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A Blockchain-Based Model for the Prevention of Superannuation Fraud: A Study of Australian Super Funds

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Abstract: Superannuation is the fund set aside by employers to provide their employees with a dignified retirement. Studies highlight that issues can arise with retirement funds from employers, such as failure to make required contributions to an employee's superannuation fund, incorrect payments, or debiting the wrong fund, contrary to legal or contractual obligations. To address these issues, the Australian Government has implemented laws and regulations to ensure employers fulfil their contribution obligations. Despite these safeguards and highly secured information systems, there has been a significant increase in fraudulent activity in the finance sector, and there have been several instances of employers not making contributions, misusing retirement funds, or reporting incorrectly in their systems. The current process restricts employees from viewing recent data until the contributions reach their super fund, which opens the doors for fraud. Recently, blockchain technology has gained popularity because of its ability to improve security and prevent fraud across many sectors, including finance. Prior studies have shed limited light on how superannuation fraud can be prevented. Moreover, there is limited literature on the possibility of utilizing blockchain technology to address this issue. Therefore, this paper aims to review the current superannuation contribution process and identify the factors contributing to non-payment, incorrect payments, misallocation of funds and communication gaps. This study presents a novel process model and develops a blockchain-based application to mitigate fraudulent practices. This research provides valuable insights into the design of innovative process models that utilize blockchain technology to address superannuation challenges. Furthermore, the paper presents a sample simulated smart contract to explore additional implications and advancements in this domain.

Keywords: blockchain; superannuation; super funds; smart contracts; Australia

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1. Introduction

Australian superannuation is a retirement savings system that is mandated by the Australian government [1]. It requires employers to make contributions to a superannuation fund on behalf of their employees, which are then invested in various assets to grow over time. The purpose of the superannuation system is to provide retirement income for Australians, in addition to the government-provided age pension. Employees can also make voluntary contributions to their superannuation fund, and the government provides tax incentives to encourage people to save more for retirement. Superannuation funds in Australia are regulated by the Australian Prudential Regulation Authority (APRA) and the Australian Securities and Investments Commission (ASIC) [2]. When individuals reach retirement age, they can withdraw their superannuation savings as a lump sum or as a regular income stream.

According to Commonwealth Australia (2023), more than 75 percent of Australians have accounts with superannuation companies to manage their employer contributions. Over the years it has grown from AUD 148 billion to AUD 3.3 trillion, and represents 139.6 percent of the national GDP [3]. According to APRA [4], at the end of March 2023,

superannuation assets amounted to over AUD 3.5 trillion, an increase in value of 3.2% from the December 2022 quarter. Employer contributions were AUD 30.2 billion for the quarter and AUD 118.6 billion for the entire year that ended in March 2023, representing increases of 12.6% from the fiscal year which ended in March 2022. This is partly because of the Superannuation Guarantee (SG) rate increase to 10.5% as of 1 July 2022, along with the positive trends in the labor market for the year. Around three-thirds of employer contributions for the four quarters up to March 2023 came from SG contributions (AUD 91.8 billion), and this percentage is anticipated to rise in line with future SG increases [4].

Kleinberg [5] analyses the Australian superannuation system from the standpoint of human rights, aiming to contribute to the debate on superannuation by examining not only whether the current superannuation policy is sufficient to meet Australia's human rights commitments under the International Covenant on Economic, Social, and Cultural Rights (ICESCR) in relation to the provision of retirement income, but also whether the government's approach, associated with the governance of the superannuation industry and its management of retirement funds, is satisfactory [5].

Similar to Australia's superannuation system, most countries have retirement funds in place to support their working class and offer financial stability. For example, in Europe, there are several retirement savings options such as pension funds, individual retirement accounts (IRAs) and annuities. In Asia, mandatory provident funds (MPFs), national pension systems and private pension plans are part of retirement savings. Whereas, in the United States, there are several retirement savings options available, including 401(k) plans, individual retirement accounts (IRAs) and social security.

In Australia, the Superannuation Guarantee (SG) was implemented at a rate of 3% in place of a pay raise and as a method of increasing retirement savings in 1992. It has now become a legal matter [6]. The Australian Taxation Office (ATO) provides the most up-to-date information on superannuation, and it shows that as of 1 July 2022, the SG rate is 10.5% of employees' wages, and employers are required to pay this amount to employees' super funds at least once in every quarter [7]. By July 2025, the employer contribution mandated by law will have increased to 12% of income [8]. When making payments, small businesses are able to pay superannuation through the Small Business Superannuation Clearing House (SBSCH), which is a free service provided by the Australian federal government through the ATO [9].

There have been many cases of outstanding super contributions in recent years, and this has been a contentious issue among the Australian government and industry experts. For instance, Helen [10] explains that some employees' superannuation amounts on their pay slips are different from the amounts on their super funds. The reason for this is superannuation being underpaid or unpaid by employers. Some employers use the phoenix method, which refers to "the deliberate, systematic liquidation of a company in order to avoid the settlement of liabilities, such as salaries, superannuation, overdue taxes, and business creditors". The business then "rises from the ashes", carrying on the same operations, free of any obligations, under a different or related name [11]. Table 1, presented below, highlights the unpaid superannuation from 2013 to 2022 due to the existing method of super contributions.

Table 1. Unpaid superannuation data.

Source	Financial Year	Unpaid Superannuation
Industry Super Australia	2013–2014	AUD 3.6 billion [12]
Industry Super Australia	2015–2016	AUD 3.9 billion [13]
Industry Super Australia	2016–2017	AUD 5.9 billion [6]
Industry Super Australia	2017–2018	AUD 5.9 billion [14]
Federal Government	2018–2019	AUD 5 billion [15]
Industry Super Australia	2019–2020	AUD 5 billion [15]
Australian National Audit Office	2020–2021	AUD 881 million [16]
Australian Taxation Office	2021–2022	AUD 1 billion [17]

According to Industry Super Australia (ISA)'s report, Australian companies failed to make at least AUD 3.6 billion in SG contributions in 2013–2014, which translates to approximately 30% of workers (or roughly 2.4 million people) not receiving some or all their required superannuation payments [12]. Furthermore, in the 2015–2016 financial year, the number of unpaid employees had increased by 220,000 employees in only two years (since a prior examination of 2013–14 ATO data). Unpaid employer super contributions have been reported to increase by AUD 300 M annually [13]. According to ATO reports, ISA [6,14] estimates that 31.3% of super-guarantee-eligible employees were underpaid in the 2016–2017 and 2017–2018 financial years, which is around AUD 5.9 billion in unpaid super annually. Australian workers missed out on AUD 5 billion in employer super contributions in both the 2018–2019 and 2019–2020 financial years [15]. The Australian National Audit Office points out that the total liabilities incurred in 2020–2021 due to corrective compliance measures only on employee notifications and ATO initiations were AUD 881 million [16]. However, the ATO reports a super-guaranteed gap of AUD 1 billion for the 2021–2022 financial year, which is a significant decrease compared to previous financial years [17].

While most businesses honor their duty to pay the superannuation guarantee (SG), there is a sizable pool of unpaid super because of some employers' noncompliance. When it comes to super fund trustees, Bernie Dean, CEO of Industry Super Australia, points out that employees lose roughly AUD 6 billion in unpaid superannuation every year, and the government must take greater action to make sure that companies abide by contribution regulations [18]. The figures from Australasian Business Intelligence show that 240,000 firms admit underpaying their workers a total of AUD 588 million, when the government had anticipated only 14,000 employers coming forward and acknowledging underpayments totaling approximately AUD 160 million [18]. However, according to Industry Super, there has been an "eye-watering" total of AUD 29 billion in unpaid super over the past six years because of the existing process of superannuation contribution [19].

Industry Fund Services (IFS) believes that superannuation fund trustees must act quickly to address the issue of unpaid super [20]. According to Thomas [15], one of the reasons for not paying super is that superannuation contributions are not visible to employees in real time, since SG is paid monthly or quarterly. In other words, due to the fact that companies are obligated to pay SG on a quarterly basis, whereas salaries are often paid weekly, fortnightly, or monthly, employees are unable to depend on their pay slip to ensure that their SG has been paid [21]. Moreover, some employees find out that their super has not been paid when they file an insurance claim [15]. Furthermore, the issue of accurately determining the level of SG non-payment in Australia has been emphasized by The Senate Economics References Committee (SERC) [12]. Due to numerous data gaps, it is a challenging task to accurately estimate the extent of SG non-payment. It is vital to obtain the opinion of a responsible person from the ATO to confirm the degree of success of the aforementioned processes, even though there are ideas and procedures implemented to identify SG non-payments. Mr. James O'Halloran [12], the ATO Deputy Commissioner responsible for Superannuation, stated,

> *"In relation to the SG gap, effectively most of last year, as certainly many stakeholders knew, we have been progressing to develop a credible and reliable methodology to determine the SG gap. We certainly had been working through an appropriate methodology, but at this stage, as is I think on the public record, we do not feel we have a reliable one, that we have a high enough level of confidence".* [12]

This statement was made according to data provided by the federal government, during the six-month amnesty that ended on 7 September 2020.

This highlights the critical need to address the issue of unpaid superannuation and develop more effective and efficient systems for detecting and preventing non-payment, thereby ensuring the financial security of Australian workers. Even though it is a major liability for employers, and superannuation contributions are essential for ensuring the financial security of employees, the timely payment of superannuation contributions by employers to employees' super funds is not always guaranteed, which highlights the need

for a robust system that enables both employees and the government (ATO) to detect unpaid contributions and take appropriate action.

It is evident that there has been a significant upsurge in the use of technology to detect fraud in various industries. In fact, a novel AI-/ML-based system called the Anti-fraud-Tensorlink4cheque (AFTL4C) has been developed to recognize fraudulent cheque fraud, which has become a significant problem for financial organizations, causing millions of dollars in losses as a result of illicit activity [22]. Moreover, National Payment Switches (NPSs), which are directly owned by Central Banks (CBs), are rapidly embracing the latest technologies to improve their fraud detection capacities in each of their respective nations [23]. Furthermore, studies point out that molecular genetics and electronic monitoring technology can be used to develop solutions to problems including food security, prohibited fishing, and depleting fisheries resources through fishery surveillance and seafood traceability [24]. Additionally, data were analyzed using MS Excel, VOS-viewer, and Bibliometrix (Biblioshinny) in a study on food fraud to find the most affected countries and food products [25]. In addition, it can be seen that automated tools such as fraud detection software, artificial intelligence (AI) algorithms and blockchain have been used in the detection of financial fraud [26]. Prior studies have noted the use of technology for fraud prevention and user acceptance. The literature highlights frauds relating to super funds across the globe. However, it sheds limited light on blockchain-based applications for preventing superannuation fraud. Therefore, based on the successful application of technology-based solutions for fraud prevention, this study reviews the role of blockchain technology in improving transparency and presents a blockchain-based solution to prevent superannuation fraud in Australia.

The purpose of this study is to introduce a blockchain technology model for the superannuation contribution process that will be useful for identifying unpaid and unsettled superannuation to Australian workers on the basis of their employers and their payroll activities. Blockchain technology is a form of distributed computing that effectively resolves the problem of loyalty to a centrally controlled authority [27]. Demur [28] suggests that blockchain technology, which was invented at the beginning of the present century, can be used as a method of information protection, storage, and transaction acceleration. The article also discusses that, in the future, cryptocurrency may be recognized as a free method of payment in a few highly developed countries or throughout the world and aid in the expansion and development of the global economy [28]. Blockchain and cryptocurrencies have always benefited from impartial and consistent market incentives in Australia, which has fueled technological advancement in payment systems, crypto assets, lending, investments, and custodial services. Therefore, blockchain and other distributed ledger technologies (DLT) are not currently covered by any specific laws in Australia [29].

Therefore, this study aims to investigate the problem of unpaid superannuation by examining the superannuation payment process, the current process for detecting superannuation fraud, and the challenges associated with detecting unpaid superannuation, as well as exploring the possibility of using blockchain technology and presenting a blockchain application to prevent superannuation fraud. Accounting practices such as superannuation contributions have yet to fully embrace blockchain technologies. Accordingly, the following research questions are presented.

RQ1. What are the challenges with current processes in preventing superannuation fraud?

RQ2. How can blockchain technology help prevent superannuation fraud?

The rest of the paper is organized as follows. Section 2 presents the literature on the challenges associated with detecting unpaid superannuation and a justification for selecting blockchain technology as a solution for preventing superannuation fraud. Section 3 outlines the methodology adopted in this research. Section 4 details the existing superannuation payment process, the proposed process model, and the blockchain solution. Section 5 details how the developed blockchain application will address the identified issues, and the research implications and limitations of this study. Section 6 presents the concluding remarks.

2. Literature Review

AustralianSuper is one of the largest superannuation (pension) funds in Australia. It is a financial institution that provides retirement savings and investment options for its members. The fund is designed to help individuals save for their retirement and secure their financial future. Figure 1 explains the process of saving funds for retirement.

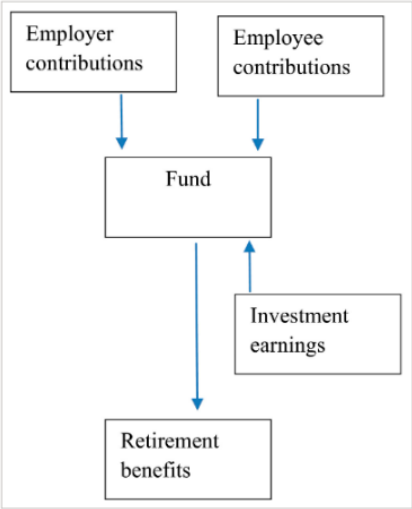


Figure 1. Process of saving funds for retirement.

The literature review section of this study focuses on two main areas: detecting unpaid superannuation and exploring the potential of blockchain technology as a solution in this context.

2.1. Detecting Unpaid Superannuation

Detecting unpaid superannuation is a difficult process. According to the ATO, complaints from employees accounted for 70% of all claims of superannuation non-compliance [10]. Superannuation non-compliance can be found and reported to the ATO through third-party referrals such as super funds, community referrals and internal ATO audits. It is evident that the ATO still relies on its internal audits and complaints from impacted parties, demonstrating a lack of technological adoption.

According to Helen [10], the Senate Expenditure Review Committee (SERC) has recommended that the Australian Securities and Investments Commission (ASIC) work together with the ATO, and discussed the importance of Single-Touch Payroll (STP) for data sharing to detect unpaid superannuation. Furthermore, government bodies such as the parliamentary committee agree that closer coordination between the ATO, ASIC, and the superannuation institutions is necessary to promote early identification and information exchange on SG non-payments [30].

STP is a system that was introduced by the government for employers to report payroll information to the ATO [31]. With this system, employers need to report wages, pay-as-you-go (PAYG) withholding, and superannuation amounts of each pay run, and the totals at the end of each financial year, by means of an STP-enabled software solution. As a result, all of these data will be accessible to employees via their myGov accounts, so that employers will no longer need to provide payment summaries to employees at the end of the financial year [32]. However, it is uncertain whether the ATO still uses this data to detect superannuation discrepancies. The STP will not include the payment of SG amounts; it will merely involve reporting [10]. The SERC also suggested that the government should consider mandating responsibilities for the reporting and payment of tax and superannuation [10].

With regard to difficulties in locating super guarantee payments, ISA, which is on a great mission to address this issue, has made several recommendations to the ATO. In response to the government's announcement of new legislation on utilizing STP in all businesses, the industry funds organization stated that while this is positive, it misses a crucial opportunity to match mandatory superannuation payments with periodic wage cycles [33].

On the other hand, in response to the government's legislative recommendations to tighten the rules around salary sacrifice contributions, the Association of Superannuation Funds of Australia (ASFA) stated that it would support additional government initiatives, such as requiring employers to make SG contributions on a monthly basis and strengthening the authority of the ATO [34]. We believe that these recommendations are important when deciding the most appropriate time frame for SG payments.

Most super funds have been working diligently to complete their duties in the interim. For example, AustralianSuper introduced a new function in their app, which directly warns users, indicating issues related to underpayment, thus reducing reliance on the ATO in order to resolve the problem of lost super [35]. The AustralianSuper group executive member for experience and advice, Shawn Blackmore, mentioned that notifications will appear on a mobile device informing the client that their super has been paid. In addition, if the account holder does not get an alert, it is time to get in touch with their company's payroll to find out where the money is [35]. Blackmore also stated that when it comes to discovering problems with super payments, the ATO should not be the only source on which people rely [35]. As superannuation companies are responsible for managing the funds once the payments are made into accounts, and this requires the allocation of resources, not all superannuation companies have adopted the same approach. This creates further opportunities for some employers to evade superannuation payments on behalf of their employees. Table 2, provided below, summarizes suggestions by experts for detecting unpaid superannuation.

Table 2. Suggestions by industry experts for detecting unpaid superannuation.

Proponent	Solution
The Senate Expenditure Review Committee	ASIC to work together with the ATO and share company information. Using STP to gather data. The government should mandate the reporting and payment of tax and superannuation liabilities [10]
Parliamentary committee	Closer coordination between the ATO, ASIC, and superannuation institutions is necessary to promote early identification and information exchange on SG non-payments [10]
Industry Super Australia	There should be further changes beyond utilizing STP. Mandatory superannuation payments should be matched with periodic wage cycles [33]
Association of Superannuation Funds of Australia	Requiring employers to make SG contributions on a monthly basis and strengthening the authority of the ATO [34]
AustralianSuper	Notifications will appear on a mobile device informing the client that their super has been paid. This new function in their app directly warns users, indicates issues about underpayment, and reduces reliance on the ATO [35]

After considering the aforementioned advice from industry professionals, it is critical to understand the actions taken by the federal government or the ATO to deal with unpaid superannuation. The government understands that there are loopholes in the superannuation payment process and has made it clear that any employers that continue to breach the law will suffer harsh repercussions under the legislation [36]. Additionally, Andrew [36] outlines the ATO's demands for compliance from companies and workers in the gathering of real-time data. The Treasury Laws Amendment (2018 Measures No. 4) Bill 2018 [37] enacts the following steps that affect employers:

- Enables the ATO to direct companies who violate their SG obligations to pay correctly and complete SG education programs.
- Enables the ATO to provide impacted workers with transparent information about SG non-compliance.
- Enhances the efficiency of the ATO's compliance and collection procedures
- Enrolls all employers into STP.
- Facilitates more frequent reporting on the part of superannuation funds.
- Simplifies the employee commencement process.
- Establishes criminal penalties for disregarding super obligations.

Additionally, the ATO claims that workers also have a part to play in discovering unpaid superannuation as follows [36]:

- Confirming their eligibility to receive superannuation.
- Identifying the amount that their company should be paying.
- Knowing the frequency, amount and to which fund the employer pays their superannuation.
- Verifying the above information by comparing it to member statements from their super fund.
- Contacting their super fund to enquire about whether the company has paid super contributions.
- Comparing the superannuation fund statements with the superannuation total amount in their myGov account.
- If, despite taking the aforementioned actions, they continue to feel that the employer is not contributing any or enough super, they can report them to the ATO.

Non-compliant superannuation contributions are automatically included in a superannuation guarantee charge (SGC) if not made on time and in full. The SGC includes the sum of unpaid superannuation contributions plus an administrative fee and an interest component [38]. Since the goal of this research is to implement an efficient technological model for the superannuation contribution process, the current procedure and recommendations for SGC payments are outlined in this paper. According to the ATO [39], the SGC is collected as a tax. Although this method can be applied to all types of businesses, Helen and Tess [39] suggest the collection approach described in the 'Commonwealth Fair Work Act 2009', in which superannuation is classified as "deferred wages", which can be recovered in the same manner as other employee benefits. It is clear that the government charges a significant amount of interest as a penalty for not paying SG on time, because there is a need to avoid late payments. However, the Institute of Public Accountants (IPA) [40] states that these harsh fines have a substantial effect on small businesses, which frequently fall behind on their SG payments because of cash flow issues rather than any other malign motives. In view of this, it can be seen that unpaid superannuation has become a significant issue in Australia, and there is an urge to implement a proper system to solve this problem. Accordingly, this paper introduces the disruptive technology model that is most suitable for superannuation payments in order to avoid the aforementioned issues.

2.2. Blockchain as a Technological Solution

Blockchain-based models are used in many industries, and their use in the division of assets and digital applications, as well as in distributed data records made through smart contracts, is considered a great way of undertaking the most prevalent rational functions of

companies. According to Ainsworth and Viitasaari [41], a blockchain solution for each of the following components of payroll service provision is currently being developed:

- At Futurice, employees track bonus hours on the Ethereum blockchain and are compensated for those hours in the usual course of business.
- Employers pay their global workforces using Bitcoins, which can be maintained in Bitcoin or automatically converted to local fiat money in 60 countries using Bitwage's smart contracts, which combine the original Bitcoin blockchain and the Ethereum platform.
- J.P. Morgan Chase is working on Quorum, a private/permissioned blockchain based on the official Go version of the Ethereum protocol for coordinating payments among financial institutions that is fully accessible to regulators while being completely private for participants.

Before a payroll service provider can deliver complete payroll services via the blockchain, these three key aspects must be reinforced by numerous additional developments in the payroll industry [41].

Blockchain technology may be used to address the issues raised because of the increasing size of the economy and the complex set of occupational deductions in Australia. As a result, Allan and Potdar [42] have suggested a blockchain solution for tax and superannuation systems that automates an enormous portion of the process of filing a personal income tax return and calculating tax liabilities and outstanding tax payments [42]. When reviewing blockchain solutions for pension plans around the world, van der Schans et al. explains that blockchain can be used to personalize contribution strategies by means of smart contracts to avoid having insufficient funds at retirement [43]. After identifying the requirements for blockchain adoption in the pension sector, Sarker and Datta introduced an architectural design for blockchain-based re-designed pension business processes [44]. They also demonstrated how blockchain could be integrated with current pension technology platforms using an API layer to facilitate the effortless enrollment of all individuals into a single online platform with the aim of speeding up processing times, eliminating operating costs, and allowing the completion of other pension reform plans [44].

Blockchain technology and distributed ledgers are attractive in many industries [45–47]. The blockchain concept consists of ledgers of transactions being recorded as blocks of data through a chain of data packages. The transactions that are created in the blockchain are permanent, verified and encrypted [48]. The technology is a peer-to-peer (P2P) distributed system with a scalable model. When studying the blockchain concept, it can be seen that these distributed systems can be adopted in different industries to fulfil their differing requirements [49].

Cryptocurrencies are digital currencies that have no tangible existence, but currency transactions are rather recorded as digital signals. Bitcoin is an example of a cryptocurrency, and it records transactions on an electronic ledger [50]. The idea of distributed blockchain transactions among a cryptographic mailing list led to the development of Bitcoin [50]. Most importantly, these digital ledgers cannot be altered [49].

Among popular disruptive technologies, the next innovation to follow blockchain was the Hyper ledger. Hyper ledger is an open-source project that came out of the Linux Foundation, which is a leading developer of open-source technology [51]. Open source is a software licensing model that allows users to use software for free. The purpose of creating a Hyper ledger was to help advance cross-industry blockchain technologies. This is a shared ledger that has smart contract, privacy, and trust features. Salman [51] also argued that the development of the Hyper ledger was a good solution for industry as such.

Blockchain can be regarded as the fundamental technology underlying many virtual currencies, as shown by Monrat et al. [52]. Within a decentralized and distributed system, a blockchain is indeed a series of blocks that contain data with digital signatures. Decentralization, immutability, openness, and auditability are some of the characteristics of blockchain, increasingly enabling transactions to be secure, as well as tamper-proof. Aside from cryptocurrencies, blockchain technology has applications in social and financial

activities, risk management, healthcare, and other fields [53]. Several studies have looked into the potential of blockchain in a variety of applications.

To describe the mechanism of this system, a blockchain, often referred to as a distributed ledger, is critically an append-only data model managed by a group of nodes that do not entirely trust one another. The blockchain can be seen as a record of organized transactions, with nodes agreeing on an ordered collection of blocks, each of them including numerous transactions. Blockchain can be considered a solution to distributed transaction management in the database sense. In this, nodes store copies of the data and concur on a transaction implementation order. Traditional databases, on the other hand, presume a trusted environment and organize transactions using well-known concurrency management strategies [54].

Blockchain technology has also been rapidly disseminated around the glob, largely because of the success of Bitcoin [55]. Bitcoin nodes use a simplified replicating state machine design to move Bitcoin from one location to another. Since then, blockchain has evolved to accommodate user-defined states and Turing complete-state machine structures, in addition to cryptocurrencies. More crucially, industry demand has begun to push the creation of new blockchain networks built for private settings with verified participants. Under such circumstances, blockchain systems are referred to as private (or permissioned), in contrast to the early systems, which operated in public (or permissionless) contexts, where anybody was able to join and leave. Security trading and settlement [56], assets and financial management [39,40], and banking and insurance [57] are among the applications now being developed and appraised. Enterprise-grade database systems such as Oracle and MySQL are capable of enabling such applications. However, blockchain has the opportunity to alter that because of its reduced infrastructure and personnel expenses [57].

According to Christos Makridis, blockchain has become "a technology with typical purposes that is appropriate throughout industries". The "Finance sector, for instance, is able to utilize it to create smart agreements among customers and their banks. In the same way, it may be used in healthcare to create smart agreements among insurance providers and medical centers, and also between patients and hospitals. The options are limitless" [58].

Over the years, several cryptocurrencies have been introduced by private entities. These cryptocurrencies were neither regulated nor guaranteed by government authorities. However, there have been efforts by government authorities to regulate crypto assets to protect consumers and benefit from digital products. The Australian Competition and Consumer Commission (ACCC) noted that the losses due to scammers demanding crypto payments from their victims amounted to AUD 221 million in 2022 (Commonwealth Australia 2023) [59]. In addition to cryptocurrencies, the use of blockchain technology in other sectors has been steadily growing due to smart contracts that can be run on blockchain networks. Smart contracts generally contain some business logic and a limited amount of data in order to meet specific criteria. Recently, blockchain technology came to be used as a decentralized execution platform for smart contracts. There is no specific legislation applied to distributed ledger technologies such as blockchain technology [45].

One of the many advantages of blockchain applications is perhaps their ability to operate companies effectively. Rajat Kapur, who is a senior manager, stated about blockchain technologies [58] that *"The capacity to establish additional revenue or business strategies, as well as the necessity to safeguard data integrity, are indeed the best drivers for more than half of all respondents"*. With the significant upsurge in the use of smart contracts, it can be seen that there are different sectors using this technology. It will be advantageous for the proposed model to be designed after referring to some of the existing models in order to prevent the aforementioned issues. Kamal [60] gave examples of blockchain-based smart contracts, including the following:

- NXTh, a public blockchain platform that is accessible due to its ready-to-use templates, which enable the development of smart contracts.
- Ethereum, a platform for creating smart contracts in a blockchain.

- Sila, enables the integration of real-world payment features of banks, such as ACH, KYC, and digital payments, using application programmed interfaces (APIs).

3. Research Methodology

Research is an investigation that is conducted systematically by studying sources and the literature to verify data and determine conclusions. There are four basic types of research, namely, descriptive, analytical, basic and applied. The purpose of applied research is to find solutions for a problem in a society, industry, or organization [61]. This research work on blockchain technologies for superannuation contributions is an example of applied research. This research type is beneficial because it can help solve real-world problems. However, the outcomes of this type of research are usually limited to those specific cases [62]. The proposed research approach, paradigm and design are discussed in the sections below. The research approach used in this research work focuses on process design and simulation.

The first step is to map the existing blockchain technology models that are used in other disciplines and to design compatible models for superannuation. Once the blockchain model has been designed, a computer simulation is performed regarding its use in the field of superannuation contributions. Therefore, there will be a considerable possibility of obtaining successful results that can be compared in order to refine the model. Figure 2 highlights the processes undertaken in this research study.

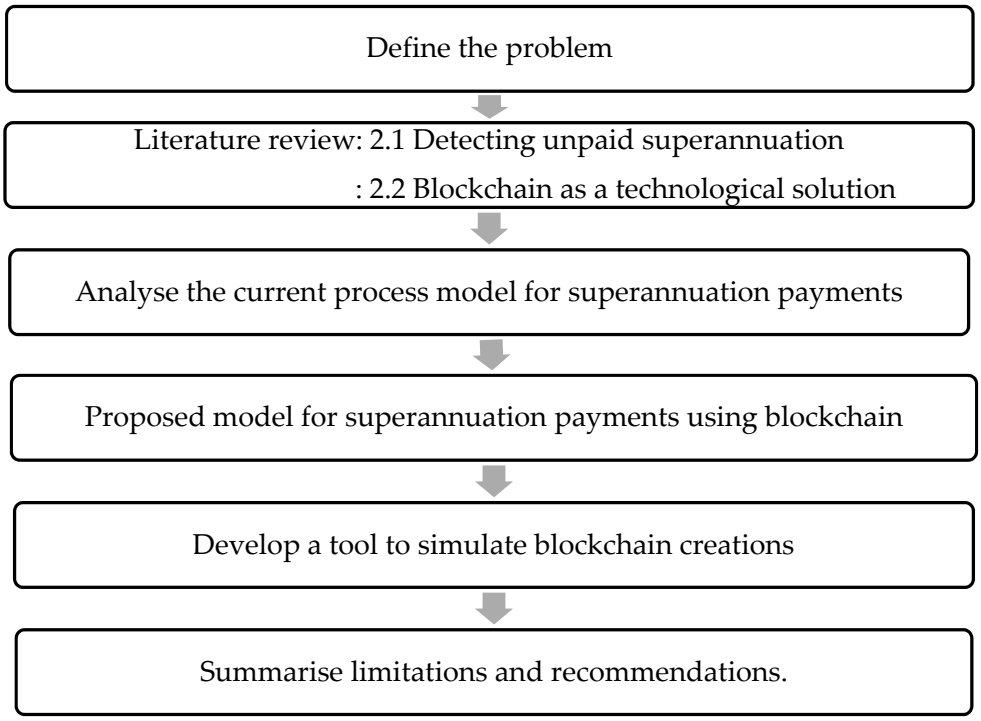


Figure 2. The research process.

In our research, we will study the literature on the use of blockchain technology in finance and other accounting areas. According to the literature review, there is significant usage of blockchain technology models in many industries such as in the finance, auditing, hospitality, health, and business sectors. For example, Wang and Kogan [63] explained that the interaction between accounting and blockchain technology reduces inessential manual handling, enhances the pace of transaction settlement, and prevents financial reporting fraud. Therefore, this study reviews the tasks that are being performed, and whether those models would be appropriate for tasks in the field of superannuation contributions.

A simulation is a process in which a task performed by a system or a procedure is imitated in order to reflect its operation over a given period [64]. Simulations are related to

experimental methods, and it can provide researchers with access to procedures that cannot be observed directly in a secure and controlled environment. During a simulation, different types of data can be gathered that can be used for the research work and objectives [65].

There are both pros and cons of using simulations in research. From a technological perspective, simulations are beneficial because they can be used to make forecasts even under conditions of uncertainty, making it possible to answer many questions. However, there can be issues such as the necessity of good theories to perform modeling, and the lack of a standard approach. When concentrating on the process of simulation, there are advantages such as fewer data being required to model a process and the ability to easily analyze scenarios. The disadvantages of simulation processes include the challenge of validating the process and the potential requirement creep in procedures [66].

In this research, simulation is highly important, since it is related to technological models, and it is necessary to simulate accounting tasks in these models in order to analyze their performance. During the simulation process, the researcher uses suitable simulation tools. Following the above-mentioned method, in this study, a simulation process is adopted regarding superannuation contributions.

The system is linked with several nodes, including the government, employers, auditors, and accountants. Therefore, it is necessary to consider the security aspects of the blockchain technology models employed for superannuation contributions. The next important factor will be the delay in each system. In terms of the efficiency of accounting tasks following the adoption of disruptive technologies, delays can be a major characteristic that will need attention when evaluating the performance of the proposed model. Therefore, the simulation method will be a great approach in the context of this research for finding out answers to the research questions and achieving the aims and objectives of this research project.

4. Analysis

4.1. Existing Superannuation Payment Process

When an employee is hired by a company, the employee provides details to the employer such as their name, date of birth, contact number, email, tax file number and super fund details. Then, the employer sets the employee up in the payroll software with the provided details. When the employer processes weekly or fortnightly wages and pays salary to the employee with a payment slip, the accounting software updates the ledger for payroll clearing, PAYG withholding, and superannuation payables. Additionally, the employer processes single-touch payroll (STP), which provides information on the wages, PAYG withholding and superannuation to the ATO. After this process, the employer pays superannuation to the employee's super fund monthly or quarterly, prior to the due date. This payment process can be carried out in different ways. Small businesses (Figure 3) use the ATO Small Business Super Clearing House (SBSCH) or pay the employees' super funds directly. When using SBSCH, the employer must provide all employee details to register the employee with SBSCH, which will remain for further payments. Then, the employer has to update their super payment instructions with the payment period and the super amount payable for each employee. The payment instructions can be lodged followed by the payment, using the ATO SBSCH payment instructions. The ATO transfers the money to the employee's super fund. Figure 3, presented below, outlines the superannuation payment process used by small and medium-sized enterprises.

With large businesses (Figure 4), the process is similar to that of small businesses up until the point of the superannuation payments. At the stage of the super payments, they have the option of paying the employee's fund directly or using an external online superannuation payment service provider that uses a similar process to that of SBSCH. When these payments are carried out, the employer updates the superannuation payable ledger as liability paid.

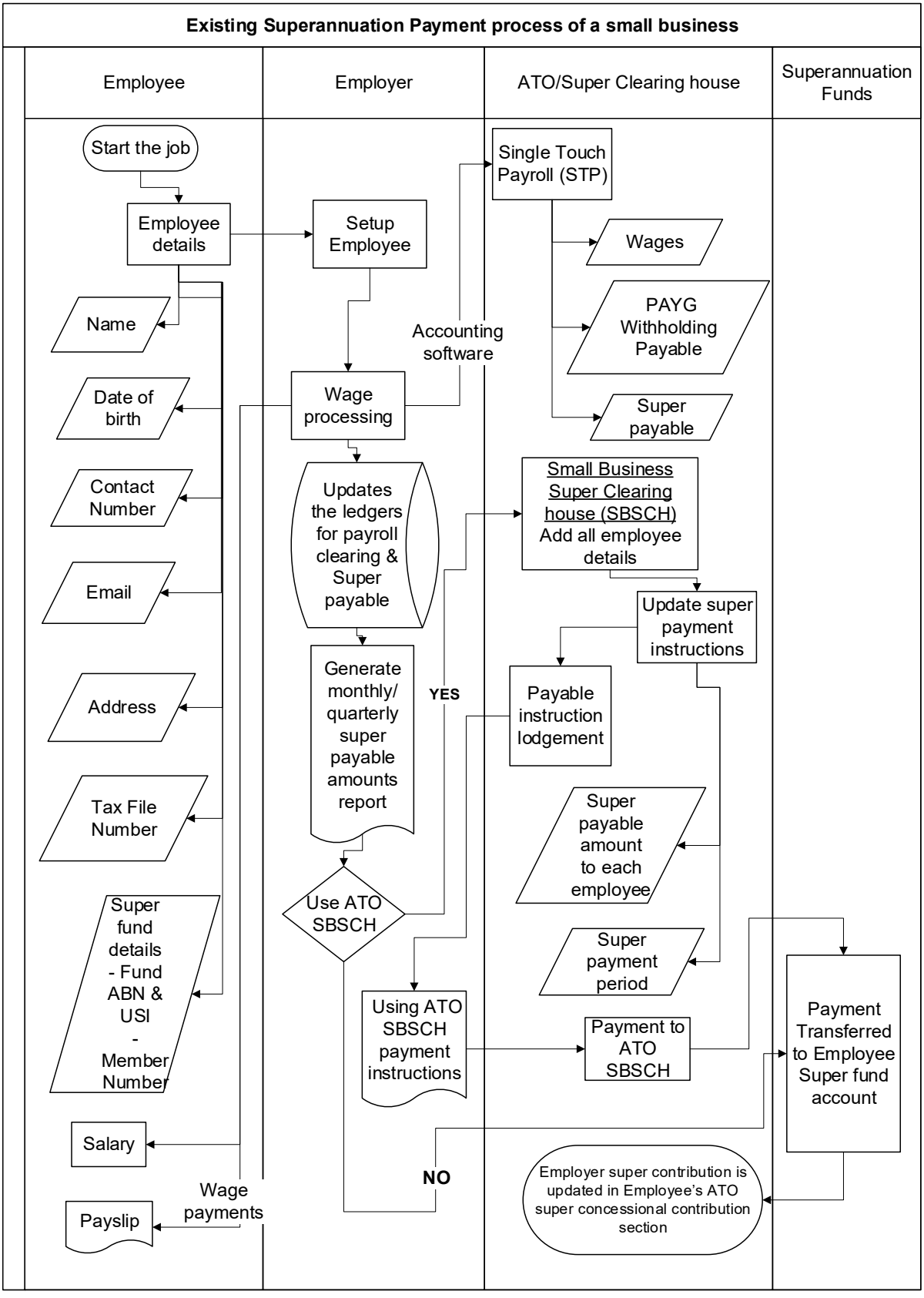


Figure 3. Existing superannuation process model of a small business.

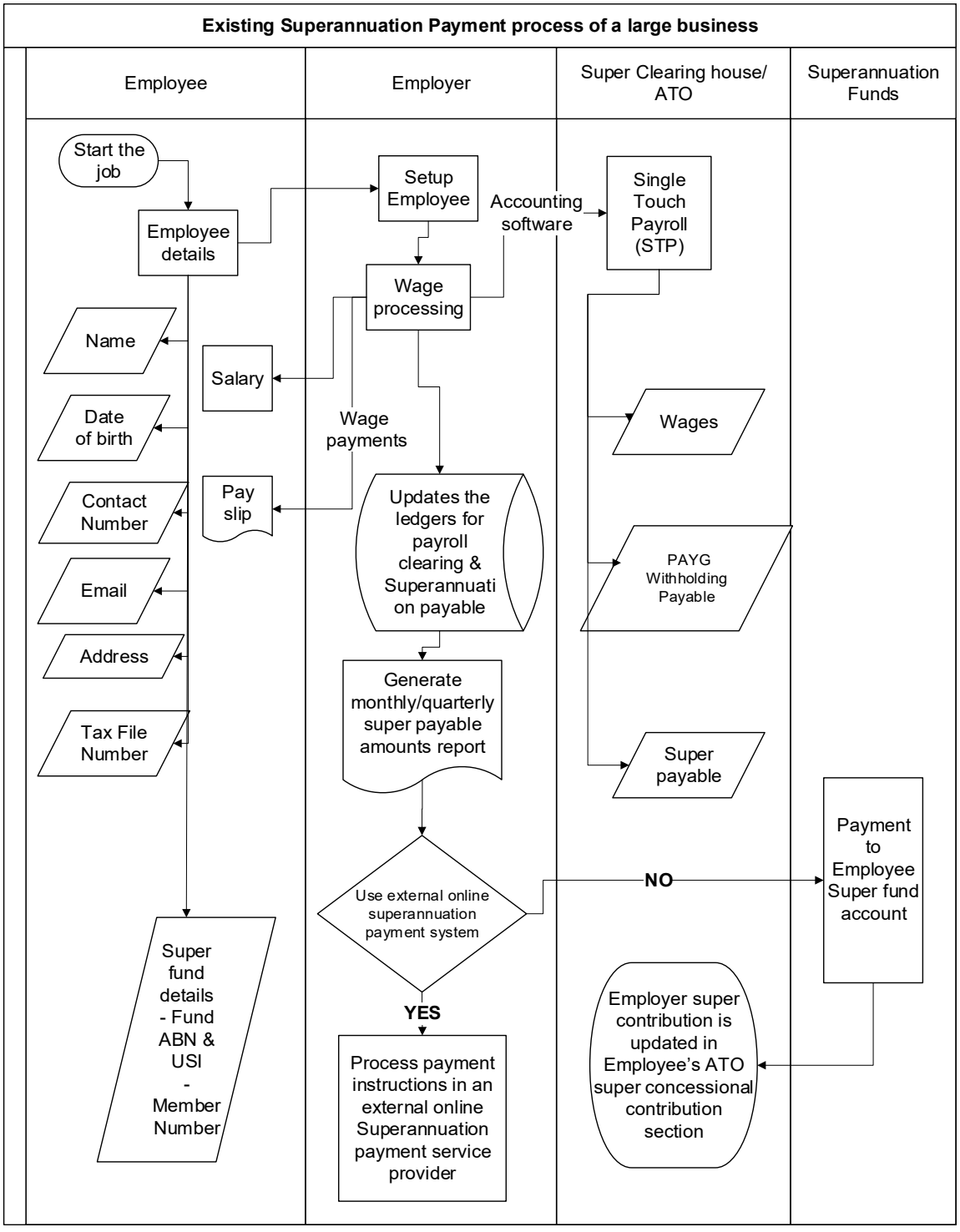


Figure 4. Existing superannuation process model of a large business.

4.2. Gaps in the Existing Process

When looking at these two processes (Figures 3 and 4), it can be seen that there is a problem with the transparency of the super payments, because not all of the related parties are connected in the payment process. The employers can even defer payments because of their sole authority in making superannuation payments. Because of the lack of information transferred among the employer, the employee, the super fund and the ATO, problems can arise with identifying unpaid superannuation. This warrants the need for a transparent payment process in which all parties can be involved and linked to the superannuation

payment process. In line with the idea of promoting security, transparency, accuracy and consistency, this presents a blockchain-based process model for superannuation payments.

4.3. Suggested Blockchain Superannuation Payment Process Model

The proposed blockchain process model is provided in Figure 5.

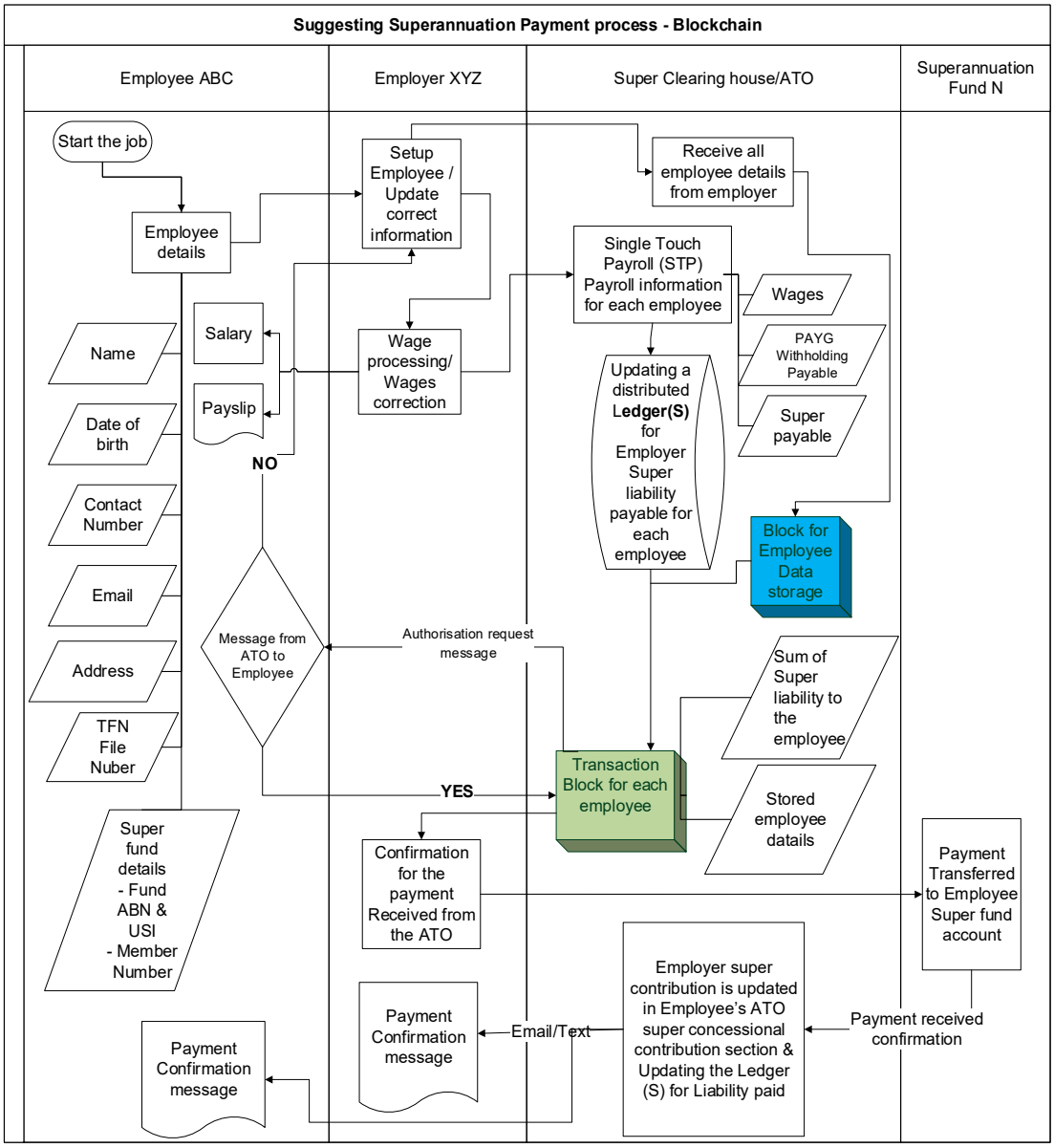


Figure 5. The proposed process model.

The process starts with the employee providing information to the employer. This enables the employer to update the ATO with the new employee's details and create a block to store data permanently until the employee resigns from that company. The employer also updates the payroll software and processes the wages. The employer will then lodge the STP file to report wages, PAYG withholding and superannuation liability to the ATO. The ATO will update a distributed ledger with the superannuation liability for each pay run.

At the end of the quarter, the ATO will create a block for each employee with the stored employee details and the total amount of super payable for the quarter. Then, the ATO will send a text message to the employee mentioning "XYZ Employer paid $$$ amount to a particular super fund for the quarter ending with the date DD/MM/YYYY". Agree?

"YES" or "No". With the pay slip information and super fund details, the employee will reply with a YES or NO. If it is a NO, the employee can contact the employer and request to update their super fund details if they have changed the fund, or query the amount differences if necessary, so that the employer is able to process a correct pay run and report the STP to the ATO to update the ATO blocks. If the response is YES, the ATO can send a confirmation to the employer to process the payment to the employee's super fund. When the super fund receives the payment, it will send a payment received confirmation to the ATO. The ATO then can update the distributed ledger with liability paid and inform the employer and the employee with the following email/text messages respectively. "$$$ is paid to N super fund for ABC employee for the quarter ending DD/MM/YYYY" and "$$$ is paid to N super fund by XYZ for the quarter ending DD/MM/YYYY". Figure 6 shows that inter-organizational transactions make blockchain attractive because data can be exchanged with outside parties ensuring the transparency of the transactions.

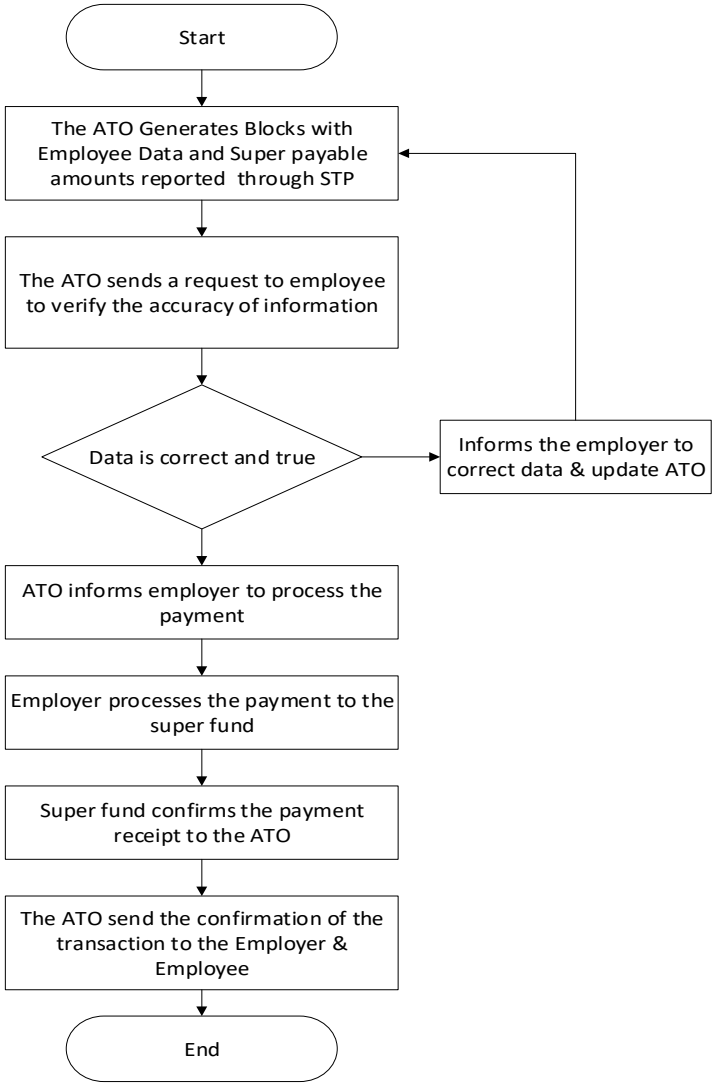


Figure 6. The process of updating the ledger.

Figure 7, shown below, highlights the use of smart contracts from the ATO side. Upon employing a smart contract from the ATO, an employer can start processing the STP. Since the distributed ledger is a medium that is shared among all involved parties, all information relating to provenance can be stored on the ledger. This allows third parties to verify the details for compliance.

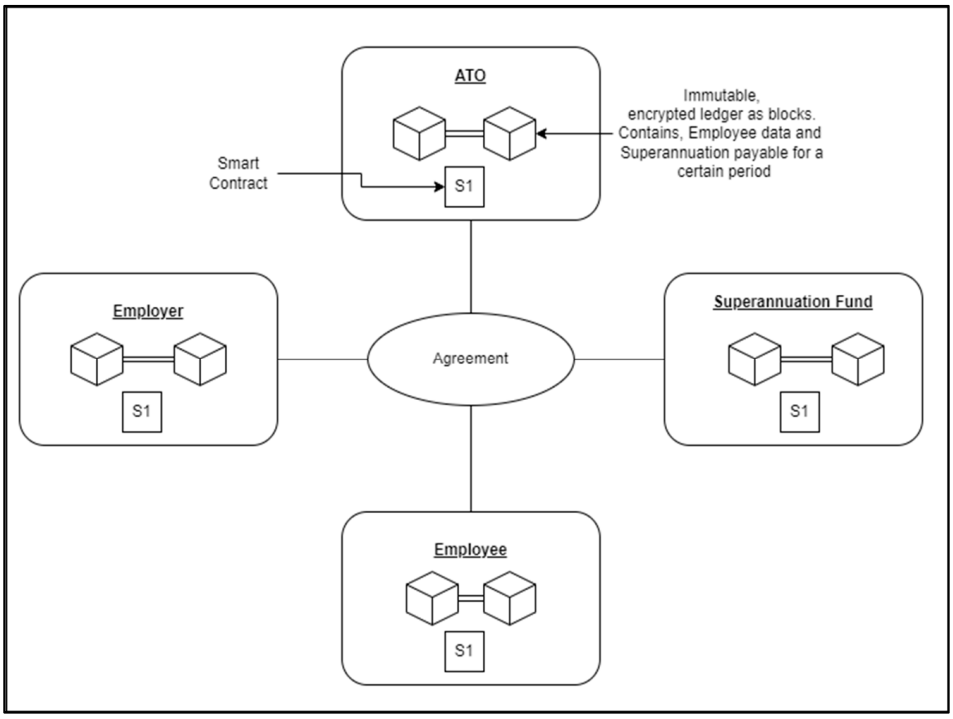


Figure 7. Smart contracts.

Through the proposed process, the ATO would have the authority to manage superannuation payments, which makes auditing and detecting unpaid superannuation much easier. Furthermore, all of the parties linked and involved in the process can seamlessly view the accurate super payment data. This will restrict employers' ability to ignore superannuation payments, as all the participants in the blockchain can track the process through smart contracts.

The rationale for smart contract triggers lies in their ability to automate the execution of specific actions or conditions within a blockchain-based system. Smart contracts are self-executing contracts with the terms of the agreement written directly into lines of code. These contracts are stored and executed on a blockchain, providing transparency, immutability, and decentralized control [67].

Triggers in smart contracts are essentially event-based conditions that initiate the execution of predefined actions when certain events occur (Figure 8). They allow for the automation of processes and the enforcement of predetermined rules without the need for intermediaries.

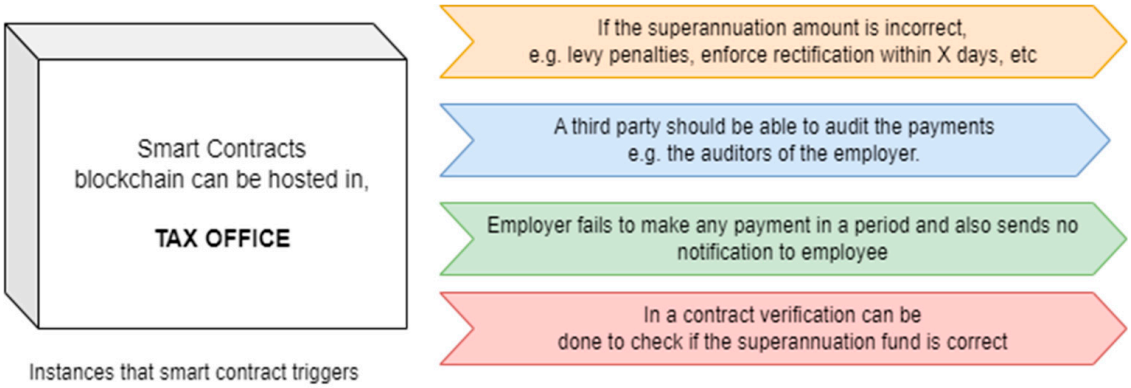


Figure 8. The rationale for smart contract triggers.

One of the key benefits of this proposed model is its ability to provide all parties with a shared view of the data. This is seen as a valuable tool for managing complex

networks with many stakeholders, because it offers a transparent, decentralized, and secure way to store and manage data. Every participant in the blockchain network has access to the same information, which eliminates the need for intermediaries and reduces the risk of disputes or errors. Additionally, the data are stored on a decentralized ledger that cannot be altered without the consensus of the network, providing a high level of security and immutability. In situations where there are multiple stakeholders with competing interests, smart contracts can help to ensure that everyone is held accountable, and that all transactions are transparent and auditable [67]. This can be particularly important in industries like finance, where there are many parties involved in the process and a high level of trust is required. These blocks can help streamline complex networks and facilitate secure and efficient transactions among multiple stakeholders. By providing a shared and immutable ledger, it can reduce the need for intermediaries, increase transparency, and improve the overall security and efficiency of the system [67].

Figure 9 shows the block simulation interface and outlines how the transactions are validated, once the new block is formed. The block header includes important metadata about the block, such as a timestamp, a unique identifier (hash) for the block, a reference to the previous block in the chain, and other relevant information.

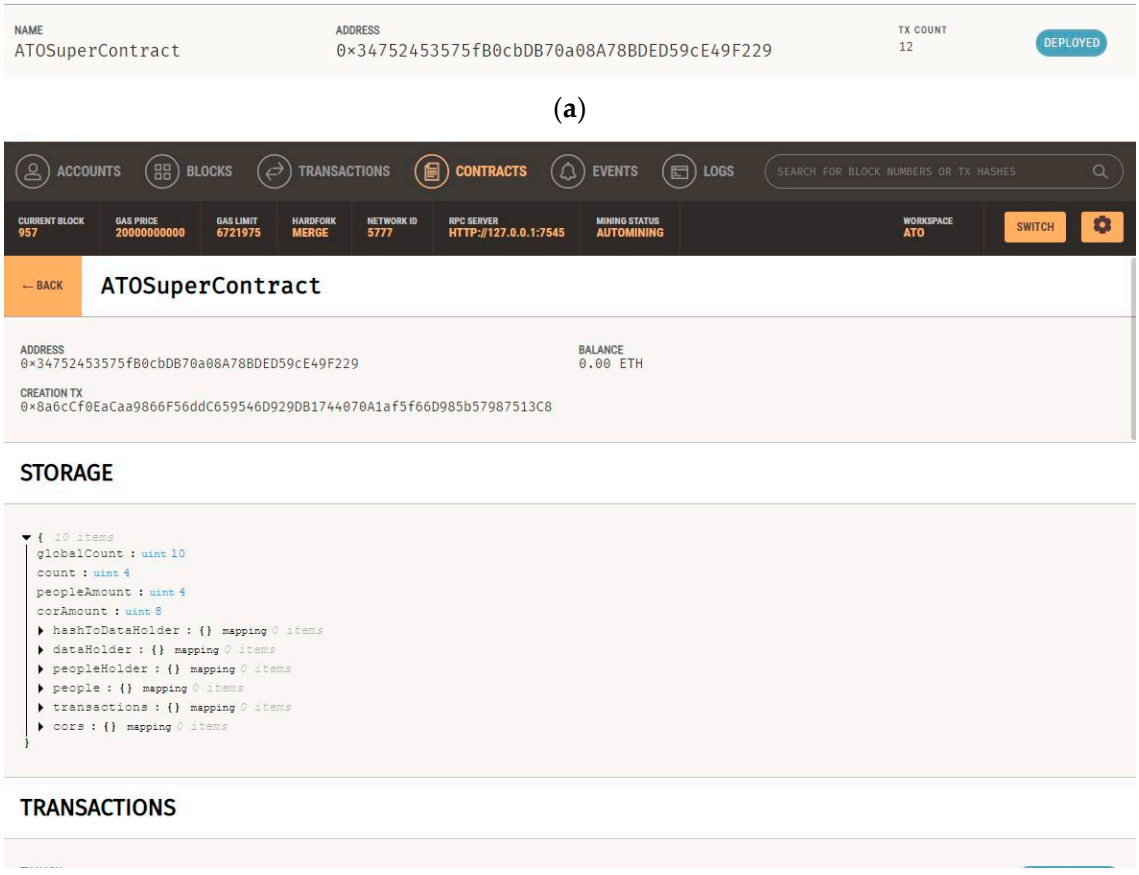


Figure 9. (**a**) Deployment of contracts. (**b**) Data storage.

4.4. Implementation of the Superannuation Payment Simulation Model

Configuration: Setting Up a Simulated Blockchain Environment.

This report outlines the steps undertaken to establish a simulated blockchain environment. The procedures described below detail the configuration process.

Node.js Installation: To initiate the setup, Node.js was installed. The installation package was obtained from the official Node.js website https://nodejs.org/en/ (accessed

on 24 August 2023). It is noteworthy that the recommended Long-Term Support (LTS) version was not selected for installation; rather, the newest version of nodejs was used. The successful installation was confirmed by executing the commands "node-v" and "npm-v" in a terminal or command prompt.

Global Installation of Truffle: Following the Node.js installation, the global installation of Truffle was carried out. This step was executed via Windows PowerShell, which can be accessed through the Start menu. The command "npm install-g truffle" was utilized to accomplish the installation.

VSCode Download and Installation: To facilitate the development environment, the process of downloading and installing Visual Studio Code (VSCode) was carried out. The official Visual Studio Code website (https://code.visualstudio.com/, accessed on 24 August 2023) was visited to obtain the installation package tailored for Windows.

Ganache Setup: The establishment of the simulated blockchain environment was accomplished by obtaining Ganache. The necessary software was acquired from the provided link (https://www.trufflesuite.com/ganache, accessed on 24 August 2023). Following the acquisition, the installation instructions provided on the website were followed to ensure the successful setup of Ganache.

NPM Modules Installation: For the seamless functioning of the environment, essential NPM modules were installed. This was achieved by launching a terminal or command prompt and executing the command "npm install ethers; npm install http; npm install express". The modules "ethers", "http", and "express" were installed via this command.

Project Folder Creation: A dedicated folder was established to house the blockchain project. This preparatory step is crucial to maintaining an organized workspace. To perform the setup, the command "truffle unpack" was run.

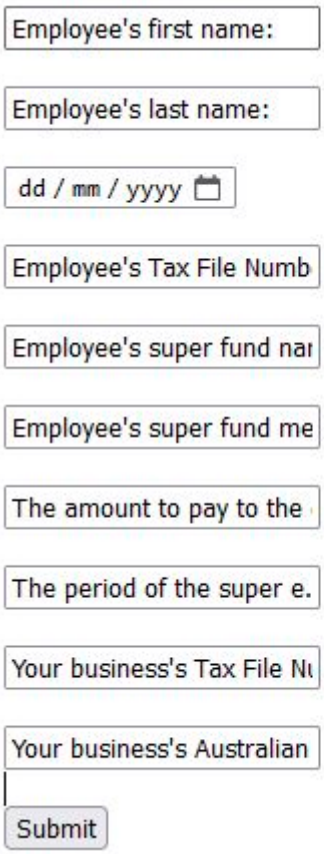
Visual Studio Code Utilization: With the project folder in place, Visual Studio Code was employed as the integrated development environment (IDE) of choice. Users opened the dedicated project folder using Visual Studio Code to proceed with development.

Commencement of Development: Having concluded the configuration steps, the development phase was initiated. The suite of tools installed—including Truffle for smart contract development, deployment, and testing, as well as Ganache for local Ethereum blockchain simulation—was harnessed to build and refine simulated blockchain applications. Visual Studio Code proved to be a reliable hub for integrated development activities.

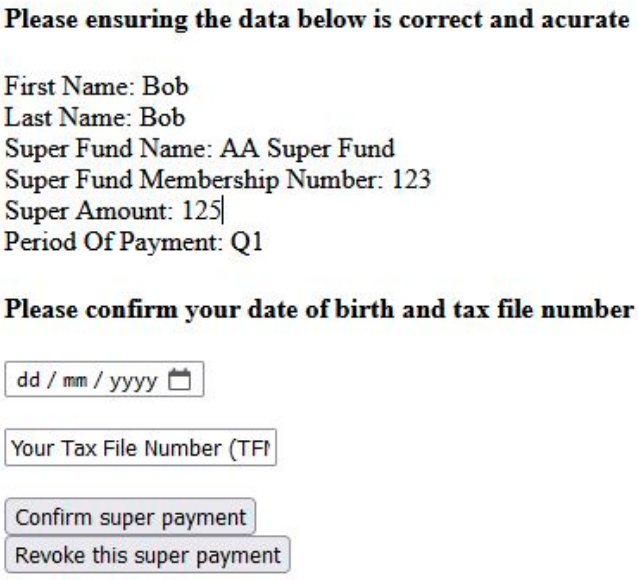
The aforementioned steps were meticulously followed to successfully set up a simulated blockchain environment. The combination of Node.js, Truffle, VSCode, Ganache, and essential NPM modules, along with the strategic organization of a project folder, provides a robust foundation for the development of simulated blockchain applications. In this application, the data will be stored in the network, specifically, in blocks.

Figure 9a,b show the deployment of the smart contracts using Ganache and the storage of data in the blockchain network.

As suggested in this research, the employee has the option of confirming or revoking super payments after reviewing payment details. Figure 10 shows the payment information that the employee needs to verify. As they are distinctive characteristics, the employee's date of birth and TFN must be provided at this stage.

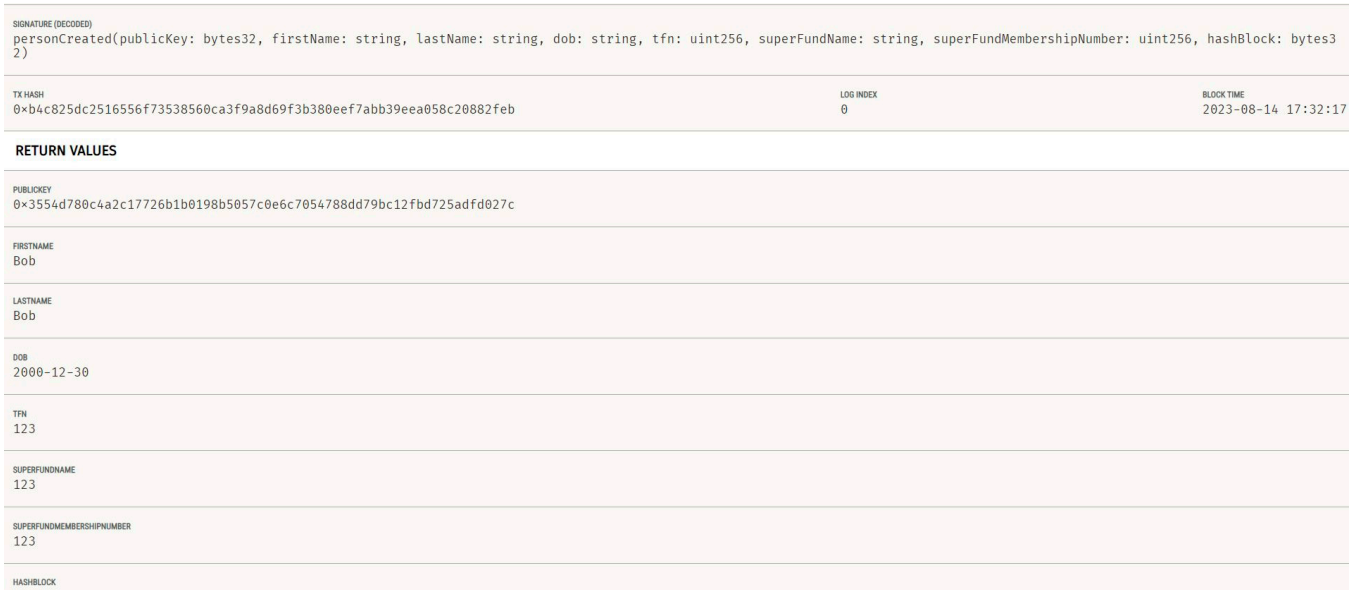


(**a**)



(**b**)

Figure 10. *Cont*.



(**c**)

Figure 10. (**a**) Employee creation page (**b**) Employee details confirmation (**c**) Employee Creation Confirmation.

During the simulation process, the hash is created (Figure 11). Then, the chains of blocks for superannuation payment transactions are created for each employee (Figures 12–14).

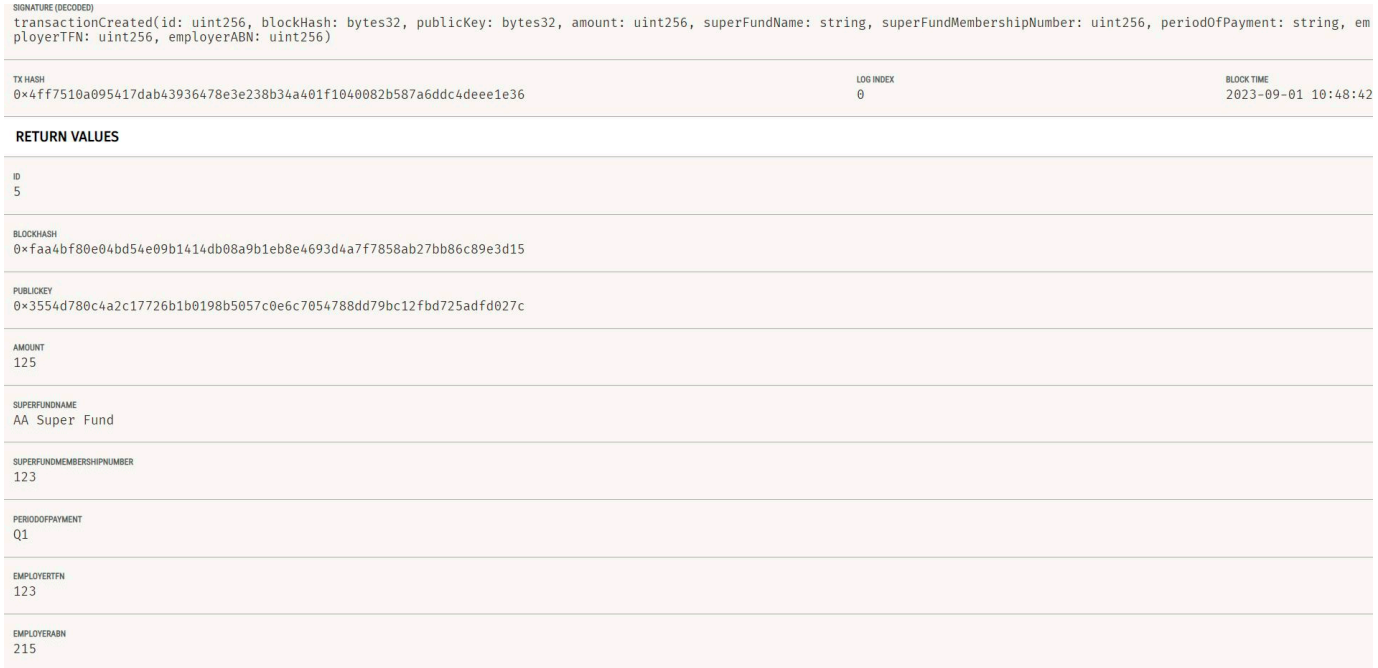


Figure 11. Creating hash.

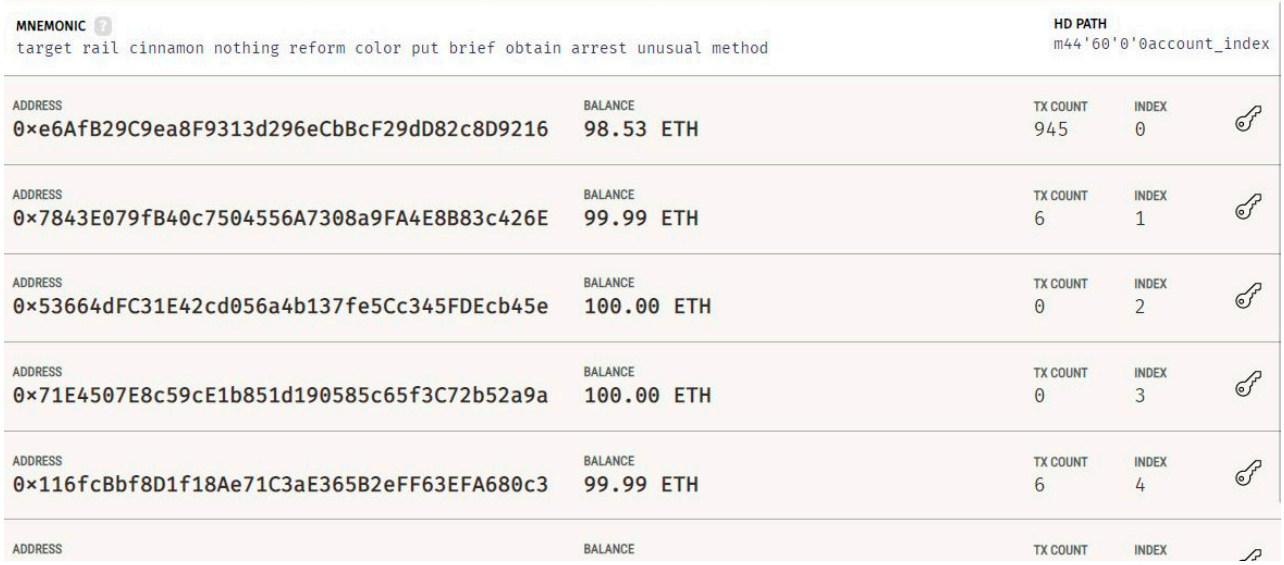


Figure 12. Blockchains.

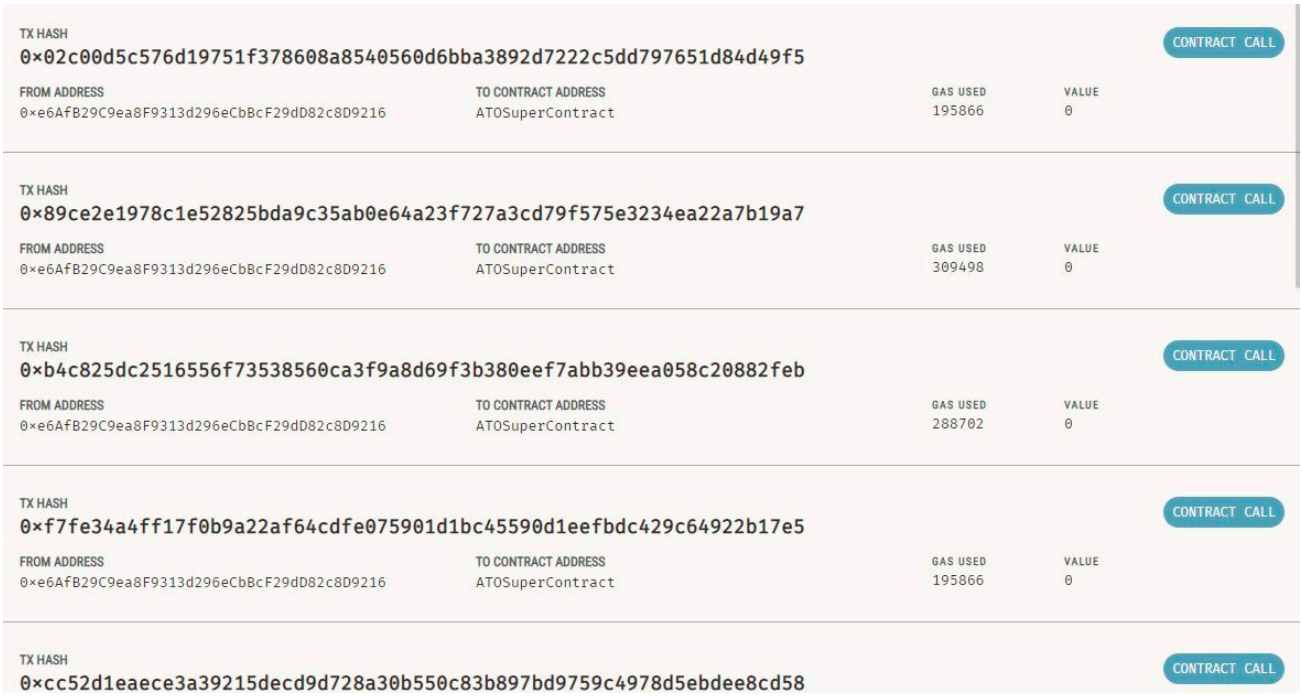


Figure 13. Transactions.

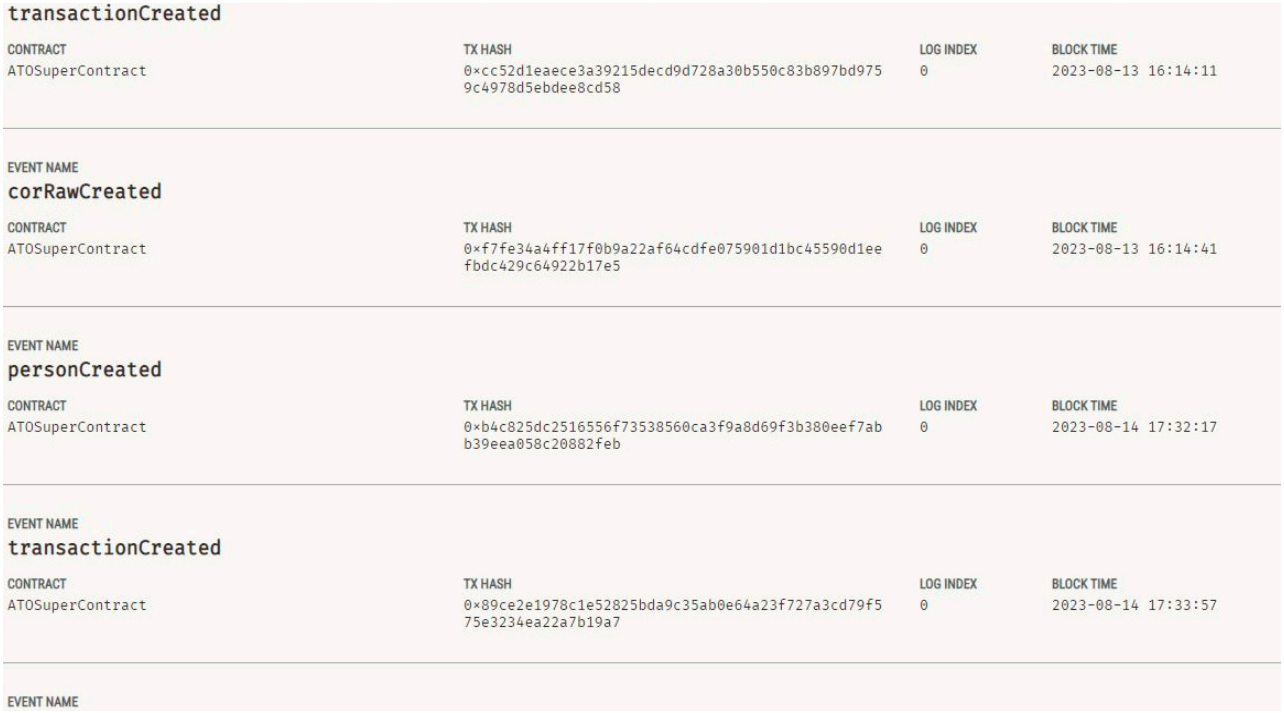


Figure 14. Contract Calls.

5. Discussion

Blockchain technology offers enhanced transactional security compared to traditional centralized computing services, making it a promising solution for secure networked transaction ledgers. However, this experiment highlights that while blockchain provides reliability, immutability, and security for business transactions involving multiple parties, it also comes with high overhead. This is due to the replication and redundancy required for data storage and processing. The partial implementation of blockchain revealed important lessons, including challenges and issues related to smart contract design, endorsement policies, data management, and network configurations.

5.1. Smart Contracts and Endorsement Policies

A smart contract encapsulates the business logic of internal operational policies and rules, as well as regulatory policies and standards [68]. However, the lack of interoperability between different blockchain regulatory policies in Australia can create silos of data and assets that are difficult to integrate and use across different networks.

In our simulated environment based on superannuation payments and smart contracts, we faced the challenge of ensuring adherence to decentralized global platforms that support global payments [69]. The execution of smart contracts by globally distributed parties such as employers, the Australian Taxation Office (ATO), and super funds requires enforcement of government laws and policies. While smart contracts are enforceable under contract law within the current US legal framework, the situation regarding blockchain laws in Australia remains uncertain [68]. The specific law applicable to the interpretation of smart contracts and the jurisdiction responsible for adjudicating disputes is yet to be determined.

5.2. Data Management

According to Bharat and Prakash [70], blockchain technology offers HR professionals various benefits, including certificate verification, skill mapping, payroll processing, data protection, and performance management. Implementing blockchain in the HR department can enhance effectiveness and efficiency. However, it is crucial to prioritize the confidentiality and sensitivity of data as key considerations [71,72].

In our case, given the involvement of multiple third parties, such as organizations managing superannuation funds, ATO and employers, data management becomes a critical aspect to consider in blockchain design. The performance and cost of blockchain operations are significantly influenced by data management.

As blockchain data are replicated across all nodes in the network, data requirements can become extensive. For instance, in a network with n nodes, where an endorsement policy demands nodes endorse a transaction, the number of messages exchanged before committing a new block becomes n messages from the superannuation service to all n nodes.

When applying blockchain to the superannuation process, one notable limitation is the scalability of the technology. As more users join the blockchain network, the network's speed and efficiency may decrease due to the substantial processing and storage demands of a large volume of data.

5.3. Network Design

The strengths of blockchain technology, such as visibility, traceability, compliance, and resiliency, have been summarized in previous work [73]. In our simulated environment, the centralized databases we used were susceptible to cyberattacks, posing a risk to the entire system. To address this, blockchain utilizes distributed ledger technology (DLT), which enhances cyber resiliency by eliminating single points of contact. In a DLT system, an attack on one or a few participants does not impact other nodes, ensuring transparency, availability, and uninterrupted transactions.

To maintain data security, encrypted channels must be used for data transmission. The configuration of these channels has a significant impact on factors such as data volume over the network, workload distribution, network resilience, and visibility. While most data reside in other ERP systems and are accessible only to authorized employees, our research did not have the necessary authorization to access them.

In a case study in which multiple parties collaborate on a business process, there are various ways to configure the blockchain channels [74]. The channel configuration determines the flow of data within the network. With a single channel, all transactions are posted to that channel, and unless the data payload is encrypted, all parties typically have access to them. Alternatively, multiple channels can be created to separate interactions among subsets of parties. However, managing multiple channels can be complex, as each channel has its own database and cryptographic keys. Additionally, there are alternative configurations and complexities to consider, especially when secrecy and privacy concerns arise with respect to the channel configuration.

When developing the model, two crucial aspects to consider are security and delay. Regarding security, confidential employee information such as Tax File Numbers (TFNs), wages, and super payment amounts must be protected from potential attack vectors. Blockchain can withstand conventional cyberattacks quite well, but cybercriminals are developing new techniques expressly with the aim of compromising blockchain technology. Additionally, the time consumption associated with this method should be considered (Figure 10).

Musa and Thomas [75] suggest that blockchain technology has the potential to enhance the security of payroll systems and reduce fraud, while improving efficiency. However, it is important to acknowledge that implementing blockchain technology can be costly, particularly for smaller organizations or those with limited resources. The expenses include significant investments in hardware, software, and ongoing maintenance and support. Furthermore, consensus implementation, which is a crucial aspect of blockchain, is both time consuming and costly, requiring the replication of several servers and databases in an integrated approach.

5.4. Other Implementation Implications

The cost is a significant factor to consider when making decisions about adopting blockchain technology. Some argue that the benefits of streamlined operations, reduced

risks, and compliance costs outweigh the implementation expenses. However, in high-tech industries where product features are prioritized and profit margins are high, the cost may receive less emphasis. It is becoming clear that blockchain is suitable only for applications where the additional transaction costs can be justified by the overall benefits after a careful analysis [76]. Privacy is another important factor to consider, as higher visibility often means sacrificing some level of privacy. IT firms will play a crucial role in developing the necessary infrastructure, platforms, and products for implementing blockchain technology in specific industry segments. However, it is challenging to predict the exact timeline for the widespread use of this technology. Consequently, there is little incentive for either party to move to a blockchain platform.

In the context of finance, blockchain technology's primary contribution is breaking down physical and temporal barriers, providing effective and efficient visibility, and enabling integration with the ATO's (Australian Taxation Office), employers', and super funds' ERP (Enterprise Resource Planning) systems. It is important to note that ERP systems like SAP and Oracle store and manage large databases internally within an organization, protected by firewalls.

The lack of interoperability between different blockchain networks can result in data and asset silos, which are challenging to integrate and utilize across multiple networks. Additionally, blockchain technology consumes substantial energy, particularly in proof-of-work blockchain, where miners compete to solve complex mathematical problems for transaction validation and rewards.

Despite the computerization of payroll processes, blockchain-based payroll applications are currently limited [41]. This can be attributed to the significant barriers to entry, further compounded by the absence of a fiat cryptocurrency that facilitates international payroll transactions without significant foreign exchange risks. Moreover, it is essential to carefully consider the use cases and implementation of different blockchain networks and protocols to maximize their potential benefits.

In summary, while blockchain technology holds the potential to revolutionize numerous industries, it is crucial to acknowledge its limitations and thoroughly evaluate its use cases and implementation. Additionally, the operational aspects of blockchain models, such as breakdowns, delays, and bottlenecks, should be proactively addressed in the context of addressing challenges in the finance sector.

5.5. Proposed Contributions to the Field of Research

This study makes several research contributions. First, this study reviewed the existing literature on superannuation fraud in Australia and mapped out the existing process. Second, there is limited knowledge of how blockchain technology could be used as a solution to prevent superannuation fraud. This study redesigned the existing process and developed a blockchain-based application to prevent superannuation fraud. This will support the finance sector in addressing superannuation-related issues. Third, it contributes to information systems and finance disciplines, as the presented blockchain-based application demonstrates the possibility of utilizing technology to address issues in the finance sector.

6. Conclusions

There are ongoing issues with the superannuation payment process, and industry experts, together with government authorities, have introduced several options for avoiding and detecting unpaid superannuation. Furthermore, the literature review explained the structures and possible technologies, such as blockchain smart contracts, that might be useful in this research as a solution for mitigating superannuation fraud. Following that, this paper highlights the use of smart contracts in various processes.

Currently, the largest applications of this technology lies in payment systems such as Bitcoin. However, blockchain technology represents a major paradigm shift in terms of how business transactions are conducted, and thus has far-reaching implications. This

paper explains the adoption of blockchain in superannuation payment processing. Our findings will allow researchers to develop their awareness of the current knowledge and limitations in the study area.

This paper reviewed the literature on superannuation fraud in Australia and examined the existing processes enabling employers to make superannuation contributions into their employees' superannuation accounts. This review highlighted the reasons for unpaid superannuation not being detected. This study redesigned the existing process utilizing blockchain technology to present a unique solution for the prevention of superannuation fraud.

Our analysis and the experiment using a newly developed blockchain application suggest that blockchain technology can be deployed for inter-organizational transactions among untrusted parties, and in applications that need high levels of provenance and visibility. This also incurs a very high overhead in terms of storage, networking, and processing costs, which can be justified only following a thorough case-by-case analysis.

In conclusion, the proposed process model and the blockchain solution will be helpful in creating more robust and reliable disruptive technology models for superannuation payments. Overall, this research reiterates that while blockchain technology has the potential to revolutionize many industries, it is important to be aware of its limitations and to carefully consider the feasibility of its use.

This study is not free of limitations. This study reviewed the process relating to how employers make their superannuation contributions to benefit their employees. As this study is based on the Australian superannuation system, the results may not apply to every super fund in the world. While this study presents a blockchain-based solution for preventing superannuation fraud in Australia, future studies on the possibility of adopting this solution in different contexts may help prevent similar frauds.

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Conflicts of Interest: The authors declare no conflict of interest.

References

1. Australian Taxation Office. Your Superannuation Basics. Australian Government. 10 June 2022. Available online: https://www.ato.gov.au/general/other-languages/in-detail/information-in-other-languages/your-superannuation-basics/#Whatissuperannuation1 (accessed on 15 February 2023).
2. Australian Securities & Investments Commission. The ASIC—APRA Relationship. 15 December 2021. Available online: https://asic.gov.au/about-asic/what-we-do/our-role/other-regulators-and-organisations/the-asic-apra-relationship/#:~:text=ASIC%20regulates%20t (accessed on 27 February 2023).
3. The Treasury. *Legislating the Objective of Superannuation*; Australian Government: Canberra, Australia, 2023.
4. Australian Prudential Regulation Authority. *Quarterly Superannuation Performance Statistics Highlights March 2023*; APRA: Sydney, Australia, 2023.
5. Klineberg. Superannuation and economic security for older Australians: A human rights perspective. *Aust. J. Hum. Rights* **2020**, *26*, 405–427. [CrossRef]
6. Industry Super Australa. *Super Scandal: Unpaid Super Guarantee in 2016–2017*; Industry Super Australia: Melbourne, Australia, 2019.
7. Australian Taxation Office. Superannuation Guarantee. Australian Government. 2023. Available online: https://www.ato.gov.au/rates/key-superannuation-rates-and-thresholds/?page=23#Super_guarantee_percentage (accessed on 5 February 2023).
8. Necmi, E.Z.; Avkiran, K. Complexity and Uncertainty regarding Superannuation Do Not Explain Key Decisions Taken by Members. *Sci. Res.* **2018**, *8*, 11.

9. Australian Taxation Office. How to Pay Super, Australian Government. 26 May 2021. Available online: https://www.ato.gov.au/business/super-for-employers/paying-super-contributions/how-to-pay-super/ (accessed on 2 February 2023).
10. Anderson, H. Detecting Unpaid Superannuation. *Aust. Restruct. Insolv. Turnaround Assoc. J.* **2017**, *29*, 34.
11. Giardina; Pinto, D. A proposal to address the impact of fraudulent phoenix activities on unremitted superannuation guarantee contributions in Australia. *J. Aust. Tax.* **2014**, *16*, 74–107.
12. Senate Economics References Committee. *Superbad—Wage Theft and Non-Compliance of the Superannuation*; The Senate Printing Unit, Parliament House: Canberra, Australia, 2017.
13. Industry Super Australia. *Unpaid Super: Getting Worse While Nothing Is Done*; Industry Fund Services Ltd.: Melbourne, Australia, 2016.
14. Industry Super Australia. Department of Employment and Workplace Relations. 24 October 2019. Available online: https://www.dewr.gov.au/system/files/documents/submission-file/2022-07/industry-super-australia-submission.pdf (accessed on 19 June 2023).
15. McMahon, T. *Super Scandalous: How to Fix the $5 Billion Scourge of Unpaid Super*; Industry Super Australia: Melbourne, Australia, 2021.
16. Australian National Audit Office. Addressing Superannuation Guarantee Non-Compliance. 28 April 2022. Available online: https://www.anao.gov.au/work/performance-audit/addressing-superannuation-guarantee-non-compliance (accessed on 22 July 2023).
17. Australian Taxation Office. *Commissioner of Taxation Annual Report 2021–2022*; Australian Government: Barton, Australia, 2022.
18. Australasian Business Intelligence. *Superannuation Amnesty Unearths $588 Million in Unpaid Contributions*; Comtex News Network, Inc.: New York, NY, USA, 2020.
19. Australian Unions. The Scourge of Unpaid Super. 1 December 2022. Available online: https://www.australianunions.org.au/2022/12/01/the-scourge-of-unpaid-super/ (accessed on 22 July 2023).
20. Goh, J. Fund Trustees Should Step in to Mitigate Unpaid Super: IFS. 6 September 2017. Available online: https://www.moneymanagement.com.au/news/superannuation/fund-trustees-should-step-mitigate-unpaid-super-ifs (accessed on 11 July 2023).
21. Industry Super Australia, CBUS. *Overdue: Time for Action on Unpaid Super*; Australian Parliament House: Sydney, Australia, 2016.
22. Uyyala, P.; Yadav, C.D. The advanced proprietary AI/ML solution as Anti-fraudTensorlink4cheque (AFTL4C) for Cheque fraud detection. *Int. J. Anal. Exp. Modal Anal.* **2023**, *15*, 1914–1921.
23. Faccia. National Payment Switches and the Power of Cognitive Computing against Fintech Fraud. *Big Data Cogn. Comput.* **2023**, *7*, 76. [CrossRef]
24. Willette, D.A.; Barber, L.A.P.H.; Bunje, P.M.E.; Cauzac, J.-P.; Conchon, A.; Trenkel, V.M. Emerging monitoring technologies to reduce illegal fishing activities at sea and prevent entry of fraudulent fish into markets. *Front. Sustain. Food Sustems* **2023**, *7*, 1166131. [CrossRef]
25. Bannor, R.K.; Arthur, K.K.; Oppong, D.; Oppong-Kyeremeh, H. A comprehensive systematic review and bibliometric analysis of food fraud from a global perspective. *J. Agric. Food Res.* **2023**, *14*, 100686.
26. Mohanty, D.; VorugantI, N.K.; Patel, C.; Manglani, T. Implementing Blockchain Technology for Fraud Detection in Financial Management. *BioGecko* **2023**, *12*, 2.
27. Khan, S.N.; Loukil, F.; Ghedira-Guegan, C.; Benkhelifa, E.; Bani-Hani, A. Blockchain smart contracts: Applications, challenges, and future trends. *Peer Peer Netw. Appl.* **2021**, *14*, 2901–2925. [CrossRef]
28. Sichinava, D. Cryptocurrency—A future medium of exchange. *Res. Gate* **2019**, *11*, 55–69.
29. Reeves, P.; O'Grady, R.; Shen, E. Blockchain & Cryptocurrency Laws and Regulations 2023 | Australia. Global Legal Insights. 2 November 2022. Available online: https://www.globallegalinsights.com/practice-areas/blockchain-laws-and-regulations/australia (accessed on 11 July 2023).
30. Taylor, M. *Help Us Pursue Employer Laggards Says Cbus*; Super Review: Chatswood, Australia, 2017.
31. Australian Taxation Ofiice. Single Touch Payroll. Australian Government. 10 November 2021. Available online: https://www.ato.gov.au/Business/Single-Touch-Payroll/ (accessed on 12 February 2023).
32. Pagura. Single Touch: What you need to know. *J. Aust. Tradit. Med. Soc.* **2019**, *25*, 226–227.
33. Taylor, M. *Govt must Go further on Unpaid Super*; Super Review: Chatswood, Australia, 2018.
34. Taylor, M. *ASFA Urges Monthly SG Payments*; Super Review: Chatswood, Australia, 2017.
35. William-Smith, H. *AustralianSuper App to Alert Members to Unpaid Super*; Super Review: Chatswood, Australia, 2017.
36. Proebstl. Government acts to make sure your super gets paid. *Bull. (Law Soc. South Aust.)* **2018**, *40*, 43.
37. Australian Parliament House. 1 March 2019. Available online: https://www.aph.gov.au/Parliamentary_Business/Bills_LEGislation/Bills_Search_Results/Result?bId=r6098 (accessed on 5 February 2023).
38. Autralian Taxation Office. ATO: Proof and voting entitlements for SGC, request for documents. *Aust. Restruct. Insolv. Turnaround Assoc. J.* **2018**, *30*, 42.
39. Anderson, H.; Hardy, T. Superannuation guarantee contributions as a tax: The case for reincarnation over reform. *Aust. Tax Forum* **2018**, *33*, 497–532.
40. Taylor, M. *IPA Says SG Penalty Regime Too Harsh*; Super Review: Chatswood, Australia, 2017.
41. Ainsworth, R.T.; Viitasaari, V. Payroll Tax & The Blockchain. *Boston Univ. Sch. Law Law Econ. Pap.* **2017**, *17*. Available online: https://ssrn.com/abstract=2970699 (accessed on 26 June 2023).
42. Potdar, V.; Allen, C. Blockchain to the Rescue: Improving Taxpayer Engagement with Blockchain. *Aust. Tax Rev.* **2022**, *50*, 211–220.

43. van der Schans, M.; Cramwinckel, J.; Ivanov, S. Nudge: Improving decisions about pensions using blockchain technology. *Vba J.* **2018**, *134*, 13–17.
44. Sarker, I.; Datta, B. Re-designing the pension business processes for achieving technology-driven reforms through blockchain adoption: A proposed architecture. *Technol. Forecast. Soc. Change.* **2022**, *174*, 121059. [CrossRef]
45. Nofer, M.; Gomber, P.; Hinz, O.; Schiereck, D. Blockchain. *Bus. Inf. Syst. Eng.* **2017**, *59*, 183–187. [CrossRef]
46. Vecchiato, R. Disruptive innovation, managerial cognition, and technology competition outcomes. *Technol. Forecast. Soc. Change.* **2017**, *116*, 116–128. [CrossRef]
47. Hill, B.; Chopra, S.; Valencourt, P. *Blockchain Quick Reference: A Guide to Exploring Decentralized Blockchain Application Development*; Packt Publishing: Birmingham, UK, 2018.
48. Douaihy, M. Blockchain. *Twice* **2018**, *33*, 14–15.
49. Kube, N. Daniel Drescher: Blockchain basics: A non-technical introduction in 25 steps. *Financ. Mark. Portf. Manag.* **2017**, *32*, 329–331. [CrossRef]
50. Smith, C.; Kumar, A. Crypto currencies—An introduction to not-so-funny moneys. *J. Econ. Surv.* **2018**, *32*, 1531–1559. [CrossRef]
51. Baset, S. *Hands-On Blockchain with Hyperledger: Building Decentralized Applications with Hyperledger Fabric and Composer*; Packt Publishing Limited: Birmingham, UK, 2018.
52. Monrat, A.; Schelen, O.; Andersson, K. A Survey of Blockchain from the Perspectives of Applications, Chfromnges, and Opportunities. *IEEE Access* **2019**, *7*, 117134–117151. [CrossRef]
53. Crosby, M.; Pattanayak, P.N.; Verma, S.; Kalyanaraman, V. Blockchain technology: Beyond bitcoin. *Appl. Innov. Rev.* **2016**, *2*, 19–26.
54. Lin, Q.; Chang, P.; Chen, G.; Ooi, B.C.; Tan, K.; Wang, Z. Towards a non-2PC transaction management in distributed database systems. Proc. *ACM Int. Conf. Manag. Data* **2016**, 1659–1674.
55. Nakamoto, S. Bitcoin: A peer-to-peer electronic cash system. *Decentralized Bus. Rev.* **2017**. Available online: https://bitcoin.org/bitcoin.pdf (accessed on 26 June 2023).
56. Ripple. Move Money to All Corners of the World. 2017. Available online: https://ripple.com/ (accessed on 18 September 2021).
57. Sachs, G. Blockchain: Putting Theory into Practice. 2016. Available online: www.goldmansachs.com/our-thinking/pages/blockchain/ (accessed on 19 September 2021).
58. Baker, P. Today's Blockchain Use Cases and Industry Applications. 1 June 2021. Available online: https://searchcio.techtarget.com/feature/Todays-blockchain-use-cases-and-industry-applications (accessed on 15 September 2021).
59. Jones, S. *Making Crypto Safer for Consumers*; Ministers Treasury Portfolio: London, UK, 2023.
60. Rupareliya, K. How Smart Contracts are Transforming Banks and Financial Institutions. 8 July 2021. Available online: https://www.businessofapps.com/insights/how-smart-contracts-are-transforming-banks-and-financial-institutions/ (accessed on 31 January 2023).
61. Kothari, C.R. *Research Mothodology Methods & Techniques*, 2nd ed.; New Age International P Ltd. Publishers: New Delhi, India, 2004.
62. Dudovskiy, J. Applied Research, Business Research Methodology. 2011. Available online: https://research-methodology.net/research-methodology/research-types/applied-research/ (accessed on 20 August 2020).
63. Wang, Y.; Kogan, A. Designing confidentiality-preserving Blockchain-based transaction processing systems. *Int. J. Account. Inf. Syst.* **2018**, *30*, 1–18. [CrossRef]
64. Banks, J.; Carson, J.S.; Nicol, D.M. *Discrete-Event System Simulation*, 5th ed.; Pearson New International, Ed.; Prentice Hall: Hoboken, NJ, USA, 2010; p. 3.
65. Lamé, G.; Dixon-Woods, M. Using clinical simulation to study how to improve quality and safety in healthcare. *BMJ Simul. Technol. Enhanc. Learn.* **2020**, *6*, 87–94. [CrossRef]
66. Duzevik, D. Advantages and Disadvantages of Simulation, Concentric. 2017. Available online: https://concentricmarket.com/blog/advantages-and-disadvantages-of-simulation (accessed on 28 August 2020).
67. Javaid, M.; Haleem, A.; Singh, R.P.; Suman, R.; Khan, S. A review of Blockchain Technology applications for financial services. *Bench Counc. Trans. Benchmarks Stand. Eval.* **2022**, *2*, 100073. [CrossRef]
68. Stuart, B.L.; Levi, D. An Introduction to Smart Contracts and Their Potential and Inherent Limitations. In *An Introduction to Smart Contracts and Their Potential and Inherent Limitations*; The Harvard Law Scholl Forum on Corporate Governance: Cambridge, MA, USA, 2018.
69. Mik, E. Smart Contracts: Terminology, Technical Limitations and Real World Complexity. *Law Innov. Technol.* **2017**, *9*, 269–300. [CrossRef]
70. Wynn, M.G. *Handbook of Research on Digital Transformation, Industry Use Cases, and the Impact of Disruptive Technologies*; IGI Global: Hershey, PA, USA, 2022.
71. Chillakuri, B.; Attili, V.S.P. Role of blockchain in HR's response to new-normal. *Int. J. Organ. Anal.* **2022**, *30*, 1359–1378. [CrossRef]
72. Madhani, P.M. Blockchain Applications in HR: Key Advantages. *HRM Rev.* **2022**, *18*, 17–26.
73. Staples, M.; Chen, S.; Falamaki, S.; Ponomarev, A.; Rimba, P.; Tran, A.B.; Weber, I.; Xu, X.; Zhu, J. Risks and opportunities for systems using blockchain and smart contracts. In *Commonwealth Scientific and Industrial Research Organisation*; CSIRO: Canberra, Australia, 2017.
74. Köpke, J.; Meroni, G.S. Designing secure business processes for blockchains with SecBPMN2BC. *Future Gener. Comput. Syst.* **2023**, *141*, 382–398. [CrossRef]

75. Bello, M.I.; Daniel, T.R. Potentials of Blockchain Technology for Payroll Systems. In Proceedings of the 24th Proceedings of the Southern Association for Information Systems Conference, Myrtle Beach, SC, USA, 18–19 March 2022; p. 20.
76. Kumar, A.; Liu, R.; Shan, Z. Is Blockchain a Silver Bullet for Supply Chain Management? Technical Challenges and Research Opportunities. *Decis. Sci.* **2020**, *51*, 8–37.