion [23].

It is not surprising that there is no commonly accepted definition of a "Smart" contract, given the phenomenon's unique nature and complicated technical foundation [24]. A smart contract is a contract whose execution is automated [23].

This concept, however, may not distinguish "Smart" contracts from other well-known automatic performance contractual forms [25]. Greenspan (2016) provides another def-

inition of a smart contract: "A smart contract is a piece of code that runs on a Blockchain that reads and writes data in that Blockchain's database" [26].

A smart contract is a computer program that runs when specific conditions are met [25]. The contract can't be changed once it's on the blockchain. Delmolino (2015) presents a basic example of a smart contract and its Lowering example, Alice and Bob make a financial bet. Before betting on the future price, both parties must deposit the same cryptocurrency [27]. Bob anticipates the stock to go up, whereas Alice expects it to go down. External pricing authority monitors stock price as deadline approaches (say the relevant stock exchange itself, which is coded into the smart contract). The entire sum jointly wagered is delivered automatically via the smart contract Alice and Bob agreed to when they agreed to these conditions [25].

2.6 Decentralized Automated Organization (DAO :

Blockchain and smart contracts are governance technologies that may increase openness while minimizing bureaucracy [28]. They may reduce organizational principal-agent issues and moral hazards.

However, Bitcoin was the first real-world application of a "decentralized autonomous organization" (DAO) and provides a new non-hierarchical paradigm for organization design [29]. Imagine working for a worldwide organiza- tion where regular operations are managed by an algorithm rather than managers and people. Information is recorded publicly and securely on an immutable public ledger called blockchain (Hsieh et al., 2019) [29]. As the most prominent example of a DAO, "The DAO" was proposed and built by Jentzsch (2017) to provide an organizational solution [30]. On April 30, 2016, the first public DAO was created on Ethereum [31]. The goal was to create a new business track for participants to strengthen their skills (Singh et al., 2020).

Currently, the DAO is not specified. According to (Wang et al., 2019) [32], DAO is a decentralized autonomous organization (DAO). The distributed consensus methods and Token Economy Incentive are used in a DAO.

Moreover, a Decentralized Autonomous Organization (DAO) is an organisation whose core functions are automated according to coded rules and principles [31]. DAOs are non-hierarchical organisations that run, govern, and grow by democratic consultation with internal stakehold- ers [33]. A DAO is a decentralised autonomous organ- isation (DAO) that lacks a traditional hierarchical struc- ture. Once deployed, the DAO is independent of its creator can only be censored by a predefined majority of its par- ticipants, defined in the consensus protocol or smart con- tract [28]. Wang et al. (2019) outline the DAO features as follows (paraphrase, add text and references) [32]:

Distributed and Decentralized: A traditional organization is hierarchical with concentrated power. The DAO's objective is realized by bottom-up interaction, coordination, and collaboration across distributed network nodes [28]. Thus, ties between nodes or nodes and organizations are no longer established by administrative membership but by individual resource endowment and complimentary advantage [32].

Autonomous and Automated: In an ideal DAO, code is law, the organization is dispersed, authority is decentralized, and administration is based on community autonomy rather than bureaucracy [28]. Furthermore, since DAOs normally follow all stakeholders' regulations and cooperation patterns, consensus and confidence are simpler to acquire, lowering trust, communication, and transaction costs [29].

Organised and Ordered: These open and transparent reward and penalty terms and conditions are based on smart contracts [28]. Individuals who pay, contribute and assume responsibility is matched with corresponding powers and benefits to promote the division of labor and the unification of power, responsibilities, and interests, making the organization's operation more coordinated and orderly [32].

2.7 AI and machine learning

AI have a lengthy computer science history dating back to 1950 [34]. After three decades of striving for "mythi- cal" human-level computer intelligence, business, governments, And the public gave up [35]. A dramatic "AI winter" occurred in the field when it became clear that the expectations were too high and AI could not deliver on them. The recent success of Machine Learning & Knowledge Extraction has sparked considerable interest in the topic. Science Jordan, (2015) and Nature [37] recently reported on the success of machine learning [36]. This achievement may be seen in everyday life, from health to manufacturing. Many modern scientists dislike the word since "intelligence" is not precisely defined, and we are still far from human-level AI [38]. The most often asked question is: "What is the difference between AI and ML, and is deep learning AI or ML?". A formal short answer: Deep Learning is part of Machine Learning and is part of Artificial Intelligence: DL $\subset$ ML $\subset$ AI [36].

The most frequent definition of AI is machine intelligence, defined by human intelligence [34]. According to Bostrom (2014), a comprehensive AI system would automate data identification, testing, and data-driven decision-making [39]. In practice, AI may include approaches such as hard-coded logic rules [40]. On the other hand, machine learning usually requires manual data selection and testing by the data scientist and human application judgments. With current technology and organizational preparedness for pure AI, the most claimed AI is machine learning [40].

Moreover, machine learning is a data science technology that allows computers to learn without explicit rules [41]. Machine learning allows algorithms to learn and predict. Unlike rule-based algorithms, machine learning benefits from increasing exposure to vast fresh data sets and may improve and learn with practice [42].Supervised and un- supervised machine learning are the two main types. In supervised learning, you have input data that you want to evaluate [40]. This is comparable to how conventional statistics test relationships between independent variables and dependent variables. Unsupervised learning uses just input data to learn more about the data's structure [42].

2.8 AI and Blockchain,

On one hand, blockchain and AI promote centralized intelligence on secure data platforms, while the other promotes decentralized applications on open data platforms [43]. But if we cleverly combine them, the real positive externalities may be multiplied in a flash [44].A blockchain, despite its immense capability, has limits. However, all of them may be influenced by AI in some way or another [43].

The exponential growth of the blockchain causes scalability issues. AI may provide new decentralized learning systems such as federated learning or novel data-sharing approaches [45]. Even if the blockchain is safe, its layers and applications are not Given the set structure of the system, AI is a terrific friend for the blockchain to provide a safe application deployment [44].

The privacy issue of owning personal data raises regulatory and strategic concerns for competitive advantages [46]. Homomorphic encryption (performing operations directly on encrypted data), the Enigma project [47], or the Zerocash project [48], are potential solutions, but I see this problem as closely connected to the previous two, i.e., scalability and security.

Deloitte (2016) projected the overall annual operat- ing expenses involved with verifying and disseminating blockchain transactions to be above $500 million. An intelligent system may ultimately predict which nodes will be the first to accomplish a job, allowing other miners to stop working on that transaction and save money [45]. Greater efficiency and reduced energy usage may also decrease network latency, allowing for speedier transactions even with structural limits.

As we strive to automate data science (so far unsuccessfully), I don't see why we couldn't construct virtual agents to establish new ledgers, interact with them, and man-

age them [43].In the future, when all data is stored on a blockchain and firms can purchase it straight from us, we'll need assistance granting access, tracking use, and generally understanding what happens to personal data. Intelligent machines can do this [45].

Now we'll look at how the blockchain may help construct machine learning algorithms (Corea, 2018). Blockchain can aid AI explanation. Corea (2018) argues The AI black box is unexplainable [43]. A good audit trail may increase the dependability of data and models while also tracing back the machine decision process (Nassar, 2019) [49]. It may improve AI efficacy. More data (and training data) equals improved models, actions, outcomes, and new data [43].

The network effect counts at the end of the day; it may privatize market entry barriers [50]. Blockchain can pro- tect your info. So, Corea (2018) argues, why not keep your data privately and sell it [43]? You'll probably. So, initially, blockchain will help organize and clean your data. Sec- ond, it will enable the formation of new marketplaces: data, models (far more intriguing), and eventually AI. Singulari- tyNET Thus, easier data sharing and new markets, together with blockchain data verification, will allow smaller firms to enter the market more easily and reduce the compet- itive advantage of big giants [49]. Because autonomous virtual agents will be managing some of the duties, hav- ing a transparent audit trail will enable bots to trust each other [51]. (and us to trust them). It will also provide a safe means to communicate data and coordinate choices and a strong technique to obtain a quorum, which is impor- tant for swarm robotics and multiple agent situations. Can minimise Catastrophic Risks (2017) An AI programmed in a DAO with specified smart contracts can only do those tasks [43].

2.9 Governance, democracy and Representative democracies:

Governance is used in many contexts and has several meanings [52]. There is consensus that governance refers to the emergence of governing styles that blur the pub- lic and private sectors—the core of governance as focus- ing on methods that do not rely on government power or punishments. A structure or order cannot be imposed from outside but is the outcome of many ruling and in- fluencing players [53]. The employment of governance in various practitioner and academic contexts is intriguing. Both elected and unelected authorities in Britain and the US use governance. Other Western nations' policy issues also touch on governance. Governance is becoming a pol- icy issue in emerging nations. But for the World Bank, it's about efficient and responsible governance Others use it to acknowledge the interconnectedness of the governmental, commercial, and non-profit sectors in developing nations. Of course, governance is also utilized for rhetorical pur- poses. Osborne and Gaebler (1992) employ the term gover- nance instead of government as though the word 'govern- ment' was hard to sell in a privatized, market-oriented so- ciety [54]. This study [54] is about how a government may make logical and successful use of a larger variety of in- struments beyond direct service provision. For them, gov- ernance is about contracting, franchising, and new kinds of regulation. In sum, it's about the "new public manage- ment" [55].

Today, democracy is the only system that works. Citizen and stakeholder accountability for public acts in a modern democracy [54].

However, Democracy is a system of governance where the people elect their leaders. People and power are essen- tial to democratic philosophy, development, and constitu- tion [56]. Membership, consent, voting, right to life, and minority rights are all cornerstones.

Direct and representative democracy are the two main forms. In a direct democracy, the people make the laws. In a parliamentary, presidential democracy, the people elect representatives to discuss and decide laws [56]. Liquid democracy includes features of both. The majority rule is often used in democracies, while alternative systems like supermajority and consensus have also been used.

They counterbalance majoritarianism by being inclusive and legitimate on difficult matters and have a constitutional precedent [56].The majority exercises its authority within a representative democracy. Still, the constitution restricts the majority and protects the minority, generally via the enjoyment of specific individual rights, such as freedom of expression or association [55]. There have been many variations on these main forms of democracy.Democracy makes all forces fight to achieve their goals and devolves power from people to laws.Various systems and degrees of the enfranchisement of the free male population were witnessed in city-states such as Classical Athens and the Roman Republic until the form faded in the West at the beginning of late antiquity [54]. The English term comes from the Middle French and Latin words.Democracy, according to American political scientist Diamond (1999), is a system of free and fair elections that allows citizens to participate in politics and civic life actively and the protection of all citizens' human rights. Landman (1996) points out that "there must be more precision in the conceptualization and operationalization of democracy and human rights."

A representative government defines Liberal Democracy. Citizens participate as voters, local elected officials, and public discourse [57]. The current historical approach, Direct Democracy, emphasises giving the people authority. Consensus (communism) or regular elections (democracy) justify decisions (socialism). Held's first modern democ- racy model depicts competitive elitism [58]. Experts partic- ipate in policy networks to represent (or pretend to repre- sent) societal interests. Political specialists help formulate policies and define public services. A competitive election system with at least two parties ensures the government via electoral majority and political liberty [57]. This politi- cal system distributes authority into three branches: legisla- tive, executive, and judicial, as well as operational admin- istration. The majority principle safeguards people against arbitrary rules. Effective political leadership is based on liberal values, limiting governmental interference in civil society and the general public's lives. The Participatory Democracy paradigm stresses that equal rights are attained via participation by competent members of society [57].

2.10 Representative democracy & agent-dilemma problem:

'Let us remember that political institutions are the creation of mankind; owe their inception and their existence to human desire.' Men did not discover them sprang up on a July morning [56]. As with representative government, Mill's insight may be extended to the emergence of DIs: they are the product of human will. They arose in reaction to the contemporary issues confronting representational democracy. Many signs point to major legitimacy issues for the representative democratic system [58]. While researchers disagree on the diagnosis, and even mainstream democracy scholars deny the severity of the crisis, it is acceptable to say that the representative system is now in trouble. The representative system faces two major challenges: shifting patterns of political involvement and declining system support [59]. Formal political engagement comprises voting, working in political campaigns and parties [58]. Informal engagement includes protesting, writing petitions, boycotting particular businesses, and debating politics online [60]. Formal political involvement is diminishing while informal political participation expands [61]. Formal involvement (e.g. voting in national elections) still outnumbers informal engagement [62]. Political parties are losing members and supporters [63], and voter turnout is at or below historic lows [64]. Demonstrations, petition signing, and political consumerism are key signs of growing informal engagement [61]. Overall, political engagement is not declining, but it has shifted from formal to informal [65]. En même temps, support for and faith in representative institutions and actors is declining. Political system support and trust span many levels of society, from the legal system to the military to government and political parties [66]. Norris (2011) defines 'system supports' as a 'psychological orientation' toward the nation-state, agencies, and actors [65]. Sys-

tem support is often measured as 'national identities' and 'agreement with core principles and normative values'. In contrast, specific support is often measured as 'evaluations of overall regime performance', 'confidence in regime institutions', and 'approval of incumbent officeholders' [66]. It seems to change over time depending on how we define system support. When we look at overall system support, there is no consistent downward trend [65]. The public's confidence and faith in politicians, political parties, and political institutions have decreased during the last generation, according to Dalton (2004) [67]. Despite voters' loss of faith in politicians, government, and political institutions, they think democracy is the best form of governance [65]. Thus, the question is not Whether we should have a democratic system but how it should work and what democratic institutions we should have.

The globe has entered the age of digitization, shifting political participation patterns and reducing system support. While the impact of ICTs on politics has been debated since the dawn of the internet [68], it was not until the 2010s that ICTs were widely used in political contexts. It is difficult to research the politics of fundraising, election advertising, political activity, public diplomacy, or social movements without considering the Internet [69]. Therefore, the virtual and natural worlds are merging, with online campaigns resulting in rallies in the streets and local concerns gaining worldwide attention. Politicians often utilize social media to connect with voters [70], and governments worldwide employ ICTs to communicate with people. This thesis will examine how municipal, regional, and state governments aim to directly or indirectly include individuals in policy- and decision-making processes. While digitalization does not directly threaten the present democratic system, it does offer a new dimension to modern politics by opening up new avenues for political engagement that are not regulated by the official political system [71].

2.11 Democratic innovation and democracy:

Dissenting voices are intimately involved in official decision- and policy-making processes. However, it is critical to grasp the concept of DI and how it is defined in the current literature. "Institutions that have been intentionally meant to expand and deepen public involvement in the political decision-making process," Smith (2009) writes [72]. Smith's definition is broad and stresses one of DI's key components: public engagement. However, Grönlund et al, (2014) feel that "democratic innovations might help policymakers better respond to public opinion [73]." In addition, DIs could be seen as "new procedures deliberately constructed to improve democracy" [75]. Newton (2012) supports formalizing DIs [74].

They are developed by governments as an official platform for public input in policy and decision-making processes [76]. Smith thinks that formal public participation in policy, legislative, and constitutional decision-making is essential. DIs, like other participatory activities, are institutionalized and formalized. A million signatures on an unofficial online petition for a political cause may attract journalists, political parties, and politicians [76]. However, neither lawmakers nor government employees are needed to sign the petition. When a petition reaches 100,000 signatures on 'direct.gov', the UK House of Commons must discuss it. So, a random participatory platform or process is not a DI. The desire to improve democracy is a key feature in developing DIs [74]. They are defined by Geissel (2013) as "new procedures actively and consciously used to repairing current democratic malaises and improving democracy" [75]. A problem that will be solved by improving democratic institutions normatively. "DIs must show how to address unequal participation, empower individuals in decision-making, construct the environment to allow informed choices, and make processes accessible to participants and observers," Smith adds (2009). Newton (2012) defines DIs as "the successful implementation of a new idea" [74]

2.12 E-democracy, E-parliament and E-voting:

The fast growth of the Internet has changed the environment for communication and coordination, increasing interest in technology-enabled political engagement [60]. E-Democracy uses ICT in political discussions and decision-making processes, supplementing or opposing conventional modes of communication like face-to-face engagement or one-way mass media. Local and worldwide [77] E-Democracy initiatives address the premise that new ICT may promote democracy [76].Van Dijk (2000) abandons historical paradigms and examines ICT's function in connection to Held's four contemporary democracy models (Pluralist, Participatory, Legalist, and Competitive Democracy) [60]. He defines the models by whether the major purpose of democracy is opinion formation or decision making and if the primary mechanism of democracy is elected representatives or popular vote [79]. Another paradigm (Libertarian) promotes citizen autonomy via horizontal internet communication. This framework of four E-Democracy models is presented by [78].Unlike Van Dijk, who views ICT as a complement to conventional communication chan- nels Bellamy (2000), sees the Internet as a necessary precursor for democracy [78]. A collection of competing discourses relating democratic principles to technological development is sought by Bellamy's four models (Consumer, Demoelitist, Neo-Republican, and Cyberdemocratic) [78].

An e-parliament is a legislature enabled by ICT to be more open, accessible and responsible. Bwalya et al. (2012) define e-parliament as integrating ICT into government value chains, increasing public involvement across socio- economic sectors [80]. Internet, computers, radio, televi- sion, and telephones (fixed and mobile) are all examples of ICTs [81]. E-parliament, using ICTs, has been highlighted as having the potential to minimize citizen-representative distance. The introduction of new and numerous commu- nication channels in the political process might promote the inclusiveness and transparency of democratic processes, as noted by [82]. It enables individuals of all backgrounds to participate more fully in public life by improving knowl- edge and access to legislative materials and activities [81]. A network of linked stakeholders uses information and communication technology to assist better the legislative tasks of representation, lawmaking, and supervision [83]. The use of ICTs to increase links between lawmakers, constituents, and civil society has been highlighted as strategic use of ICTs.

Electronic voting and electronic parliament are synonymous. Electronic voting is an essential component of electronic democracy. Electronic voting may involve voters in a broader range than current election processes [84]. Electronic Voting (e-Voting) allows individuals to voice their views on legislation, representative elections, etc. There is no commonly accepted definition of e-voting. The word is being used ambiguously, from electronic voting to elec- tronic voter registration. There are two basic forms of e- voting [85].Electronic voting machines at polling stations or municipal offices, or diplomatic or consular missions overseas, are physically overseen by representatives of governmental or independent electoral authorities. For example, voting from one's or another's computer via the internet (i-voting), touch-tone telephones, mobile phones (including SMS), or digital TV, or at public open-air kiosks—which themselves are venues and frames for different machines, such as PCs or push-button voting machines, with or with- out smart card receptacles.

2.13 Automated blockchain government and direct democracy

Jun (2018) proposes a blockchain-based governance structure. "Blockchain Law" is the first premise. Blockchain technology guarantees "absolute coercion," allowing the establishment of unbreakable laws [86]. This legislation can be placed on the blockchain and operate automatically us- ing Smart Contracts. It implies we should accept the soft- ware's rules as a law because blockchain provides "abso- lute law" that cannot be changed or broken [84]. The sec-

ond concept is open source or transparent disclosure. The scope of this disclosure includes both the blockchain software code and the data it contains [86]. The third concept is "An automated process." This would enable us to estab- lish a far more efficient government (Jun et al.,1018) [87]. Several regions currently use Smart Contracts to automate government administrative operations [88]. A direct democratic governance system is the fourth premise. We can think beyond the voting system we know [88]. All commu- nity members may decide and amend the blockchain's laws via consensus [87]. They are building a Distributed Au- tonomous Government (DAG). We can construct a funda- mentally different government from present governments if we all engage in a consensus process and make it operate on a blockchain automatically [88]. It indicates that a government may be built as a social, operational infrastructure, an information processing machine that runs automatically and whose rules are established by the entire community. DAG government [86].

However, Diallo et al. (2018) provide an eGov-DAO architecture with two categories of participants: DAO maintainer and users. Anyone with computing/storage resources may connect to the system and block creation [89]. Some blockchain maintainers may be dishonest, attempting to edit or erase transaction data or providing incorrect smart contract outcomes. The bulk of them is hon- est. Therefore bad ones cannot undermine the blockchain system. According to Diallo et al. (2018), the eGov-DAO has many customers, from government agencies manag- ing projects to suppliers of various sorts. This allows them to submit various transaction records to the eGov-DAO, which blockchain maintainers then confirm. The eGov-DAO stipulates that an authorized party must authorize one transaction before it may be approved [90].Valentini (2018) claims blockchain is ready for E-voting. He said that a citizen's vote would be recorded in the Blockchain, much like a cryptocurrency transaction, and would be unchangeable by third parties or by the same voter afterward since every node in the chain would maintain track of it [91]. A posteriori data tampering requires approval from more than fifty percent of the Blockchain chain, with thousands of nodes [92]. Another important topic is the conviction that the title expresses the vote. Each voter shall register and get voting permission through a cryptographic ID, subject to verification of the standards set out by law. This would also protect the privacy of the expressed suf- frage, a crucial requirement of democracy, as with traceable but anonymous cryptocurrency transactions [91]. Valen- tini (2018) adds: The block-chain may see representative democracy as a tool of direct democracy, as every constitution does, with three instruments of direct democracy : petitions, laws of popular initiative, and referendums, both abrogative and constitutional [91]. Alternatively, it may replace the representatives of representative democracy via abrogative referendums, i.e., to elect from the disposition of the dispositions, or in the case of the constitutional referendum, to confirm a third party's reform proposal [92]. But several direct democracy tools may be applied inside local government legislation, and which the courts have defined or expanded throughout time [93]. Repetition of interpellations and questioning of petitions to citizens' initiative proposals; Consultative referendums, which have had more luck in the statutes and their application; Referendums that at the local level, as recognized by the jurisprudence and in an optic of interpretation of a single local text, can also be proactive [91].

2.14 AI as decision-making assistance of humans

With the resurgence of AI, a new human-machine symbiosis is on the horizon. A question remains: How can humans and new artificial intelligence be complementary in organizational decision-making?To address this basic question, Jarrahi (2018)draws upon the distinction between analytical and intuitive decision-making and the three challenges that plague decision-making in organizations: uncertainty, complexity, and equivocality [94]. Organizational scholars have distinguished between analytical and intuitive prac-

tices used in processing information and arriving at a decision by studying managers and other organizational members [95]. By employing an analytical approach, individuals can engage in systematic, laborious information gathering and analysis and attentively develop alternative solutions. An analytical approach often involves analyzing knowledge through conscious reasoning and logical deliberation [96]. The problem-solving ability of AI is more useful for supporting analytical rather than intuitive decision-making. As noted, AI encompasses a broad range of applications and algorithms. For example, AI tools such as expert systems and predictive analytics provide affordances for well-deliberated calculations that integrate otherwise unmanageable amounts of data; these tools produce analyses and help evaluate alternative decision options [97]. However, much of cognition and human decision-making is not a direct result of deliberate information gathering and processing but instead arises from the subconscious in the realm of intuition [95]. In a decision-making context, intuition is defined as a capacity for generating direct knowledge or understanding and arriving at a decision without relying on rational thought or logical inference [97]. Superior intuition can be understood as a gut feeling or business instinct about the outcome of an investment or a new product. Intuitive decision-making includes imagination, sensitivity, rumination, and creativity. Psychologists such as Carl Jung considered intuitive intelligence: the human capacity to analyze alternatives with deeper perception, transcending ordinary-level functioning based on simple rational thinking [98]. The individual draws upon past embodied practices, experiences, and judgments to react or decide without conscious attention through an intuitive approach. Whereas analytical approaches to decision-making rely on the depth of information, intuitive approaches focus on breadth by engaging a problem with a holistic and abstract view [96]. These two styles of symbiosis in organizational decision-making 3 are not mutually exclusive and are employed as parallel systems of decision-Making to more effectively address various contingencies. While AI systems support an analytical decision-making approach, they are less capable of understanding common-sense situations [99], and compared to humans, they are less viable in uncertain or unpredictable environments–—particularly outside of a predefined domain of knowledge [100]. Meyerson (1916), IBM's chief innovation officer, said [101]: "Humans bring common sense to the work; by its definition, common sense is not a fact-based undertaking. It is a judgment call." Humans tend to perform better in the face of decisions that require an intuitive approach.

2.15 AI decentralized automated organization

Yadlapalli et al. (2019) built a Decentralized Autonomous Organization (DAO) (AI). They argued that when human error becomes the main cause of errors, from little ones like missing medicine to catastrophic ones like Chernobyl, it is necessary to automate as many operations as possible [101]. Creating automated organizations is only the first step. They create a business selling paintings to generate money. The conventional method is to develop a human-controlled online portal like Amazon that sells art and lets human artists post their work. But to make it as automatic as possible, they created a Generative Adversarial Network (GAN) [102]. Our group will sell the GAN's paintings and utilize the proceeds to fund its Resources. AI will lead it. So the DAO will be an autonomous human-free entity.SingularityNet is another AI and blockchain project. It will supply intelligence services to companies, people, and organizations, stimulate the growth of more power- ful distributed general intelligence, and use artificial intelligence to benefit as many humans and other sentient creatures as feasible [103]. A future self-modifying, decentralized "artificial cognitive organism" with the potential for global intelligence and helpful, ethical features beyond the human level is the goal of SingularityNET (Westin, 2018) [103]. They are illustrated by long-term theoreti- cal thought and experimentation by the creators on top- ics like Artificial General Intelligence, Open-Ended Intelli-

gence, and the Global Brain [102].

2.16 CBPP and blockchain

It is an emergent paradigm of socio-economic production in which groups of people work with one other to generate shared resources without conventional hierarchical structure is called CBPP [104]. Examples of this phenomena include Wikipedia, a collaboratively written free encyclopedia; OpenStreetMap, a collaboratively created world map; and Free/Libre Open Source Software (FLOSS) projects like the operating system GNU/Linux or the browser Firefox. Crowdsourcing research Morell et al. (2016) discovered evidence of the wide variety of domains where collaborative work on commons is evident. Open research, urban commons, peer financing, and open design [105]. The literature on CBPP highlights three key features of this form of production [106]. First, CBPP is decentralized, with individual agents rather than a single coordinator [104]. Second, it is founded on commons since CBPP communities often employ shared resources that are freely available and collectively owned [104]. These resources may be immaterial, like open software source code, or material, like 3D printers shared at Fab Labs. Third, non-monetary incentives are common. Extrinsic and intrinsic drives are often interwoven. Consequently, CBPP communities function on numerous levels of value, including monetary, usage, reputational, and ecosystemic [105]. The three traits of peer production are associated with blockchain properties. Being decentralised is a significant feature of CBPP, employing blockchain infrastructure to support CBPP procedures is an option. A commons is a transparent, open, collaboratively owned, and controlled data set shared among all participants in the CBPP [106]. So, might such blockchain commons host or support commons resources or "commonize" other CPP community elements like governance rules? Third, CBPP depends on multi-dimensional value and incentives, and blockchain allows for non-monetary exchanges [107]. This raises the subject of new channels for CBPP community governance. Overall, we think the marriage of CBPP with blockchain is an attractive subject for investigation, where blockchain technologies are utilized to enhance community coordination activities [105].

2.17 Research question

From the literature review, this paper can conclude finding in several areas. Firstly blockchain and DAO technology are ready for creating decentralized automation organizations. Secondly, AI and blockchain can leverage each other by integrating. Then people are giving up faith from representing democracy. And also, Technological intervention always changes the traditional institutions such as the political process, e.g., e-voting and e-democracy. AI makes decisions as human assistance is the best possible logical decision-making process. Also, we find direct democracy is the purest form of democracy where there is no agent dilemma problem. It is possible to implement a direct democracy system with blockchain technologies, but we don't find any suggested system.

For the Automated direct, decentralized democracy system, we couldn't find any proposal other than E-govdao, an automated government serviced for leveraging government work, not achieving consensus.

So the research question is

(i) Do current technologies support the creation of a di- rect democracy system?

(ii) How can blockchain and AI technologies altogether make a decentralized automatic direct democracy system?

(iii) How can blockchain support scalability, transparency, and security?

For answering research questions, A decentralized automated direct governance system design and model will be shown in the result section. Then the system will be evolved and analyzed in a separate section.

3 METHODOLOGY

In this chapter, this section will provide a brief introduction to different types of methods of research. Also, justifying the research method used to collect the appropriate data to accomplish the research aim mentioned in this section answers the refined question.

3.1 Research Aim

As stated in the literature review the current limitations and flaws of the current government system, we are growing more and more aware of the different biases that affect the decisions of officials and politicians that work in the implicit level of the mind, such as optimism bias where politicians and officials are over-confident about implementation and overestimate their abilities, the quality of their plans, and the likelihood of future success, and them believing to know more than what they do in reality.

Furthermore, the worsening this optimism bias, the more senior they become. The system lacks transparency, accountability, and challenge, as many of the policies are made behind closed doors with many evidence transparency frameworks in place but still do it poorly where the citizens are unaware of changes made and expose its thinking as early as possible. It is often unclear which senior official is responsible for the quality of evidence used to inform decisions. The result of which makes it easier for bias to slip through. Lastly, the lack of challenge in the system when poor (or misinterpreted) evidence goes unchallenged as challenging political officials above in position may lead to them risking their job. Independent voices must be able to challenge the decision-making of those in power and be rigorous.

With the recent advancements made in the fields of Artificial Intelligence, Blockchain, and DAO technologies, as mentioned in the previous sections, this paper shows a possible method to Intervene in the current government policy voting and passing system to circumvent the problems caused by the various biases that affect the current system and its impact on the lives of countless people that would be affected by the policies introduced or amended.

3.2 Research Design

In this paper methodological approach for data collection involves using two different data collection methods. We also state its effectiveness on the research using these methods.

3.2.1 Quantitative Methodology

In this method, analyses collected numerical data to find patterns and averages and make predictions and generalizations to represent a wider population. All the while also providing a sufficiently comprehensive view of the population. It lays down a systematic approach that allows us to reach a higher sample size, collect information quickly and convert it to a more understandable format using statistical models and procedures such as SPSS, R or Stata . Along with computational techniques and mathematics obtained from the empirical investigations. Using quantitative research, we can focus more on the facts than generalized beliefs and judgments. As long as the individuals can confirm that they belong to the study group, they can use them for data collection without the need to provide their personal information, thus avoiding any repercussions due to stating one's personal opinions about a controversial topic out in the open.

Quantitative research, however, is very expensive to conduct using traditional methods. It requires a great quantity of data to be analyzed to increase accuracy in the result that would accurately represent the demographic profile of the respective study focus group, or pool, from which the data is being obtained. Therefore, many people are needed to be employed and resources to carry out quantitative polls. Modern means of online polling using emails don't guarantee that the respondents fit the targeted demographic. Either way, we cannot verify the validity of the data as not everyone will be truthful in their Answers while polling.

Thus, the need for the poll staple times to be confident in the data produced increases the cost to carry out the re- search. Also, one of the major concerns with this method is the lack of ability to obtain specific reasoning behind the vote and, if obtained, make the data useful enough to be used in quantitative research.

3.2.2 Qualitative Methodology

This method involves non-numerical data to be collected and analyzed. It aims to set forth a deeper understand- ing of a given problem by taking concepts, opinions, or experiences into account. Compared to the quantitative method, this requires a much smaller sample size and can also obtain faster results. We try to understand the con- text of what is going on instead of looking at individuals' choices or behaviors as in quantitative methods. Qualita- tive methods also create more predictable outcomes as we can learn the actual structure of the decision-making pro- cess leading up to the choices, thus taking into account and making it apparent the unconscious biases in the informa- tion being collected. Qualitative research works with the universe of meanings, motives, aspirations, beliefs, values, and attitudes, which corresponds to a deeper space of re- lationships, processes, and phenomena that cannot reduce to the operationalization of variables [111]. It, therefore, fo- cuses on the purpose of a decision instead of the details.

Keeping the advantages in mind, it is worth noting that the data collected does take a lot of time to process and de- termine what is usable and what is not. Another downside of this method is that it does not offer a broad statistical representation as the results may vary as per the local area. Hence, it fails to give a broader perspective of the entire demographic. There would need to be

several follow-ups to ensure the accuracy of the process. Lastly, a crucial disadvantage to this method would be that there is a challenge to replicate the results as opinions are highly subjective so may vary from time to time and so when the time comes to verify the findings, the opinions might have already changed, thus offering ineffective decisions to be made using the results.

3.2.3 Mixed Methodology

This methodology includes qualitative and quantitative data collection for analysis and investigation. It helps to better reveal patterns from the qualitative and quantitative data obtained during analysis. Like that, it would also shed light on the flaws within the system through analysis, thus giving an overall deeper understanding of the data acquired.

However, the use of mixed methodology would also mean that more time and manpower would be needed to successfully collect and analyze the data obtained from both qualitative and quantitative methodology approaches individually. It would notably bring both the respective methodologies advantages and disadvantages for each approach, thus leading to more uncertainty. Once data collection is complete, it would increase the difficulty during the data analysis phase. It could likely result in a confounding conclusion due to the dissimilarities between the approach in obtaining qualitative and quantitative data and the data types obtained through those uniquely distinctive means.

3.3 Research Strategy

The research strategy adopted in this paper will be in an interpretative approach, requiring analytical techniques and concepts followed by theory building and operational procedures made out of the aggregated data collected through studies of formerly published research papers. The criteria for the interpretation are made following the case study goals mentioned in the previous section, i.e., research questions. This paper uses a mixed methodology consisting of quantitative and qualitative techniques. Quantitative research helps classify features and phenomenons to construct statistical models out of to build a synopsis of the different scenarios being observed. Qualitative research here helped provide a deeper understanding of the partic-

ipants' Interpretations, intentions, motivations, and expectations in their respective scenarios. By examining and analyzing the data obtained from both methods, we obtain a great mass of information to perform our studies on. It was aware of and overcame limitations in funding by utilizing previously conducted research databases to obtain further information that increased confidence in the final interpretation.

3.4 Data Collection

Through the studies of past research papers, data is compiled, reviewed, and analyzed to identify common themes and patterns for qualitative research. In contrast, the data obtained from quantitative research were studied and classified to later be scrutinized in the data analysis phase. Obscure information and data obtained throughout the data collection phase that lacked evidence or sufficient proof were later disqualified from being included in the final analysis for a more accurate conclusion.

3.5 Data Analysis

For qualitative data analysis, a compiled list of statements, judgments, beliefs, assertions, etc. were studied and analyzed for patterns that were then categorized appropri- ately, which led to the identification of recurring themes that would later be the base foundation on which this the paper built its research on along with the quantitative anal- ysis.

For quantitative analysis, statistical data and models were investigated, examined, and correlated to help find patterns which were then categorized and structured to help identify trends.

What then compiled the categorized trends from both quantitative and qualitative methodologies for a mixed methodology analysis that would finally underpin the goals of the research questions made in the previous section.

3.6 Limitations:

The lack of resources related to blockchain as it is a new industry and technology that is still evolving did add a layer of difficulty in conducting this research. During the creation of this dissertation, many resources had to be gathered from reports published by the same organizations and researcher papers.

Decentralized digital identity management systems are still being developed at the research time. Therefore be- cause of there being no alternatives, we have assumed for there to be a decentralized digital identity management sys- tem to be built in the future or the use of any other means to obtain participants' identity for verification purposes to be integrated into the proposed system is essential.

Many of pre-existing systems that perform the tasks obtained through data collection were still being developed with many of their features missing and-or in the beta or prototype stages, so relying completely on them at their current state for the significant purpose of governance can introduce flaws of its own, so they were omitted leading to a further lessening of resources to rely on safely. Lack of sources familiar with blockchain technology with the mixture of governance, artificial intelligence, and machine learning leads to a lack of authentic information needed for an accurate, data-backed, reviewed analysis and conclusion.

3.7 Conclusion

Research methodology section mentioned the method used to conduct the research, i.e., a mixed methodology that includes qualitative and quantitative data collection and analysis methods. It then explains how the data is obtained and used for mixed methodology. Lastly, we mentioned the limitations that bring forward the unfavoured conditions that otherwise would have led to a more accurate research finding.

4 RESULT

Elaborate design of a Decentralized Automated Direct Government System (DADGS) Based on AI and blockchain is shown here as a result. This section consists of an overview, components of the system, technologies used in the system, and some special algorithms used in the system.

4.1 Overview

DADG is made for the structuralization of direct government on blockchain infrastructure. Here citizens vote on every legislation and decision for distributing work to other government agencies. Citizens and other government agencies provide proposals and legislation. When one proposal or legislation is passed, it is converted to smart contracts by maintainer-programmers. Before deploying this smart contract, it is again reviewed by citizens. This condition has to be specified in primary smart contracts. Apart from citizens, two kinds of agents connect with this main system. One type is a different government sector. The other is an AI agent who works for scheduling, analyzing, categorizing, whether it is the proper format, spam or not, by unsupervised machine learning. Then summarize the proposal by NPL and visualize it in the client hub. The AI agent also can make decisions by analyzing the relevancy of the proposal with preliminary data. There is a decentralized discussion forum added to the main blockchain. A proposal can be in a group format. What will incen- tivize citizens if their proposal is passed. They also vote as a tokenized form. For every proposal, one user votes one time. Assuming all other government sectors are on blockchain infrastructure. So, the government is crowdfunded by other agencies, e.g., the tax department. And when one proposal passes, relative agencies or vendors take the fund to complete the work in timespans. Auditor confirms the work progress. Auditors are the users chosen randomly, and the AI agent will choose the basis of the user's interest by its algorithm.

4.2 DADGS Life-Cycle Explained

Stage 1:

The citizens and government agencies alike first construct a proposal for submission to the Decentralized Automated Direct Government System (DADGS) following a strict standard and a template for proposal could be as suggested similar to the Ethereum Improvement Proposal (EIPs): Summary, Abstract, Motivation, Specification, Rationale, Future Compatibility, Test Cases, Implementation, Security Considerations, Copyrights, etc.

Once the proposal is made, they would submit a pull request to the Decentralized Automated Direct Government System Proposals (DADGSP) where it would be with the other proposals submitted by all the other participants of the system. The submitted proposal has then given the status "Draft"

Stage 2:

DADGSP will then go through the second stage where it is reviewed by other citizens and government agencies who will then provide feedback over a DADGS community forum and will go through iterations where it may have changes applied based on the suggestions.

It should be noted that these suggestions may or may not be applied by the author(s) of the DADGSP to maintain the severity of the demands for those who the proposal represents for this will be later reviewed and filtered by an AI, unbiased agent in an upcoming stage. In this stage, the proposal is given the status "Review."

Only after a proposal has been in the "Review" stage for at least a month, or an adequate amount of time seen as sufficient for the reviewing of proposals, will the proposal be given the next status "Submitted

Stage 3:

Both citizens and government agencies can now vote DADGSPs with the "Submitted" status. The voting means will be standardized, and the UI should be simple enough for the general audience to participate and encourage other participants to vote on a DADGSP with ease. This stage will

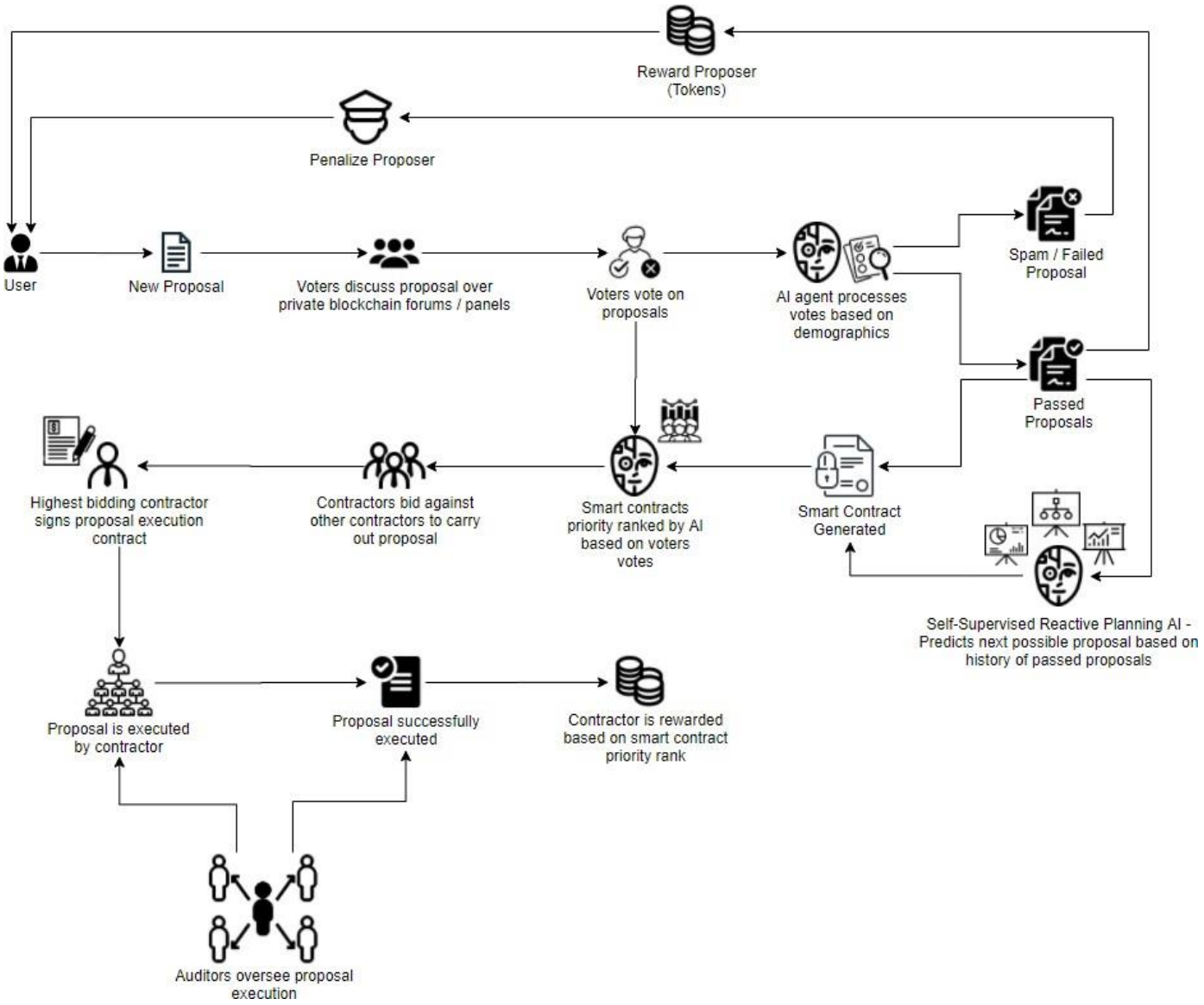

Fig. 1.

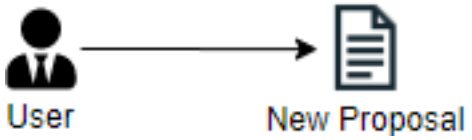

Fig. 2. 1: Stage 1 of the life cycle of DADGS

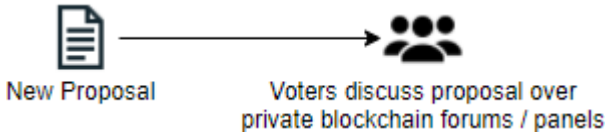

Fig. 3. 2: Stage 2 of the life cycle of DADGS

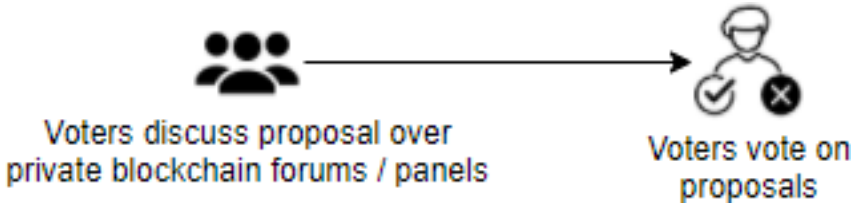

Fig. 4. 3: Stage 3 of the life cycle of DADGS

have a deadline before which all votes must be submitted. By default, have no automatic voting system to maintain the integrity of every participant's right to vote on proposals based on their discernment.

Furthermore, possibly allow trust-worthy privacy-safe voting with an option for the voter address to be unassociated with the vote they cast. To vote, one must use tokens that possess a value within the DADGS, and this would also add solemnity to every vote being cast and then reward with sub-tokens for performing voting. The voting could be performed with the pseudocode provided in Section 4.6 or with already implemented means of secure, decentralized, auditable e-voting mediums such as using 'votosocial' or 'VoteWatcher'. However, this is ill-advised as it would introduce external flaws in the system but suitable enough for small-scale testing purposes.

Stage 4:

AI agent, DADGS Demographic AI (an AI Supervised Classifier), then analyses the votes based on demographics and filters DADGSPs into two categories "Bad Proposal" and "Passed Proposal." This would be one of the most complex functional components of the DADGS system and would perform many crucial roles that maintain the system's legitimacy.

The primary role of the DADGS Demographic AI is to ensure that minority proposals that the majority has negatively voted are reconsidered and recycled in the system so they would not need to be re-proposed and pass the prior stages again but instead, be given to editing on these recycled proposals that will be given the status "Recycled" based of further discussions. These proposals with enough of its demographic votes will be set the status "Passed" instead of being tagged "Recycled" automatically and would then be given an auditor to overlook these proposals and ensure that it would be implemented, thus ensuring that the minorities are not oppressed in the DADGS system.

This would also enable the DADGS Demographic AI to perform its secondary role, and that would be to differentiate which DADGSPs are deemed as bad proposals from the recycled proposals, and that is done by checking if a proposal was voted to be a bad proposal by the majorities as well as by the minorities and sub-minority branches and then finally setting the status of these DADGSPs as "Bad Proposal." Lastly, the DADGSPs most voted are automatically set as status "Passed

Stage 5:

If a proposal is given the "Passed" status, tokens are awarded to the proposer(s) of the proposal using a simi-

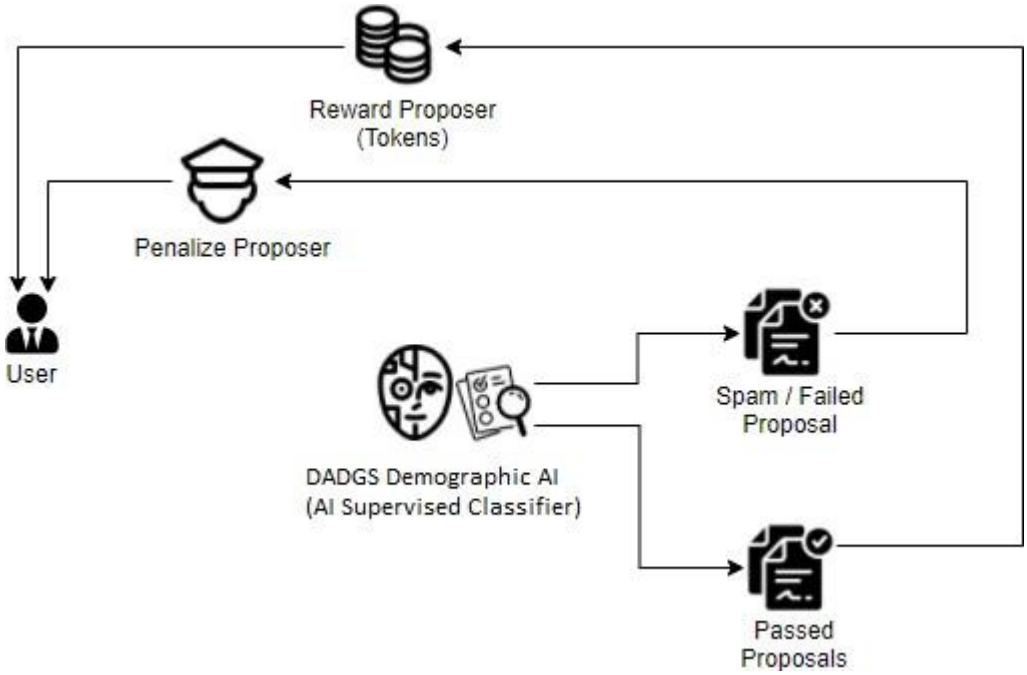

Fig. 5. 4: Stage 3 of the life cycle of DADGS

lar system as Honeyol (SLP) Token Reward Platform) for the implementation of a token reward system for DADGS to manage tokens transactions. An alternative would be to use a token generator such as ERC20 Token Generator or using generators like TokenGen, that features a step by step process that allows the generation of smart contracts containing all the necessary code for deploying tokens and managing tokens for the Ethereum network during the testing of the implementation of the system. Suppose a proposal is given the "Bad Proposal" status. In that case, the author(s) of the submitted proposal is penalized, and tokens are confiscated, which could be used to feed more bad proposals in the future by the proposer.

Stage 6:

AI agent, DADGS Reactive Planning AI, the role is to automatically make proposals by reading patterns, classified by tags and sentence structure, based on the history of proposals and their timestamps. This would take away the tedious work of someone having to make and submit proposals that would be proposed anyways after certain events take place, for example, a proposal to fund and rebuild an area impacted by natural disaster after someone submits a proposal to send assistance to an area currently being impacted by a natural disaster would be an obvious upcoming proposal and tedious work for a proposer. This AI adds a secondary benefit, and that is to prevent devaluing of the tokens as that would occur due to proposers who aim to benefit from such events submitting their proposals earliest, by having them premade and ready for submission, to get their proposal passed and get rewarded for such trivial events thus diluting the value of the rewarded token.

The smart contract is then created for proposals with the "Passed" status on the Ethereum blockchain platform using Ethereum Virtual Machine (EVM), which is a runtime environment for smart contracts built on Ethereum and uses 'Gas,' a measurement unit, as a transaction fee for The complex computation required to run smart contracts. It would be built using Solidity, a smart contract programming language for Ethereum.

Stage 7:

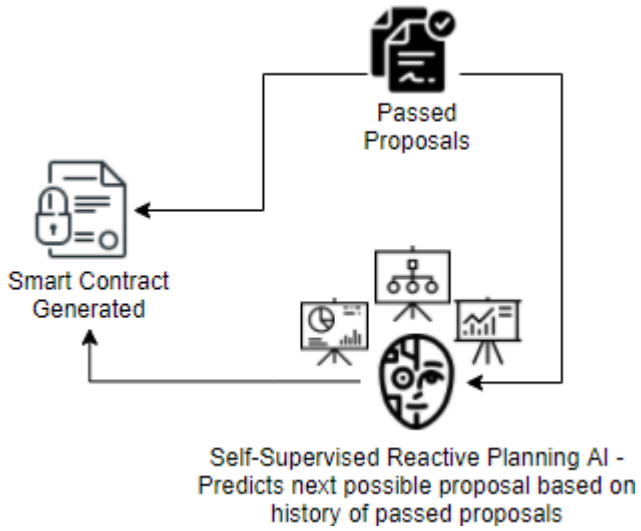

Fig. 6. 4: Stage 3 of the life cycle of DADGS

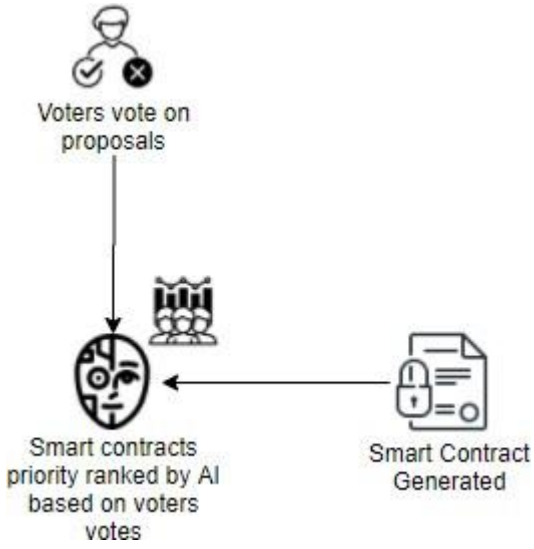

Fig. 7. 5: Stage 3 of the life cycle of DADGS

AI agent, DADGS Priority Ranking AI, is an AI that is trained by categorizing past passed proposal votes, time is taken for each of these proposals to follow through the "Review" stage and the demographics that voted for the passed proposal. This is a necessary component of DADGS. It decides the amount of token reward for contractors who would carry out the proposals to be motivated to take on high-priority proposals. As an example scenario would demonstrate its importance such as if there were two proposals, with one proposal being to assist an area impacted by a natural disaster whereas another second proposal which proposes to fix a broken streetlight that has not been fixed for a long time which could lead to accidents, there needs to be a motivation for contractors to pick harder more

complicated contracts such as assisting natural disaster impacted area over the traffic light repairing contract as to get it started with the execution of the contract as soon as possible. It would also reward the contractors that would execute the smart contracts for the minorities, making sure their needs are met. Therefore creating a conscious sys- tem and understanding of the ecosystem would be imple- mented for and behaves more incorporated with the out- side world.

Stage 8:

Contractors would then bid against one another to be the ones to execute the smart contract using preferably an E-auction means such as an implemented form of the 'Verifiable Sealed-Bid Auction' proposed by Galal and Youssef (2018) for this DADGS system or the proposed pseudocode (Figure 4.4A) on the Ethereum platform. The winning bid- der would then sign the contract and execute tasks to meet the proposal requirements while an auditor overlooks the Activity and completeness of the tasks. Once the proposal is successfully executed, the contractors are paid via government contracts and tokens to encourage further contractor activity in DADGS.

4.3 Components of DADGS:

Users /citizens: three kinds of users. One is a citizen, the second is a miner and programmer, and the third is an auditor. A group of people is being chosen in a round-robin manner as an auditor for a certain time to oversee different kinds of projects for a certain time. An AI agent does this assignment. The users will vote for a proposal, approve to confirm the transaction to add it on the blockchain, and give the approval to deploy a smart contract passed as a proposal or legislator. Citizens or a group of citizens or other agencies give proposals and legislation to carry out a project.

Proposal/legislator: if the direct vote approves a proposal, it will be converted to a smart contract. With citi- zens' approval, the smart contract will be deployed to the system. This smart contract is a legal contract that has a certain timestamp and is executed by the blockchain.

Token: The tokens are the incentive AI agent does this assignment and are automatically processed based on Smart Contracts. This system will have its native tokens called v-token only for the vote. But incentives will be given by the main currency of the public network. The main currency M-token, all government, and public monetary system happened. So, the token and transaction net will always be the same. That's why no black money cannot enter the system.

Miner: It is a node on the private DADGS network that will act as a facilitator for processing the request by other participants in the network and pack it into a Blockchain transaction. The Miner, in this case, is just a virtual entity and no proof of stake or proof of actually done. All the nodes on the network can act as a Miner node.

Private Network: The private network of this system stores and obtains access to data. This network layer will lie upon the main blockchain public network. e.g., Ethereum or a customized blockchain platform for the entire government. All the internal agencies reside in the private network like AI agents, which is not public because it will be less secure and more prone to tempered.

Public Network: An ERC-20 compliant open-source system provided by Ethereum to enable token integration, Smart Contracts execution, and maintaining the token balances. The public network will add to the other government and private agencies. The system is getting funded by the transaction occurred by contracts and disparate transactions that will also occur by contradicting.

AI agents: it resides on the private network that analyzes proposal and citizen data, sorts out the proposal into different proposals, sorts out the spam proposal. If a spam proposal is passed, AI agents have the power to hold the proposal and call reconsidering after reviewing. It detects malicious requests by any agent. And it prunes the unnecessary parts of the blockchain.

Different autonomous government sectors: Other autonomous government sectors connect with this decision-

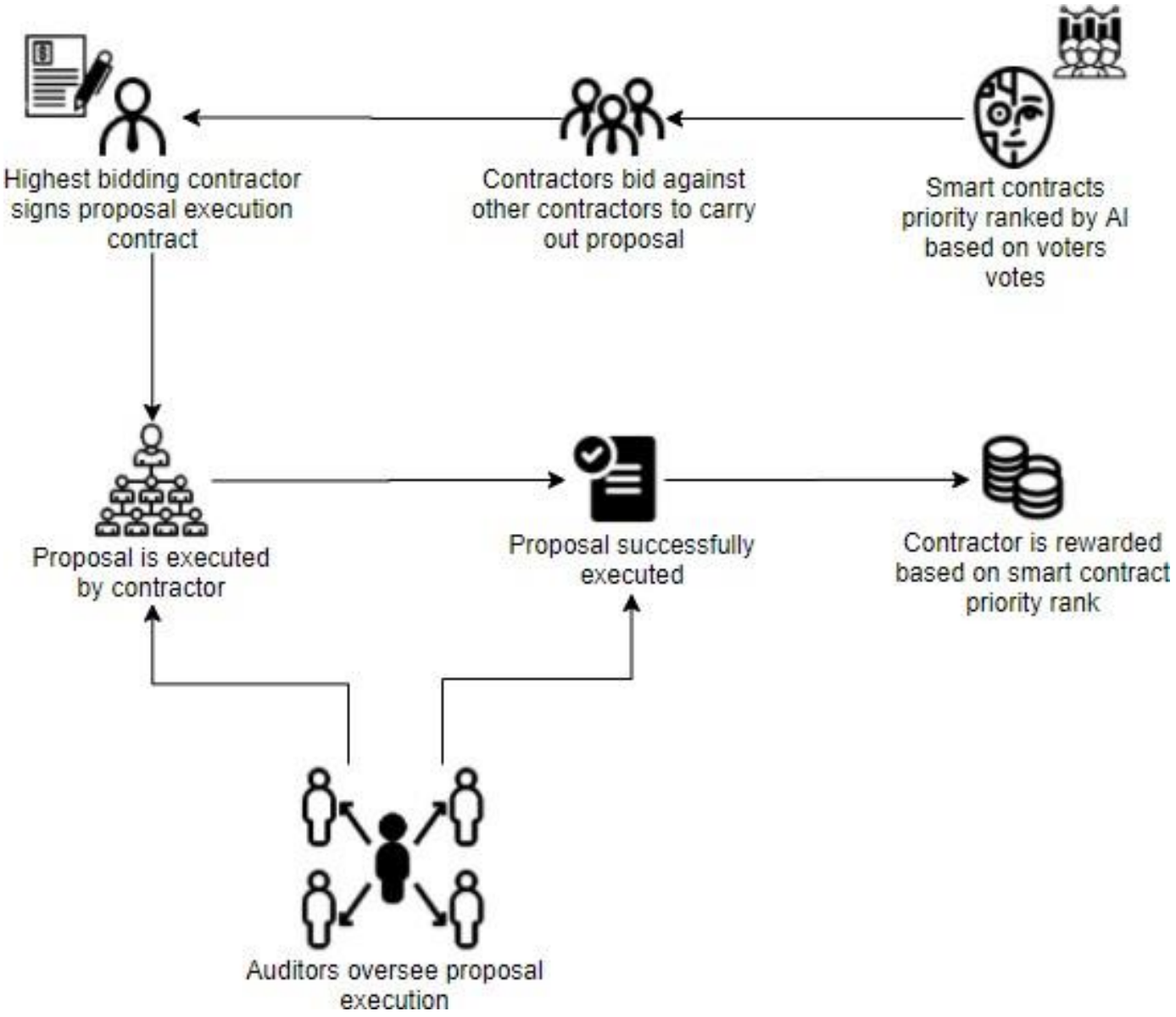

Fig. 8. 6: Stage 3 of the life cycle of DADGS

making system with their private blockchain network. Auditors approve all the projects to check the progress.

Decentralized Dissuasion forum: it resides on the private network of the blockchain where discussion and de- bate on proposals will happen. It will clarify the proposal. How will he write a good article about a proposal by the like button people donate the coin for his effort.

4.4 Technologies used in DADGS:

Blockchain infrastructure: whole system implemented in blockchain infrastructure. Suppose the infrastructure in Ethereum is alike or more robust. Implementing Ethereum-like infrastructure from scratch for a government is not tough. This system resides in a private network of this blockchain with all its components. And the whole private

blockchain network connects with public networks where other government agencies reside. Blockchain infrastructure distributed private tokens as vote coins to the user node. Users vote by the token of the proposal. Accord- ing to the proposal, if the proposal is passed, which needs a transfer fund to an agency. The public network executes the smart contract. And the transaction records are stored in the blockchain.

Artificial intelligence: In this system, an artificially intelligent agent will be added to automate the proposal to the client hub, open the voting system automatically for the proposal, then post the proposal to the discussion forum and set the time for the voting, count the vote, declare the process when a workflow occurs. The agent has two kinds of artificial intelligence. One is rule-based artificial intelligence, which does the routine work like when a proposal arrives, it sends the winning and losing status and asks the programmer to convert it to the smart contract and many more clerical operations like that. Other types of artificial intelligence machine learning will be used for analyzing the data or proposal to sort it according to categories or spam. Or dividing the voter according to age and ethnicity to prioritize minority rights. Hold the spam proposal for not being executed. Here many machine learning models can be used like supervised learning and unsupervised learning for sorting and categorizing and NLP for spam detection.

Smart contract: the proposal will be converted as a smart contract for automated and obtaining transparency for the transaction. Smart contracts here act as legal contract differences. It is written in programming language and executed in blockchain and written by clerical programmers who have not written the alter the purpose clauses and are being monitored by the auditor. All terms in a smart contract must be written in the DADG system's supported language. An example of a DADGS contract is shown in Algorithm 1. The contract issuer digitally signs the con- tract when generated and shares it with other authorities and auditors. Each auditor or actor verifies that the con- tract follows all applicable rules and creates a digital signature using their private key. After completing these steps, the contract and associated signatures are uploaded to the DADGS blockchain network and made public. The smart contract's contents include both specific project requirements/descriptions and contractor selection criteria. The contract also specifies the number of milestones by which the contractor must deliver data to the DADGS. All of the data is stored in a smart contract.

This Algorithm 1 for a smart contract controls DADGS bidding.

Input:

Speaker: address of chairperson

Voters: array list of voters

proposals: array list of proposals

Function Vote(proposal i, voter x)

Function ProposalThatWon

API and Web technology: client user interface and dissuasion forum user interface will be implemented by the existing web technology.And In this system blockchain platforms come with pre-made necessary APIs. Such as Generating key pairs and addresses, performing audit-related functions, data authentication through digital signatures and hashes, data storage and retrieval, smart-asset lifecycle management, smart contracts. With web3.0 technologies, the UX will be built by the front end and programming languages (e.g., HTML5, CSS, PHP, C#, Java, Javascript, Python, Ruby, Golang, Solidity, Angu- lar JS Nodejs). It needs to choose external databases (e.g. MySQL, MongoDB) and servers (including Web servers, FTP servers, mail servers).

4.5 Notable functions and their role in the system:

AISupervisedClassifierSpamFilter:

I. Classifies proposals by tags and sentence structure. Pre-Trained using supervised classification methods before final implementation into the system and learns over time under supervision.

II. Checks if the proposal has already been made in the

if voter x.voted then return false if proposal i ≥ proposals.length then return false voter x:voted true voter x:vote proposal i proposals[proposal i]:voteCount voter x:weight return true

TABLE 2

win a:0 for prop:0,prop < proposals:length,prop++ do if proposals[prop]: voteCount > win a then win a: proposals[prop]:voteCount ProposalThatWon

past.Checks if the proposal is bad or has been flagged previously based on the history of proposals.

III. Learned based on the past flagged proposals what a spam proposal would look like and compares with the proposal passed into it as an argument.

AISupervisedClassifierBadProposalFilter:

I. Checks if both majorities and minorities flag proposals like the one being proposed based on the voter demographics array. If that is true, the submitted proposal is marked as a bad proposal. Suppose the demographic that proposed is too small, an offset. In that case, the AI is trained to cycle the proposal back into the currentProposals and let voters vote on it, thus circumventing biases in the decentralized blockchain voting system. This proposal is also added to the cycleMinorityProposals array so future searches made by the AI completes faster.

II. Classifies proposals by tags and sentence structure. Pre-Trained using supervised classification methods before final implementation into the system and learns over time under supervision.

ReactivePlanningAI:

I. Based on the history of proposals and their timestamps the AI will automatically make proposals by reading patterns in proposals made and passed (thus taking away the tedious work of someone having to make and submit proposals that would be proposed anyways after certain events take place. Example: Proposal to fund and rebuild an area impacted by natural disaster after someone submits a proposal to send assistance to an area currently being impacted by a natural disaster). This AI adds a secondary benefit and that is to prevent devaluing of the tokens as that would occur due to proposers who aim to benefit from such events submitting their proposals earliest, by having them premade and ready for submission, in order to get their proposal passed and get rewarded for such trivial events thus diluting the value of the rewarded token.

4.6 The Central Algorithm of The DADGS:

Inputs:

5 Evolution and Discussion

This section analyses and evaluates the proposed system from implementability, automaticity, transparency, decentralism, security, and performance perspectives. After that discussion about the system is given.

There are three major challenges to implementing it. The first is creating blockchain protocol from scratch. For creating a protocol, multiple modules are implementable. Like the Account Model, it can be used UTXO-based or balance-based according to necessity. Hash or asymmetric keys can be used as an Encryption Algorithm. There are various Data Architecture options available to implement, and it is also possible to use hybrid architecture if needed. For Node Communication p2p network with HTTP, socket, and GRPC methods are very available protocols to make a public chain. Available Consensus Mechanisms are POW, POS, and POA for making public chains. If it is a consortium

```
voterIDs:array <- list of voters and their demographic characteristic
informationallPastProposals:array <- list of all past
proposalspastWinningProposals:array <- list of all previously successfully passed
proposalscurrentProposals:array <- list of current active proposals (These are proposals currently active and being
voted on) and their votescycle
MiniorityProposals:array <- list of minority proposals reproposed and unflagged (keeping flag
history)voterDemographics:array <- Demographic characteristics of votersfunction Vote(proposalID, voterID) if
voterID.voted then return false voterID.
voted <- true voterID.votedProposal <-proposalID proposal[proposalID].
incrementVoteCount return
voterID.votedfunction PassedProposal(currentProposals) for currentProposals <- 0, currentProposals <
currentProposals.length, currentProposals++
do
if currentProposals.votes > maxVotedProposal.votes then
maxVotedProposal.ID = currentProposals.ID TokenRewarder(maxVotedProposal.proposerID)
return maxVotedProposal.IDfunction AddNewProposal(submittedProposalID) if
AISupervisedClassifierSpamFilter(submittedProposalID, allPastProposals, currentProposals) then
currentProposals.addProposal(submittedProposalID) ReactivePlan- ningAI(submittedProposalID)
return true else if(AISupervisedClassifierBadProposalFilter(submittedProposalID)) Penal-
ize(submittedProposalID.proposerID)
return false
else
cycleMinorityProposals.addProposal(submittedProposalID)
currentPropos- als.addProposal(submittedProposalID) return true
else
return false
```

chain, methods like PBFT / RAFT can be used. For Smart Contracts, it can be chosen any programming language like solidity and go, or java can be chosen for executing this smart contract. It needs to build a runtime environment that is also implementable. The second challenge is implementing artificial intelligence agents. Like SingularityNet, it is possible to create decentralized AI networks or vari- ous cloud platforms in an artificially intelligent agent. The challenge is to integrate an agent with a blockchain network. The solution is it needs not be integrated actually. Their work is separated, but they meet in the user interface. However, it is also possible to deploy a smart contract by AI by defining those rules previously in a timestamp.

A conventional representative government system is fully manual, and decisions made by representatives might not echo the people and bribe to happen to a certain rep- resentative to obtain a work. In the proposed system, scenarios like those can not happen. Because here two kinds of automaticity make this system adequately automated. Blockchain technology with smart contracts automated every kind of transaction. And system-level automation is

handled by AI agents with the citizens' direct consensus.

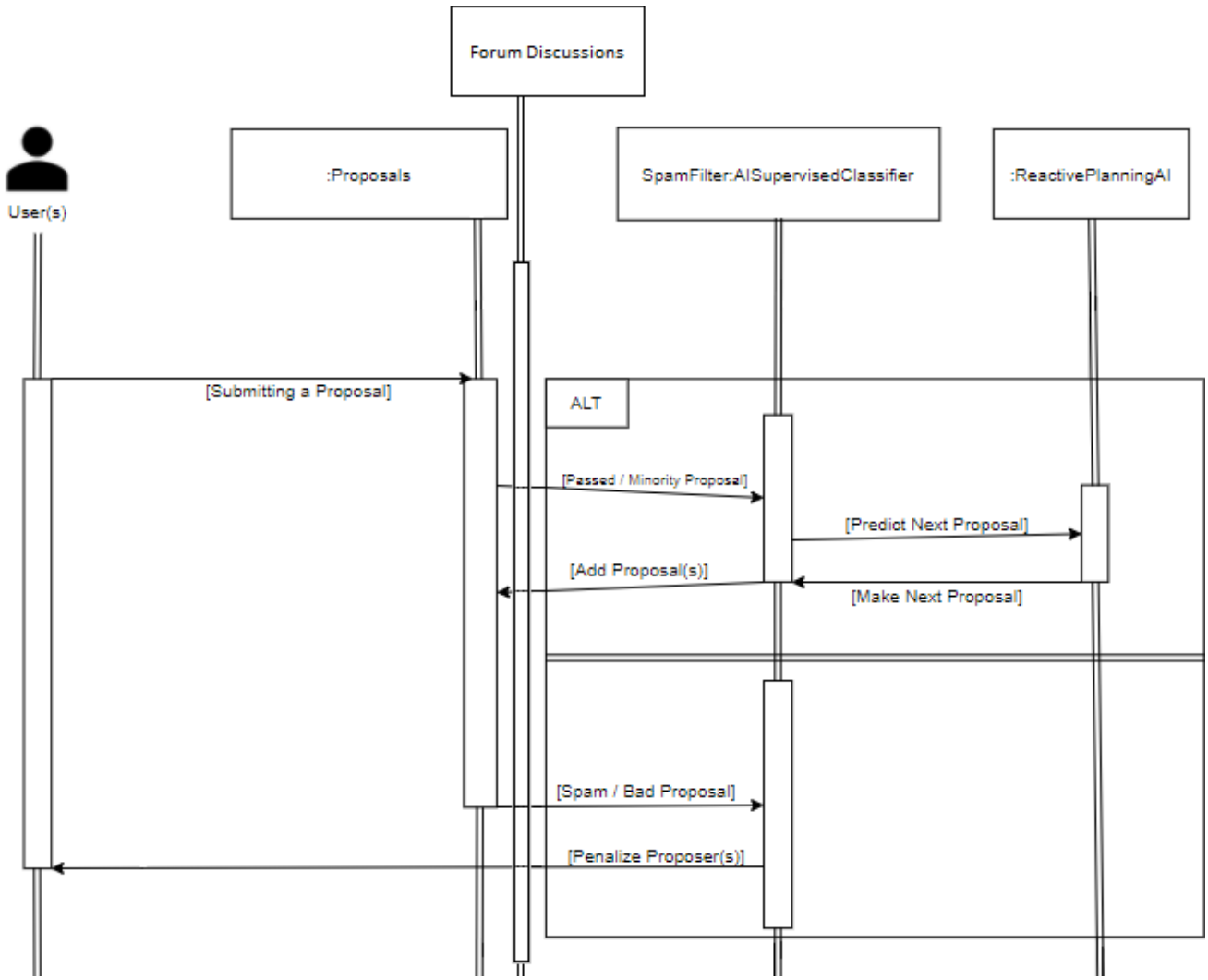

Fig. 9. **Sequence diagram showing the time of ReactivePlanningAI intervention in DADGS**

attached there for every big transaction. So it is also possi- ble to block all kinds of black transitions by adding rules in the big transactions.

The key features of a traditional government system are center and hierarchy. As a result, bureaucracy and uncon- scious prejudice emerge. Our system is decentralized in terms of technology and idea. Everything in this system is well-organized and very fault-tolerant since it does not rely on human computations. As a result, system failures due to human error are uncommon. City residents now have power over their properties thanks to decentraliza- tion. They don't have to depend on anybody else to keep track of their assets. They can all accomplish it at the same time if they work together. Because decentralization is one of the system's major properties, it can withstand any hos- tile assault. This is because hacking the system is more costly for hackers and is not a simple solution. As a result, it is less likely to fail. Because of the technology's decentral- ized structure, it is a system that does not depend on third- party corporations; no third-party, no danger. No way for anyone to defraud you since the system is based on algo- rithms. No one is allowed to use blockchain for personal advantage. Because of technology's decentralized nature, each participant's profile is visible. Every modification on

the blockchain can be seen, which helps to solidify it. This system's nature distinguishes it as a one-of-a-kind system for all types of people. Hackers will have a difficult time breaking it.

This system faces two significant risks: data and rule integrity. Data is the cornerstone for all system operations. An attacker who can alter/delete current data or add new data to historical data may create major issues. The blockchain framework protects data integrity by avoiding these threats. To compromise data stored in the blockchain, an attacker must compete with all other users to create new blocks. Proving employment or stake is difficult in this system, and the chances of success are slim. Rules are embedded logic in smart contracts. Rule integrity prevents an attacker from influencing the outcome of a smart contract. Rules (smart contracts) are encoded in blocks before execution, preventing direct modification. The smart contract execution approach requires everyone to execute a contract rather than just accept one. Another possible security risk is data confidentially held on the blockchain that it depends on. Because DADGS uses public blockchain, everyone may view the data. That's usually not an issue since the government must ultimately provide such information. Sensitive data may be encrypted before being sent to the system if all parties agree on a key. This technique protects data from unwanted access but decreases government openness. To avoid exploiting this function, data that has to be safeguarded should be declared ahead of time.

Modern governments are complicated, and the system must manage a lot of work. Most of these works do not need high latency is a plus. For example, a delay of several days is acceptable in the bidding and selection process. Its throughput, latency, and scalability. These strategies may be used to increase the system's processing capacity.

The proposed system shows that current blockchain and artificial intelligence technology, a decentralized automated direct democracy system, can be built where citizens vote on any law and proposal made by a citizen or other government service agencies. When the proposal is approved, it becomes a smart contract, and the proposed organization receives funds, which are immediately transmitted to the contracted agency. The research shows a link between technology and state governance as one of the most ba- sic human organizations. This study confirms Ostrum's (2010) notion for peer-to-peer production where the community self-governs without a central authority. The research shows that the system can be implemented using current blockchain and AI technology with complete transparency and security. It eliminates the agent dilemma issue via decentralization, automation, and community engagement.

Based on current blockchain evidence, artificial intelligence technology may intervene to develop an automated decentralized direct democracy system. However, un- like Atzori (2015) who argues that blockchain-based governance is an organizational theory with significant technical and managerial advantages for markets, private services, and communities, blockchain technology, and decentralized platforms are not hyper-political, but rather prepolitical tools, this paper can make an architecture [112]. Blockchain and artificial intelligence may replace age-old conventional processes and can be utilized to realize the political dream of direct democracy. For constructing an automated direct governance system while keeping the essential democracy principle, the suggested method uses blockchain and artificial intelligence to make it more transparent and free of charge. While this system focuses on developing a direct government decentralized automated organization, it just decentralizes government activity. It makes it visible and safe via the blockchain, but it has no executive decision-making authority.

6 Conclusion

6.1 Achievements of Objectives

This primary paper goal were met when proving that the blockchain and AI could produce an improved change to traditional institution systems in government, corporate

and communities which could be used to circumvent many of the problems that exist that hold society back from progressing fairly towards its members with its known flaws such as bias that resides as one of the base characteristics of human nature. Blockchain, with its properties as a distributed ledger, efficiency, cost-effectiveness, irreversibil- ity, transparency, auditability, and censorship resistance [4], provides one of the greatest alternatives to build a system to carry out the role of the traditional systems while circumventing many of the current time issues.

It aimed to recognize the current state of AI successfully, Blockchain and DAO technologies with its limitations and possibilities, and the paper suggest a prototype architecture of a functional AI-based decentralized automated governance system while stating its advantages, such as its superior ability to process information, the ability to identify and authenticate all parties involved and policies passed without the need to hire intermediaries to perform those tasks, establish a no central power or authority system thus giving power to every individual participant, freedom of biases, lack of side interests and limitations, increased transparency and the ability to ensure that all participants are following the rules established in the system equally. Albeit the limitations that one might face, such as the lack of an established platform to implement the prototype in the time of making this paper, governance is a highly complex system to replicate and integrate into an AI and blockchain system, to name a few. However, this paper does not shy from providing possible solutions to the limitations and obstacles for implementing and testing the proposed decentralized automated governance system in the current times. The paper then archives its third aim to scrutinize the history, evolution, and workings of blockchain technology, smart contracts, AI, DAO, and Machine Learning through vacillating statements and opinions from authors of past studies made on the topics. Reasonably, the paper Also vacillates statements and opinions by various authors on will be used, which of governance, democracy, and rep- resentative democracies and the forthcoming innovations such as e-democracy, e-parliament, e-voting, and the advancements made in the field that would build a foundation on which the research question yields justification for running a blockchain-based decentralized automated government to revolutionize and could bring forth change in a progressively practical way.

It then successfully discloses the life cycle of the proposed decentralized automated direct government system (DADGS) based on AI and using blockchain technology is made along with suggested components, i.e., the functional parts of DADGS accompanied by the technologies that are available in the current time that could be used to build up DADGS architecture is provided. Subsequently, after that, a pseudocode algorithm is also presented, which DADGS would follow to perform its basic duties and could function to achieve the main goals.

Validity is provided for DADGS regarding implementation, automation, decentralization, security, and the performance benefits against the complications it might and can face while demonstrating its superiority over the current traditional established system being used in our current time are foreseen. Nonetheless, the contribution, integrity, and impact DADGS would have in the field of governance, either government, co-corporations, or communities, can undoubtedly be anticipated. Where every individual could represent for themselves and a system that rewards them for their active participation in the process all while excluding the need for a centralized government and other third parties, thus building more transparent and bias-free decisions and policies to be passed, all while blockchain technology being the base for this promising future.

Furthermore, it set goals to go in-depth on the differ- ent relevant aspects, this dissertation which was to dis- cuss the various governance systems such as digital, ana- log, and decentralized governance systems along with their limitations to advocate for a need for the proposed Decentralized Automated Direct Government System (DADGS) with the support of the extensively discussed historical evolution of blockchain, Ethereum, Decentralized Automated

Organization (DAO), artificial intelligence, machine learning which it will use and this is achieved adequately.

Additionally, along with discussions of the government systems, the secondary objective was to go further in-depth by discussing Common-Based Peer Production (CBPP) communities and organizational, legal, and political theories to scrutinize and identify the voids that would best fit suit a technological intervention. That goal was fairly met through the literature review.

Moreover, acknowledging AI, Blockchain, and DAO's possibilities and limitations was an extremely important aim set in this paper as it was crucial to deliver this paper's practicality, which was to propose a system, ie. Decentralized Automated Direct Government System (DADGS), including a graphical representation exhibiting the data flows and connections among the agents, along with several technological solutions and propositions for each of the agents in the system for implementation in the current time as well as suggest improvements that could be done to the system using future technologies that are currently in a prototype state which would significantly improve the current traditional governance systems.

6.2 Future work and recommendations

Acknowledging the limitations of the dissertation, suggestions are made for further research include the following points

I. As governance is a highly complex system to replicate and integrate into an AI and blockchain system, this paper recommends further research on integration between government and the blockchain architecture to be established by further studies before moving forward to implement a blockchain governance system of this scale. Another main concern for citizens would be the maintenance of privacy and security in DADGS For its participants.

II. Even though blockchain is considered a breakthrough for cybersecurity, the lack of knowledge in this field by the general public will make it hard for acceptance within the society and therefore this paper suggests that more blockchain technology-related studies be done in academics else, it would hinder the number of casual participants willing to get involved in such a system giving their personal opinions and feedbacks for testing or post-implementation.

III. The AI agents in DADGS, ie. DADGS Demographic AI, DADGS Reactive Planning AI, and DADGS Priority Ranking AI will all respectively need data collectors to col- lect a sufficient amount of accurate, representative, and use- ful data for training the AI before the testing of the AI to better prepare for real-world scenarios and check if a good result is obtained that would validate its adequacy before the trial phase when implemented. This is essential because for government agencies to collaborate into implementing DADGS to be a justifiable substitute to their pre-existing system, these major components need to be rational and defensible for their choices.

IV. It is known that security is established over the blockchain using encryption which requires participants to solve complex algorithms, and this requires a lot of computing power. So this paper further recommends implementing on a smaller, efficient, and effective scale before expanding for implementing on a larger community, government, or organization level as there is a lot of energy cost to keep blockchain systems active.

V. Implementing and setting up a transparent AI agent would also be a challenge as it performs one of the major roles and is also a major component that defines DADGS, so proper time and effort need to be invested to programming a transparent system that the public would understand and be able to scrutinize and be a part of constructing its decision-making process which is essential which otherwise would hinder participants willing to accept the system.

VI. Making the DADGS AI agent more stable, defined, and robust over its policy analyzing and decision-making processes would also be wise. It would also require a supportive and collaborative professional team effort to build

and test small and large scales. So adding supporters to help build the system will be a challenge that must be over-come.

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