building 4.0 crc

PROJECT 55: TOWARDS SMART CONTRACTS AND SMART FINANCE IN CONSTRUCTION

FINAL REPORT

QUT

MASTER BUILDERS VICTORIA

BPC Building and Plumbing Commission

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Australian Government
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Cooperative Research Centres Program

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LIST OF ABBREVIATIONS

AFSL	Australian Financial Services Licence
AI	Artificial Intelligence
API	Application Programming Interface
ASIC	Australian Securities and Investments Commission
BIM	Building Information Modelling
BPC	Building and Plumbing Commission
BTI	Building Trustworthy Indicator
CBDC	Central Bank Digital Currency
CDE	Common Data Environment
CRC	Cooperative Research Centre
CSIRO	Commonwealth Scientific and Industrial Research Organisation
eIDAS	Electronic Identification, Authentication and Trust Services
EU	European Union
iCIRT	Independent Construction Industry Rating Tool
ISO	International Organisation for Standardisation
MBAV	Master Builders Association Victoria
NCC	National Construction Code
NFT	Non-Fungible Token
QUT	Queensland University of Technology
RBA	Reserve Bank of Australia
SME	Small and Medium Enterprise
UNSW	University of New South Wales
USDC	US Dollar Coin
USDT	US Dollar Tether
UX	User Experience
VBA	Victorian Building Authority
VMIA	Victorian Managed Insurance Agency

CONFIDENTIAL:	☐Yes X No
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1. EXECUTIVE SUMMARY

The Australian construction industry faces numerous challenges, including meeting productivity targets, supply chain disruptions, coordination difficulties between contractors and subcontractors, and a lack of transparency in contractual changes. Emerging technologies such as blockchain and smart contracts have the potential to enhance productivity by addressing these problems.

The term ‘smart contracts’ is used in the construction industry to describe a wide range of digital, automated and blockchain-based applications, often leading to confusion about what is technically feasible and commercially practical. While blockchain-based smart contracts present significant cost, complexity and skills challenges, other forms of smart contracts (particularly those focused on automation and improved data management) offer more realistic near-term value. This report clarifies these distinctions and outlines practical pathways for adopting smarter contract and data systems without relying on full blockchain implementations.

Alongside desktop research, this project involved semi-structured interviews with 33 participants connected to the building and construction industry. This informed the research and creation of 3 case studies (Paid, BIMCHAIN, and Origins Next) as well as the creation of the Smart Contracts Spectrum as a tool to better understand the potential application and uses of smart contracts.

This report and its recommendations do not state that the industry should not pursue this technology, but do indicate that there are too many barriers in 2026 for it to be embraced. However, this report’s position is that this technology still has an important role to play. The report tries to clarify what the technology is and what smart contracts can mean to different people. It also aims to provide actionable steps. Some projects have embraced the technology (including case studies featured in this report), but these are few and far between. Despite significant global discourse, real-world adoption remains minimal. Trials have been rare, and many early initiatives have shifted away from traditional blockchain-based approaches due to technical complexity, regulatory uncertainty and high implementation costs. This ultimately indicates the challenges to blockchain smart contracts in the construction industry operating on any great scale.

In principle, the construction industry would greatly benefit if this technology were used; however, there are many challenges to adoption and no progress is instantaneous. This type of technology sees its greatest benefits when it experiences widespread adoption, but this is simply not practical at this time. Instead, this report presents some clear steps that can be taken to potentially allow the industry to gain some benefits while also remaining in a future-ready position for when other factors align to make smart contracts a more viable option.

Recommendations

The report sets out several key recommendations and steps for how to implement different smart contracts choices (referred to as a blueprint) that can be found summarised in Section 2 and listed in full in Section 6. In summary, industry leaders should do the following:

- Consider technological solutions across the spectrum of ‘smart contracts’ as both something for contracts and payment, as well as for greater data integrity and transparency.
- Depending on the smart contract spectrum desired, stay informed about developments in Central Bank Digital Currency (CBDC) policy and regulation to ensure payment systems are legally compliant and future-ready.
- Pilot smart contract solutions in controlled environments before implementing at scale.
- Be aware of blockchain solutions outside of payment systems and explore their use as a broader platform for data transparency, project coordination and relationship-building.

2. PROJECT OVERVIEW

The Australian construction industry faces challenges in productivity, supply chain disruptions, contractual transparency and coordination of contractors and subcontractors. These issues persistently hinder project delivery and cost management. Emerging technologies such as blockchain and smart contracts have been widely discussed as potential solutions.

Blockchain technologies and smart contracts offer promising solutions by enabling secure, immutable records of contractual changes and automated processes that could improve trust and efficiency. However, adoption remains limited and experimental. By examining each technology in detail and exploring how technology might offer targeted solutions, this report aims to contribute to research that supports a more resilient, transparent and productive construction sector. As of 2026, the construction industry has rarely trialled practical blockchain or traditional smart contract applications, and those companies that have attempted to do so have often pursued alternative approaches.

This research engages with the potential of blockchain and smart contracts in the construction industry and lays out a potential pathway towards adoption. It does this while mapping the current reality that full-scale 'blockchain smart contract' solutions may not be necessary in the construction industry. Instead, the industry needs greater transparency of data and trust. This situation can be achieved without a blockchain solution.

Project Objectives

- To examine the challenges facing the Australian construction industry. This includes productivity, timely payment, insolvency, supply chain disruptions and contractual transparency.
- To investigate the nature and potential of blockchain technologies and smart contracts as mechanisms for addressing these challenges, including their varying degrees of digitisation, automation and immutability.
- To identify the key barriers to implementation such as legislative uncertainty, digital asset decisions and industry readiness.
- To evaluate whether the identified benefits can be achieved through alternative technological approaches and to develop practical recommendations and a blueprint for how blockchain principles could be adopted to support a more resilient, transparent and productive construction sector.

Report Structure

Section 2 introduces the problems faced by the construction industry. These include timely payment, insolvency and supply chain transparency. The section also details the project method.

Section 3 explains the nature of blockchain and smart contracts, including the different ways in which the term 'smart contract' can apply to a range of uses with varying degrees of digitisation, automation and immutability.

Section 4 presents a series of case studies that demonstrate the key problems faced by the construction industry and ways in which smart contracts have, or have not, been used to try to resolve these.

Section 5 explains how blockchain smart contracts could be implemented and the associated challenges. This addresses the issues of legislative uncertainty, digital asset decisions and industry adoption. The section draws on the case studies and interview data to propose realistic steps that can be taken and how the industry may best approach this issue in 2026.

Section 6 includes recommendations and concludes with a 'blueprint' indicating ways that blockchain technology and/or its lessons could be adopted within the construction industry.

This report aims to inform the Australian construction industry about the potential for smart contracts and blockchain technologies to address existing challenges within the sector. However, it also highlights the current limitations, the global infancy in use cases and existing regulatory challenges. The report concludes that it may be possible to address these challenges through technology without the adoption of a full blockchain solution.

Summary Table of Recommendations

This report presents two sets of recommendations: the 'blueprint' – practical steps for implementing specific smart contract types (C3, C4, D3 and D4 – terms to be explained throughout this report); and broader recommendations to support blockchain adoption in the construction industry. A full list can be found in Section 6.

Table 1: Recommendations Overview

General Recommendations: Steps to implement the findings from this report. These steps supplement any actions that might be taken towards smart contracts (whichever iteration is desired).

General Recommendation G1	**Smart contract education and terminology** Promote consistent understanding and terminology of smart contracts, using a shared framework such as the 'smart contract spectrum'.
General Recommendation G2	**Conduct a national review into the use of smart contracts in construction** Undertake a coordinated national review to assess current use of smart contracts, share knowledge and standardise approaches to data standards and technology integration across states.
General Recommendation G3	**Engage in discussions with Treasury and ASIC** Increase industry awareness and participation in regulatory discussions through consultation to ensure construction perspectives shape policy.
General Recommendation G4	**Link technology literacy to education** Embed digital and technology competence into education to improve industry capability and reliability.
General Recommendation G5	**Greater industry investment in technology** Invest in integrated digital systems to enhance transparency, risk-detection and decision-making across projects.
General Recommendation G6	**Advocate for a digital Australian dollar and CBDC-compatible payment infrastructure** Engage with Treasury and RBA initiatives, including Project Acacia, to ensure that construction payment needs shape any future digital currency framework.

General Recommendation G7	**Develop national construction data interoperability standards** Collaborate across industry and government to establish consistent CDE protocols and data structures that enable cross-organisation smart contract integration.
General Recommendation G8	**Reform security of payment legislation to recognise automated payment triggers** Advocate for reform of the *Security of Payment Acts* to give automated and smart contract-triggered payment claims the same legal standing as manual payment claims.

Blueprint Overview: Specific recommendations for those seeking to implement autonomous or immutable smart contracts.

C3 Recommendations: Practical steps for implementing smart contracts that are both digital and autonomous (referred to here as C3 Contracts) as an important first step towards further levels of smart contracts

Recommendation C3.1	**Audit contracts to determine what can be automated:** Identify which contract elements are suitable for automation, limited to clear, objective conditions to avoid disputes.
Recommendation C3.2	**Standardise events:** Define and consistently apply trigger events across systems and contracts to integrate automation into normal project workflows and improve interoperability.
Recommendation C3.3	**Build in fail safes:** Ensure that automated systems allow human intervention through clear controls for pausing or correcting actions.
Recommendation C3.4	**Ensure automation is contractually valid:** Explicitly recognise automated actions within legal contracts to ensure they are binding and enforceable.
Recommendation C3.5	**Experiment and adopt slowly:** Introduce automation gradually in targeted areas to test performance and minimise risk.
Recommendation C3.6	**Educate:** Provide structured legal and technical education on contract automation and AI integration to ensure accurate understanding and use.

C4 Recommendations. These are practical steps and considerations for implementing immutable (unalterable) blockchain smart contracts (C4 Contracts) for payment and contracting

Recommendation C4.1	**Enhance industry consistency:** Develop consistent terminology and reliable verification mechanisms (oracles/certifiers) to accurately link real-world events to automated outcomes.

Recommendation C4.2	**Adoption must start from authorities:** Secure involvement and endorsement from regulators and industry bodies to support legitimacy and adoption of blockchain systems.
Recommendation C4.3	**Align legal frameworks:** Clarify legal recognition, responsibilities, and dispute processes for blockchain-based execution, supported by both smart and traditional contracts.
Recommendation C4.4	**Adopt incrementally:** Begin with limited, simple use cases and expand gradually while managing risks and complexity.
Recommendation C4.5	**Payment System must be approved:** Ensure tokenised payment systems are legally approved and consistent with any regulation (such as that currently in development) before widespread use.

D3 Recommendations. These are practical steps and considerations for implementing data-focused smart contracts (D3 Contracts) that are digital and autonomous.

Recommendation D3.1	**Standardise platforms:** Adopt consistent platforms, naming conventions, and data structures to enable reliable digital workflows.
Recommendation D3.2	**Automate easy areas first:** Start with simple workflow automations to improve efficiency and reduce manual coordination.
Recommendation D3.3	**Integrate wider systems:** Connect CDEs with scheduling, cost and contract systems to turn data into actionable project processes.
Recommendation D3.4	**Educate:** Train teams in both BIM tools and digital workflow management to ensure effective system use.
Recommendation D3.5	**Embed contractual recognition of digital workflows:** Ensure that contracts formally recognise digital outputs as authoritative to reduce disputes.
Recommendation D3.6	**Audit and continuously refine workflows:** Regularly review and improve workflows based on performance and user behaviour.

D4 Recommendations. These are practical steps and considerations for implementing blockchain smart contracts that prioritise data immutability and accountability (D4 Contracts).

Recommendation D4.1	**Clearly establish what is on-chain vs off-chain:** Determine which data benefit from recording on a blockchain, focusing on high-value, verifiable events. Aim to keep most data off-chain.
Recommendation D4.2	**Create with user experience (UX) focus:** Design systems so blockchain operates in the background, minimising user complexity.

Recommendation D4.3	**Align governance and legal frameworks with the system:** Establish clear rules and legal recognition for blockchain records and participants.
Recommendation D4.4	**Adoption and endorsement by key entities:** Gain support from regulators and industry bodies to build trust and ensure compliance, especially for payments.
Recommendation D4.5	**Start slow:** Implement in controlled stages to resolve issues before scaling.

Problem Overview

The construction industry faces many challenges and inefficiencies that technology may help to address. Examples include insolvency risk, cash flow stress and the reliability of project information. Because these challenges are related to payment timing, responsibility and data accuracy, emerging technologies may be particularly well suited to addressing them. It is within this context that digital, automated and so-called 'smart contract' approaches are increasingly being considered as potential mechanisms to improve the management of payment and information in construction projects.

There is an increased demand for construction in Australia. The federal government's ambitious target of building 1.2 million homes by 2029 appears to be increasingly unattainable under current conditions.[1] The Productivity Commission Inquiry on Housing Construction Productivity has underscored the urgent need to improve productivity in the residential construction sector.[2] The Commission provides a broad overview of systemic inefficiencies. The problems are not new, and technological solutions have been proposed for some time. For instance, Building Information Modelling (BIM) is a widely adopted digital approach in the sector. This involves the creation and management of data-rich 3D models that integrate design, construction and operational information across the project life-cycle, providing a shared and coordinated source of project information. However, BIM is not a complete solution and may be just one step towards greater digital improvements. This report aims to complement existing solutions by incorporating insights from stakeholders across the construction life-cycle. It also investigates how smart contracts and blockchain could streamline workflows, reduce friction and enhance overall productivity.

Supply chain complexity further compounds the industry's challenges. The construction sector is characterised by long, intricate supply chains involving numerous parties. These extended networks introduce significant financial risk, particularly for the small and medium enterprises (SMEs) that dominate the subcontractor landscape. Many of these firms rely heavily on trade credit and timely cash flow, making them vulnerable to delays and disruptions. The result is a fragile ecosystem in which insolvency can quickly cascade through the supply chain. Beyond financial instability, the complexity of these networks also leads to information loss. As supply chains grow, critical data (such as contractor qualifications, insurance coverage, manufacturing details and compliance

[1] Emilia Terzon, 'Cotality Warns Building Industry Cannot Keep Pace with Building Approvals in Race to Fix Housing Crisis', *ABC News* (6 August 2025) <https://www.abc.net.au/news/2025-08-06/cotality-says-building-delays-not-approvals-holding-up-housing/105614902>.

[2] Productivity Commission, *Housing Construction Productivity: Can We Fix It?* (February 2025) <pc.gov.au/research/completed/housing-construction>.

documentation) can become obscured or inaccessible, undermining transparency and accountability.

The intricate hierarchy of contractors and subcontractors in the building industry complicates oversight and accountability, obscuring accountability. The number of parties involved in a typical construction project creates coordination challenges and increases the risk of miscommunication. SMEs often operate with limited administrative capacity, which exacerbates issues related to documentation, compliance and financial management. The industry-wide reliance on these smaller entities contributes to a high business failure rate, driven by cash flow constraints and limited access to external financing.

A final challenge lies in the opacity of contractual variations. Construction projects are dynamic in nature, and changes to scope, design or timelines are common. However, these variations are frequently handled informally, through verbal agreements, undocumented decisions or ad hoc communications. This lack of formal documentation creates significant legal risks. When changes are not properly recorded or communicated, the reliability of the original contract is compromised. Stakeholders may continue to operate under outdated assumptions, leading to disputes, delays and cost over-runs. Moreover, the absence of centralised data storage means critical information about project changes can be lost or inaccessible, further eroding trust and transparency. Addressing this will not be possible with technology alone. However, if combined with an industry cultural shift, technology may be a useful tool to help resolve this challenge.

Methodology

This project used a semi-structured interview method to better understand the challenges and how technology might be useful in resolving those challenges as they are experienced by industry partners.[3] This was combined with desktop research to interrogate the potential of blockchain technology alongside wider concerns in the construction industry raised by industry partners, and problems arising from both existing and emerging regulation.

Industry regulator the Victorian Building Authority (VBA)[4] and member association the Master Builders Association Victoria (MBAV) were contacted to generate a list of potential interviewees. Recruitment involved snowball sampling,[5] which built upon industry partnerships established through the Building 4.0 CRC.[6] The interviewees were contacted to confirm their interest and to schedule the date and time of meeting.

Between January and March 2025 interviews were conducted with 33 participants. They included participants from three general categories: industry regulators, technology companies and participants who were actively part of the construction industry (e.g. builders, industry association).

[3] QUT Ethics Approval no: 9156, 12 November 2024.
[4] On 1 July 2025, the Building and Plumbing Commission (BPC) replaced the VBA, bringing together the functions of the VBA, Domestic Building Dispute Resolution Victoria and the domestic building insurance function of the Victorian Managed Insurance Agency.
[5] Patrick Biernacki and Dan Waldorf, 'Snowball Sampling: Problems and Techniques of Chain Referral Sampling' (1981) 10(2) *Sociological Methods and Research* 141. Snowball sampling involves recruiting additional participants through referrals from existing participants and is particularly suited to hard-to-reach professional populations.
[6] Building 4.0 CRC, 'About' (Webpage, n.d.) <https://building4pointzero.com.au>. Building 4.0 CRC is an Australian Cooperative Research Centre focused on construction industry innovation.

Semi-structured interviews were conducted with open questions. The interview focused on three issues: the problems in the construction industry; the interviewees' understanding of smart contracts and blockchain; and how the technology could solve problems in the industry.

Table 2: Industry participation in interviews

Industry partner	No. of participants
Industry association/industry members	16
Industry regulator	9
Technology company	8

All interviews were recorded through either an in-person recording device or embedded recording functions in zoom/teams for interviews conducted online. First-round transcripts were generated using the AI transcription software 'Otter.ai'.[7] The generated transcript was then verified against the original recordings by the research team for accuracy.

The final transcripts were coded for common themes, including problems identified in the construction industry and potential solutions raised by interviewees, and the role of smart contracts and blockchain technology. Further analysis was conducted to identify repetitive issues and categorise them into case studies or thematic categories.

Interview Insights

The results and quotes from the interviews are integrated into the case studies found in Section 4. These interviews highlighted several pain points in the construction sector, such as disputes regarding specifications, unapproved variation, delayed payments, builder insolvency, supply chain issues and force majeure. These issues reflect several challenges that threaten the longevity of the Australian construction industry. Our findings align with the recommendations made by the Queensland Productivity Commission in its 2025 Report on Opportunities to Improve Productivity of the Construction Industry – namely, to facilitate innovation, improve process transparency, streamline processes and reform licensing. The issues highlighted by interviewees are discussed under thematic categories, covering key problems in the construction industry, knowledge and perceptions of smart contracts and blockchain, and potential ways in which they could be used.

Taken together, the interview data suggest that many of the persistent problems in the construction industry ultimately centre on payment and information. Insolvency and cash flow stress create ongoing uncertainty about whether parties will be paid and when that payment will occur. At the same time, a lack of transparency and accuracy in project information undermines confidence in who is involved in a project, what has been agreed and which data can be relied upon at any given point in time. These issues are closely interconnected: uncertainty about information feeds disputes, disputes delay payment and delayed payment exacerbates financial stress and insolvency risk. From an industry perspective, the core concerns are practical: whether parties will be paid, when payment will occur, who holds responsibility and whether the data being relied upon can be trusted. In responding to these interconnected challenges of trust, timing and reliable project information, smart contracts, in their various forms, are often proposed as a potential pathway.

[7] Otter.ai, 'AI Meeting Assistant' (Webpage, n.d.) <https://otter.ai>. AI-generated transcripts were used as a first-pass only; each transcript was verified and corrected by the research team against the original recording before analysis.

3. THE SMART CONTRACTS SPECTRUM

This section defines the key terms used throughout the report and introduces the Smart Contracts Spectrum: a framework distinguishing between physical, digital, automated and blockchain-based approaches to contracting and data management. Understanding this spectrum provides essential context for the case studies and adoption challenges examined in Sections 4 and 5.

Smart Contracts

Through automation, smart contracts and blockchain systems can support increased transparency. This has the potential to address some of the key industry problems with finance, trust and transparency. However, not all 'smart contracts' are the same. The term 'smart contract' is applied to many different types of products and code. For the purposes of this report, we distinguish between the important features of these on the basis of the types of actions on which they focus, what features are present (such as automatic execution) and whether or not infrastructure (such as an underlying blockchain) is involved.

The Smart Contracts Spectrum (Figure 1) demonstrates two key qualities commonly found in smart contracts: namely 'contracts' and 'data'. Both sides of this spectrum can have different ranges of sophistication but can be commonly referred to as being 'smart contracts'. A technical level of C1 describes a simple, non-technical solution, however level C4 involves the use of a blockchain infrastructure (such as Ethereum). The following provides further definitions of contract categories captured in the Smart Contracts Spectrum, ranging from C1 (physical contracts) to C4 (blockchain contracts), as well as the classifications of Data Storage, coded from D1 (physical data storage) to D4 (blockchain data storage).

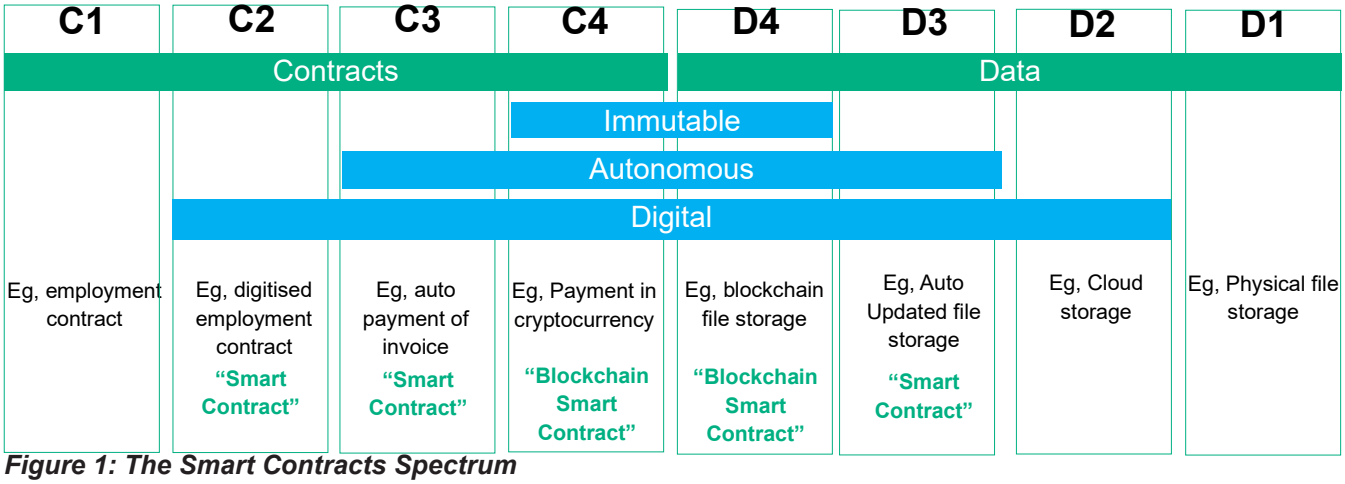

Figure 1: The Smart Contracts Spectrum

C1: Physical Contracts

A physical contract represents traditional contracting without embedded technology. The agreement is drafted in natural language, printed, physically signed and performed through human action. While technology may be used to prepare the document, it plays no role in execution or enforcement.

A contractor and principal execute a signed paper contract setting out scope, timeframes and payment milestones, administered manually throughout the project.

C2: Digital Contracts (Smart)

A digital contract is a legally binding agreement presented in electronic form. Often described as a 'smart contract', this category is better understood as a machine-readable contract. The contract remains written in natural language, but is enhanced by digital tools such as search, hyperlinks, annotations or AI-based explanations. The contract itself is not programmed and does not self-execute.

A contractor accesses a searchable digital contract PDF with hyperlinks to drawings and explanatory notes, hosted on a project platform.

C3: Automated Contracts (Smart)

An automated contract links a digital contract to software systems that automate parts of performance. While the legal contract remains written in natural language, specific functions – such as notifications, approvals or payments – are executed automatically through applications when predefined conditions are met. These systems rely on central platforms and trusted operators, and their records can generally be modified or overridden. Automated contracts should be distinguished from smart legal contracts: although automation is driven by code, legal rights and obligations still require a traditional written contract alongside the automated system. A blueprint of actionable steps and considerations to achieve a C3 implementation is presented in the C3 recommendations in this report and the final blueprint in Section 6.

A progress payment is automatically triggered by a project management app once the superintendent uploads a completion certificate, in accordance with the underlying written contract.

C4: Blockchain Contracts (Smart)

A blockchain smart contract is an automated contract, in which the execution logic and record-keeping are embedded directly into a decentralised blockchain infrastructure, such as Ethereum. Once deployed, the contract executes according to its coded rules without reliance on a central platform operator. Transactions and outcomes are recorded immutably on the blockchain, often involving digital assets such as cryptocurrencies or stablecoins. A blueprint of actionable steps and considerations to achieve a C4 implementation is presented in the C4 recommendations in this report and the final blueprint in Section 6.

Funds are locked into a blockchain-based contract at the start of the project and released automatically when an agreed certifier (or digital oracle) records completion, with the transaction permanently recorded on the ledger.

D1: Physical Data Storage

Physical data storage involves managing project information in paper form, stored in filing cabinets or on-site repositories. While simple and familiar, this approach is vulnerable to loss, damage, duplication and limited access.

Printed drawings and specifications are stored on site, with updated versions distributed manually and superseded documents remaining in circulation.

D2: Digital Data Storage

Digital data storage involves creating and storing project information electronically, typically on local servers or basic cloud repositories. This improves accessibility and duplication, but remains largely passive: files are stored rather than actively governed, and version control depends on human discipline.

BIM models and drawings are shared via email or cloud folders, with version control managed through file-naming conventions.

D3: Automated Data Storage (Smart)

Automated data storage uses cloud-based platforms to actively manage data through software logic. In construction, this commonly occurs through BIM-enabled Common Data Environments (CDEs), which automate workflows such as version control, approval states, clash detection and notifications. Despite being 'smart', these systems remain centrally administered. A blueprint of actionable steps and considerations to achieve a D3 implementation is presented in the D3 recommendations in this report and the final blueprint in Section 6.

A revised BIM model uploaded to a CDE automatically supersedes prior versions and notifies relevant consultants.

D4: Blockchain Data Storage (Smart)

Blockchain data storage records data events on a decentralised ledger, providing immutability, traceability and resistance to unilateral alteration. Rather than storing full datasets, blockchains typically record verified proofs, timestamps and references to trusted data states. When combined with blockchain smart contracts, data states can trigger automated downstream outcomes. A blueprint of actionable steps and considerations to achieve a D4 implementation is presented in the D4 recommendations in this report and the final blueprint in Section 6.

Approval of a BIM model issue is recorded on a blockchain, creating an immutable audit trail of when and by whom the model was approved.

Common Misconceptions About Smart Contracts

The Smart Contracts Spectrum described above is frequently misunderstood. The following is extrapolated from interview data and addresses common misconceptions that can impede clear thinking about adoption options for the construction industry.

- *All smart contracts are blockchain-based.* Many systems described as smart contracts operate entirely on traditional cloud platforms or proprietary software. These may automate processes, but they do not rely on blockchain infrastructure or provide decentralised or immutable records.
- *If a contract is digital, it is a smart contract.* A digital or PDF contract, even one with hyperlinks, searchable text or AI tools, is not a smart contract in the technical sense. Digitisation improves access and readability, but it does not automate performance or execution.

- *Automation automatically makes contracts more legally enforceable.* Automation determines how actions occur, not whether they are legally valid. Automated or blockchain-based contracts still require alignment with conventional legal agreements and governing law to be enforceable in practice.

- *Blockchain smart contracts replace lawyers and written contracts.* Blockchain smart contracts do not replace legal drafting or interpretation. In construction, they are best understood as technical tools that automate specific outcomes (such as recording approvals or triggering payments) based on inputs agreed elsewhere in a traditional written contract.

- *BIM platforms and Common Data Environments are blockchain systems.* Most BIM platforms and CDEs operate at the level of automated data storage, not blockchain data storage. While they may be highly sophisticated, they remain centrally administered and do not provide immutable, decentralised records.

- *Blockchain means all project data is stored on-chain.* In practice, blockchains rarely store full drawings or BIM models. Instead, they store timestamps, cryptographic proofs and references to verified data states, with the underlying files held off-chain.

- *Smart contracts eliminate the need for trust.* Smart contracts change *where* trust is placed, not *whether* it exists. Traditional systems rely on trust in parties or platforms; blockchain systems rely on trust in code, agreed inputs (such as certifiers or oracles) and the underlying network.

To address these misconceptions, the following provides further clarification of the differences across the Smart Contracts Spectrum to highlight important use cases of blockchain-based smart contracts in construction.

Automation versus Blockchain

Understanding the difference between an automated smart contract and a digital smart contract (regardless of whether the focus is on ‘contracts’ or ‘data’) is important because it represents a fundamental shift in the infrastructure and technology used. Blockchain-based implementations typically involve higher upfront costs, ongoing technical maintenance and specialist expertise, which are not required for purely digital or cloud-based systems. They also require additional education and capability-building across project participants, as understanding of blockchain systems and their risks is currently unlikely to be widespread within the construction industry.

An automated contract (C3) is a machine-readable contract that can automatically execute specific parts of a contractual arrangement. In practice, this often involves linking a traditional or digital contract to a separate software application – for example, a project-management or payment system that initiates actions when predefined conditions are met. These contracts are developed using programming logic that allows certain obligations, such as approvals or payments, to occur without further human intervention at the time of execution. Rather than relying on one of the parties or a third-party administrator to progress the contract, automation enables agreed conditions to be verified by the system itself and executed accordingly. This can reduce opportunities for delay or strategic non-performance, particularly in administrative functions such as certification or payment processing.

Automated smart contracts can be distinguished from smart legal contracts, which are drafted primarily in natural language and are intended to reflect legally enforceable rights and obligations. Automated smart contracts, by contrast, are predominantly underpinned by programming language.

As a result, they may raise concerns about transparency and understandability for contracting parties. For this reason, automated smart contracts are not always regarded as legal contracts in their own right and are typically implemented alongside a traditional written contract that sets out the parties' legal obligations. The automated system operates as a mechanism for execution, rather than as a substitute for legal drafting.

Critically, while C3 automated contracts can self-execute, they remain dependent on centralised platforms, proprietary software and trusted intermediaries. Control over the system, data integrity and records generally rests with the platform operator or administrator, and records may be altered or over-ridden in accordance with system rules.

Blockchain is often heralded as something 'revolutionary' or 'new', which can change the way the world thinks about technology security or the validity of data, or (through cryptocurrency) the role of money. Put simply, blockchain is code that can build and record a growing archive of events. Each block contains information and they are assembled, in order, into a chain. This chain creates a ledger of information, like pages being added to a book, which can then be checked later with confidence that nothing has been changed, removed or added. It is not inherently novel, new or revolutionary; it simply allows for digital records of human interaction in different and arguably more secure ways. One way it can do this is through smart contracts.

A blockchain smart contract (C4) differs fundamentally in terms of where execution, trust and record-keeping are located. Rather than being implemented within a centralised application, a blockchain smart contract is deployed directly onto a blockchain infrastructure, such as Ethereum. The blockchain operates as a distributed ledger that records events sequentially in blocks, creating a cumulative and verifiable record of activity.

Once deployed, a blockchain smart contract executes according to its coded logic and records outcomes directly onto the distributed ledger. Unlike C3 systems, this does not require reliance on a single platform operator or administrator. Records are designed to be immutable, meaning they cannot be altered unilaterally after the fact. Blockchain smart contracts often involve transfers of digital assets, such as cryptocurrencies, stablecoins or central bank digital currencies,[8] although this is not their defining feature. Instead, a blockchain smart contract also needs to be seen as something that can include accurate data storage and immutability advantages.

The key distinction between C3 and C4, therefore, is not the presence of automation, but rather the removal of centralised control and the introduction of decentralised, tamper-resistant record-keeping. Trust shifts away from institutional intermediaries and towards agreed code and network validation.

Importance of Data-focused Smart Contracts in Construction

Blockchain-based smart legal contracts could have several important applications for the construction sector to improve data management, version control and transparency.[9] One of the main benefits for construction project management could be helping with version control and variation tracking, which would in turn reduce risk and promote transparency and accuracy. Keeping track of different versions of documents and the materials used for construction has been problematic in the construction industry, resulting in project failures.

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[8] For a detailed discussion of CBDCs, stablecoins and digital asset decisions relevant to blockchain smart contracts in construction, see Section 5.

[9] Purva Gupta and Neeraj Kumar Jha, 'Determining Delay Accountability, Compensation, and Price Variation Using Computable Smart Contracts in Construction' (2024) 40(3) *Journal of Management Engineering* <https://ascelibrary.org/doi/full/10.1061/JMENEA.MEENG-5811>.

A smart contract would be useful to address problems of this nature because it enables additional documents to be linked to a main contract. This means parties can access the documents from the smart legal contract itself without having to go through the tedious process of finding documents and verifying the latest documents. This could be accompanied by a blockchain-based smart contract, which could create a ledger of all transactions and as such keeps a record of all the versions. Therefore, parties can easily access the latest version of documents. Moreover, a blockchain-based smart legal contract also serves as a non-manipulatable source of truth as it maintains a record of all changes made to the document. Because of its distributed nature, parties with required access levels can easily see what changes have been made and by whom. The immutability of blockchain records also means errors in data entry cannot easily be corrected, making careful validation before committing data to the chain essential.

Similarly, blockchain-based smart legal contracts would also allow for a much more systematic and transparent approach to variation tracking in construction projects. As discussed in interviews,[10] managing variations is crucial for the construction industry as it is a common reason for disputes. Disputes may arise due to parties disagreeing with the changes that were agreed to, or a dispute may even arise due to the parties not acknowledging any variations in the first place – even if this is due to a lack of documentation rather than malice. Nevertheless, a clear single source of truth that would record and evidence all variations made would be useful for the construction industry. A blockchain-based smart legal contract would be one way of achieving this. Due to their immutable and distributed nature, smart contracts can enable parties to easily see and access all variations made during the construction process through a hyperlink within the main contract itself.

Composite Categories: Combining Contracts and Data

In practice, construction projects rarely sit neatly at a single point on the contracts (C) or data (D) spectrum. Instead, many real-world systems combine different levels of contractual automation and data storage. The following composite categories illustrate common hybrid arrangements observed across the construction industry. We draw on these in the case studies in Section 4 of the report.

C2D2: Digital Contracts Within BIM-based Storage

Under this arrangement, contracts and project documents are digitised and stored within a BIM-enabled infrastructure or Common Data Environment. The contracts themselves do not self-execute, but benefit from improved accessibility, version control and coordination alongside drawings, models and specifications. This is a common configuration in contemporary projects, where BIM platforms function as central repositories rather than execution engines.

C3D2: Automated Contracts with Basic Digital Storage

This category involves contracts that can self-execute certain functions, such as triggering notifications or payments, while the underlying contract documents are stored in conventional digital locations, such as on company servers, in cloud folders or on individual devices. While contractual actions may be automated, contract data remain fragmented and subject to conventional risks such as version inconsistency, loss or unauthorised modification.

C3D4: Automated Contracts with Immutable Data Records

This category represents a more advanced configuration, in which contractual processes are automated and all related documents – such as contracts, agreements and variations – are recorded sequentially on a blockchain-based ledger. While automation supports execution, the defining

[10] Interviews to be discussed in greater depth in case studies later in this report.

feature is the immutable data record, which preserves a trusted history of contractual changes that cannot be reordered, altered or deleted. This structure is particularly relevant to dispute-prone areas such as variations and approvals, where evidentiary certainty is critical.

Ultimately, the concept of a ‘smart contract’ is one that changes with use, industry and implementation. The Smart Contracts Spectrum presented in this report aims to help standardise the language used.

The next section presents a series of case studies that demonstrate use cases that exist within the Smart Contracts Spectrum, showing how they can address some of the problems identified in the construction industry.

4. CASE STUDIES

Case Studies of Paid, BIMCHAIN and OriginsNext are used to illustrate ways in which various forms of smart contracts can be utilised in the construction industry. This provides insights into the different potential applications for both payment and data, as well as connected limitations.

This section examines the range of contractual and data 'events' that occur during a construction project and the practical ways in which smart contracts and smart financing can improve the construction industry.

Three case studies are presented to illustrate potential improvements. These have been developed to respond to industry interviews and the problems revealed during those interviews that could potentially be addressed through the use of smart contracts. The case studies in this report focus on how smart contracts can: (1) be used to improve how contractual payments are executed (the Paid case study); (2) improve supply chain transparency (the BIMCHAIN case study); and (3) enable greater confidence in project delivery and strengthen assurances that the building as constructed aligns more closely with the building as planned (the OriginsNext case study).

Through interviews, collaboration with industry partners and further research, the project conducted a series of exploratory 'mapping' activities with the aim of identifying a range of contractual and data 'events' that occur during a construction project, and the role smart contracts and data can play in improving payment and delivery outcomes. An example of this map is provided in Figure 2.

- Column 1A describes the stages of an example build, with 1B showing the substages and 1C representing the traditional payment made at the completion of each of these stages.
- 2A is a further breakdown of Stage 1: Base, showing the general tasks to be completed. 2B lists the general tasks within each of those, while 2C indicates the typical role to which that task is assigned.
- 3A drills deeper into the specific task of installing reinforcement by the concreter or steel fixing, listing further considerations required for that task to be completed correctly by a qualified person.

Ultimately, within just one task of the formwork – which is just one task of the Base stage of a build – this requires the following:

- The concreter/steel fixer completed the task correctly – namely, the physical components of reinforcement mesh were correctly chosen, manufactured and transported.
- The concreter/steel fixer was properly qualified to complete this task, as evidenced through correct licensing, certified qualifications, Building and Plumbing Commission (BPC)[11] registration and site-specific inductions.
- The concreter/steel fixer invoiced correctly and was paid.

This mapping does not apply to all construction; rather, it is an example of a low-rise residential building at base stage only. It aims to illustrate just one piece of the overall build, which is highly dependent on the integrity of contracts and data. There is a need to have confidence in the parts being used, the person using them and that payment will flow in line with the contract. While this can be based on trust, it is a problem at scale when considered alongside the complexity of a build. As such, smart contracts may be able to address some of these pressure points of construction projects.

[11] As noted above, the BPC replaced the VBA as Victoria's building regulator on 1 July 2025.

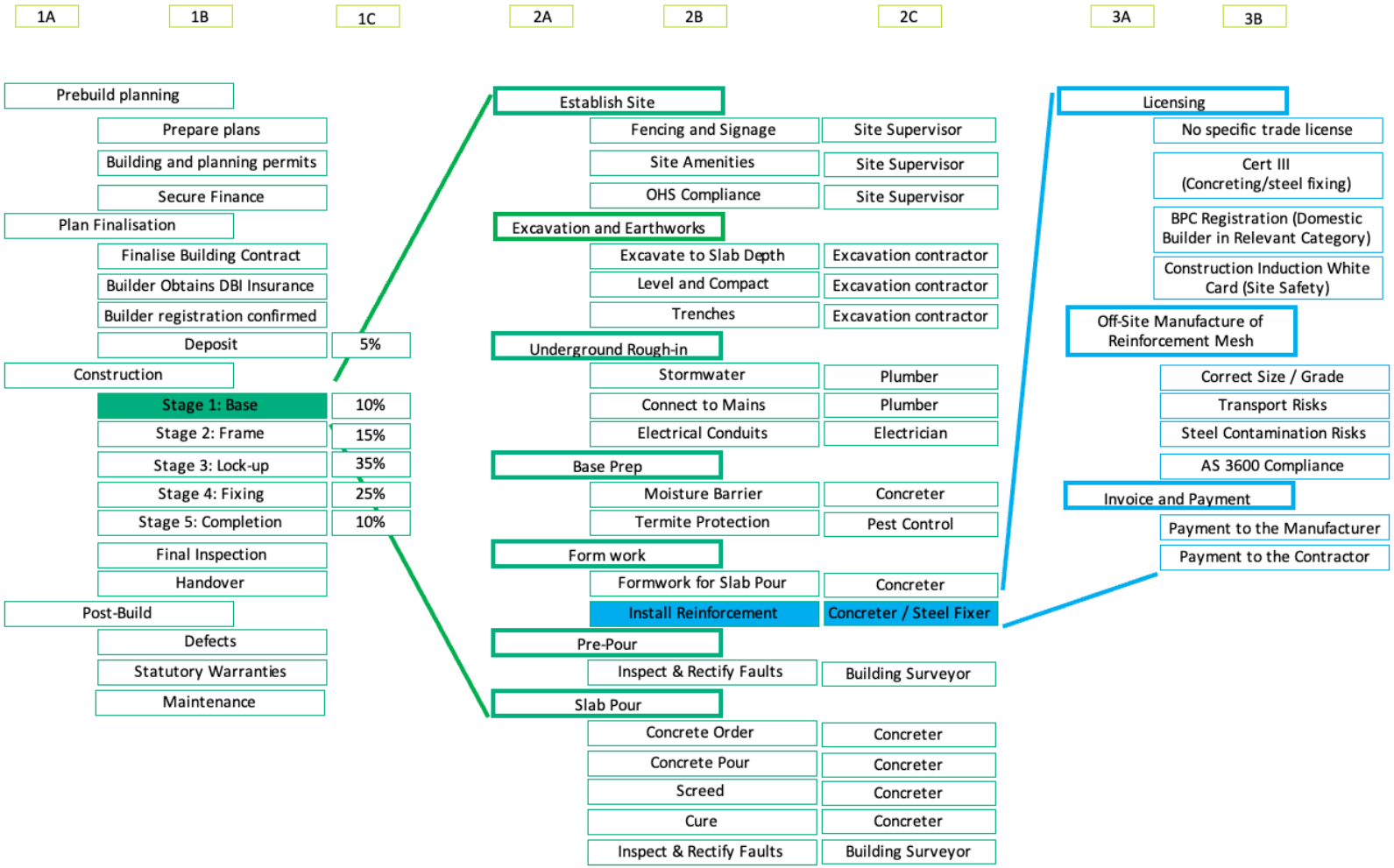

Figure 2: Example residential building construction supply chain: contracts, relationships and trust networks[12]

[12] This example is intended to be illustrative, not a true reporting of data presenting in a scientifically accurate figure.

The payment of the contractor can be digitised, automated or made immutable (depending on the level of 'smart contract' used) to allow them to trust that they will be paid on time and in a way that decreases insolvency risks for the contractor, builder and manufacturers. The manufacture of the reinforcement mesh (as an example) generates data about the size, grade, material, location, time and so on. Smart contracts can use this data to create a more comprehensive account of the supply chain and increase overall transparency. Finally, data about the 'individual' can be integrated with smart contracts to allow the builder to verify the qualifications of the contractors, and to enable the overall build to be trusted due to this increased transparency.

The case studies in this report bring together mapping data, interview findings and real-world examples to explore the potential of smart contracts across three broad areas. Each case study begins with an explanation of a specific industry problem, supported by interview data, and presents a fictional amalgamation of that problem through a process map showing common steps, current risks and potential smart contract improvements. Its structure comprises an initial summary, a company profile, a description of the technology, an identification of how it sits on the Smart Contracts Spectrum, and a discussion of benefits, challenges and practical limitations. This then allows for a return to the mapping with renewed perspectives on each issue explored.

Smart Contracts and Payment

Smart contracts can improve how contractual payments are executed. They enable automated and immutable payment processes, including data storage, almost instantaneously. By reducing opportunities for human interference or delay, smart contracts can increase confidence that payments will be made as agreed. The Paid case study demonstrates different applications of smart contracts in payment processes and highlights that the use of cryptocurrencies does not deliver immediate advantages for construction payments.

The Problem

All interviewees identified some form of finance-related difficulties as a serious problem affecting the industry, ranging from delayed payments affecting individual parties, to more grievous issues affecting the national economy at a macro-level (such as builder bankruptcies).

Insolvency

Insolvency is one of the most visible and damaging issues in the sector.[13] According to ASIC, the construction industry recorded nearly 3000 insolvency cases in the 2024 fiscal year,[14] a 28 per cent increase from the previous year.[15] This makes construction the leading sector for insolvency in Australia.[16] Interviewees consistently identified this as a critical concern:

> *At the moment, there must be 3000 builders that walk out the door every year from liquidations and bankruptcies.*[17]

[13] Bradley Hastings and Peter Swan, 'Construction Nightmares: How Builder Bankruptcies are Costing Aussie Homeowners Millions' UNSW (14 October 2024) <https://www.unsw.edu.au/newsroom/news/2024/10/construction-nightmares--how-builder-bankruptcies-are-costing-au>.
[14] ASIC, 'Insolvency Statistics' (n.d.) <https://www.asic.gov.au/about-asic/corporate-publications/statistics/insolvency-statistics>.
[15] Olvera, 'Australia's Construction Sector: 2024 Year-In-Review' (n.d.) <https://olveraadvisors.com/australias-construction-sector-2024-year-in-review>.
[16] ASIC, 'ASIC Corporate Insolvency Update – Issue 34' (13 December 2024) <https://www.asic.gov.au/about-asic/corporate-publications/newsletters/asic-corporate-insolvency-update/asic-corporate-insolvency-update-issue-34>.
[17] 21 February 2025 Interview (Organisation 1, Person 1).

Collapses of building companies have cascading effects. Homeowners lose deposits and are left with incomplete projects, becoming unsecured creditors. The liquidation of Porter Davis left 1700 homeowners stranded,[18] while Area Projects Pty Ltd owed over $2.3 million to creditors.[19] These cases highlight the vulnerability of consumers and the lack of safeguards.[20]

Subcontractors, tradespersons and suppliers are also severely impacted. They often go unpaid for work that has already been completed, and the reliance on trade credit exacerbates their exposure.

> *Because right now in the industry, because of how things are structured, there are high insolvency rates solely because they've really poor payment practices. So, builders within the industry, they really rely on trade credit, which is the idea that 'I won't pay you when it's due'.*[21]

> *A lot of the subcontractors end up not getting paid. They're the ones who are actually quite damaged by, you know, the payment issues.*[22]

The financial burden is frequently borne by small businesses with limited capacity to absorb losses. One interviewee described the personal toll:

> *And that's what we always found, the supply chain unfortunately gets dunked on all day, every day, and they wear it – it's the cost of doing business. Like all my mates are in the trade … and every time I speak to them, I'll say, 'Hey, how's business?'*
>
> *'Oh, yeah, it's not too bad but … I'm owed some money. … It's like, 60, 100, 180K …"*[23]

These examples illustrate how insolvency cascades through the construction supply chain, leaving smaller contractors exposed and often forcing them into bankruptcy. The collapse of Quasar Constructions (Commercial) Pty Ltd, which resulted in a $60 million loss for tradespeople, is a stark example of this systemic failure.[24]

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[18] Michael Bleby, '1700 aspiring owners stranded as Porter Davis goes under' Financial Review (31 March 2023) <https://www.afr.com/property/commercial/home-builder-porter-davis-goes-under-20230331-p5cwzj>.

[19] Alex Turner-Cohen, 'Melbourne Building Company Collapses Owing $2.3m, Questions Around $2.5m Transfers', News.com.au (10 February 2025) <https://www.news.com.au/finance/business/other-industries/melbourne-building-company-collapses-owing-23m-questions-around-25m-transfers/news-story/c1ab5a85207adb7f77adb1bfc75cbafe>.

[20] Bradley Hastings and Peter Swan, 'Construction Nightmares: How Builder Bankruptcies are Costing Aussie Homeowners Millions' UNSW (14 October 2024) <https://www.unsw.edu.au/newsroom/news/2024/10/construction-nightmares--how-builder-bankruptcies-are-costing-au>.

[21] 20 February 2025 Interview (Organisation 2, Person 1).

[22] 5 February 2025, Interview (Organisation 3, Person 1).

[23] 21 February 2025 Interview (Organisation 1, Person 1).

[24] *A Current Affair*, 'Tradies Chasing $60m from Collapsed Builder Responsible for Supermarket, Builds' 9Now (11 November 2024) <https://9now.nine.com.au/a-current-affair/nsw-construction-giant-quasar-collapse-owing-subcontractors/c4a2f2fa-b420-4182-a464-34489b045128>.

Payment Practices and Cash Flow Stress

Delayed payments are a central issue in construction finance. Typically, payments are only released once work is completed and verified, often by a bank-appointed quantity surveyor. This multi-layered approval process creates significant delays:

> *In a typical project, people don't get paid until things are on site. So, a property developer is on the hook for a massive loan that he's got for his bank, or whatever. But there are people downstream from there. All these people need to get paid. Typically, that doesn't happen in a traditional project until a quantity surveyor, who's brought in by the bank, sees things arriving on site …*[25]

> *Banks are not wanting to release money unless they've had their own quantity surveyor come out to check the builds to make sure that what is there is there, which is delaying time. But then also delaying the money coming through, because they're not issuing that next stage payment to the builder until all the extra checks and balances are in place. And then same from a contractor side, because the delay of funds is coming from the head contractor, they're then delaying the money to the subcontractors.*[26]

These delays push financial risk down the supply chain. Subcontractors and suppliers often fund work upfront, relying on credit and waiting months for payment:

> *Risk gets pushed further and further and further down. Everyone's pushing it down, which is why so many small building companies and so many subbies [subcontractors] go broke, right?*[27]

> *So, you imagine them waiting, I don't know, seven months getting paid 20 million bucks. It would kill them.*[28]

This structure places enormous pressure on small businesses, many of which operate with thin margins and limited financial buffers. The result is a fragile ecosystem where one insolvency can trigger a chain reaction of unpaid debts and further insolvencies. Additionally, payment disputes often arise from breakdowns in trust or misaligned expectations:

> *If the relationship does break down … [The client] will nitpick at the work already done to find reasons not to pay. Yeah. I find that part happens quite often as well, just because I think owners are like in their minds, 'Okay, the payment claim is here. It's time to make a payment, so I will double check, and I want to make sure everything's done to my satisfaction, not to "the" contractual requirements, but to "my" satisfaction'* [29]

The financial risks are compounded, creating an environment where payment is not only delayed, but also contested. The interviews reveal that poor payment practices are not just procedural, but cultural. The industry has normalised delayed payments and credit-based operations, which disproportionately affect smaller players. There is a widespread sentiment that financial instability is a routine part of doing business in construction. This normalisation of risk has created a system where insolvency is not an exception, but rather an expectation.

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[25] 12 Feb 2025 Interview (Organisation 4, Person 1).
[26] 20 Feb 2025 Interview (Organisation 2, Person 2).
[27] 12 Feb 2025 Interview (Organisation 4, Person 1).
[28] 12 Feb 2025 Interview (Organisation 4, Person 2).
[29] 20 Feb 2025 Interview (Organisation 2, Person 1).

Smart Contracts as a Potential Solution

During the interview process, participants were asked to reflect on how blockchain and smart contracts could be applied to address challenges in the construction industry. Their responses varied depending on their familiarity with the technology, but several consistent themes emerged, particularly around finance, payment automation and contract administration.

Many interviewees saw potential for blockchain and smart contracts to streamline administrative processes such as invoicing, billing, and documentation. This reflects a perception that any process which can be documented could be improved through digital automation.

Interviewees believed that automating payment processes could improve cash flow and reduce risk across the supply chain. From a subcontractor's perspective, smart contracts could ensure fair compensation and reduce the need to factor in losses that had become a hallmark of the industry:

> *You get accurate costings on what things are, and you'll get subcontractors being more competitive because they don't have to factor in the issue of going, 'Ah, no, I'm gonna have to write off 10% of my income this year.*[30]

Interviewees also saw value in gaining greater control over financial flows:

> *Like if [a building developer] said to me, 'You've got control over every dollar that we spend', it's 'happy days! because I know that my steel has been taken care of, my crew has been paid for … So at least if that builder falls over, I simply just put another builder in his place. My supply chain and everything's taken care of. Therefore, my insurance payouts are way less. The VMIA [Victorian Managed Insurance Agency] is very happy, because they don't have to fork out $200 million a year anymore just to keep the industry rolling …*[31]

Some interviewees explored more advanced financial applications, such as the possibility of blockchain to create tokenisation and programmable cash flows:

> *But I guess there's other funky things that can be done. So maybe, I don't know, maybe the developer sells the land at a slight discount? But then they've got a trail where every on-sale they earn a small percentage, which happens kind of with the NFTs [non-fungible tokens] and another thing. So yeah, the original landowner might give it at an 'X amount of discount'. But then every time that land is resold, so they could be creating things there…".*[32]

> *Tokenising the residential lease and the management agreement with a view of effectively programming the cash flows and then securitising the rent rolls into bonds.*[33]

[30] 21 Feb 2025 Interview (Organisation 1, Person 1).
[31] 21 Feb 2025 Interview, (Organisation 1, Person 1).
[32] 20 Feb 2025 Interview, (Organisation 2, person 7).
[33] 19 February 2025 Interview (Organisation 5, Person 1).

Smart contracts were widely seen as a tool to automate payments based on verified milestones:

> *We could certainly help with making our smart contracts more efficient in terms of payment processing.*[34]

> *If you can automate payment systems, when projects are certain, goals are met … which will automatically trigger those payments.*[35]

Interviewees also suggested that smart contracts could reduce the number of approval touchpoints, such as surveyors, banks and contractors, thereby accelerating payment timelines:

> *So, in terms of the processing, I think of some of our payments, there's a lot of people involved to approve payments to actually release the payments, to actually get the money to our suppliers and our vendors … there's a … lot of effort involved to do that. So, if that could somehow be simplified by smart contracts, I think that would be a great win, because we'd be able to free up administrative time and effort in more value-adding contributions to the business.*[36]

> *We speed up that decision-making process … the quicker they reach that approved position … the quicker it goes into the payroll and payment runs.*[37]

The interviews demonstrated that the financial challenges facing the Australian construction industry are systemic and deeply rooted in both structure and culture. Insolvency, delayed payments and poor credit practices are interlinked issues that threaten the viability of businesses and the integrity of the supply chain. These factors underscore the need for improvements. Blockchain and smart contracts offer potential solutions by automating payments, improving transparency and reducing reliance on manual verification.

These issues can be mapped out into a fictional example to highlight the range of scenarios and how smart contracts may be of benefit.

Figure 3 shows how a typical build may involve one of the mapping events (such as plumbing) being dependent on the work of other contractors to reach the concrete pour stage and then initiate the release of funds.

[34] 20 February 2025 Interview (Organisation 2, Person 6).
[35] 20 February 2025 Interview (Organisation 2, Person 1).
[36] 20 February 2025 Interview (Organisation 2, Person 6).
[37] 12 February 2025 Interview (Organisation 4, Person 4).

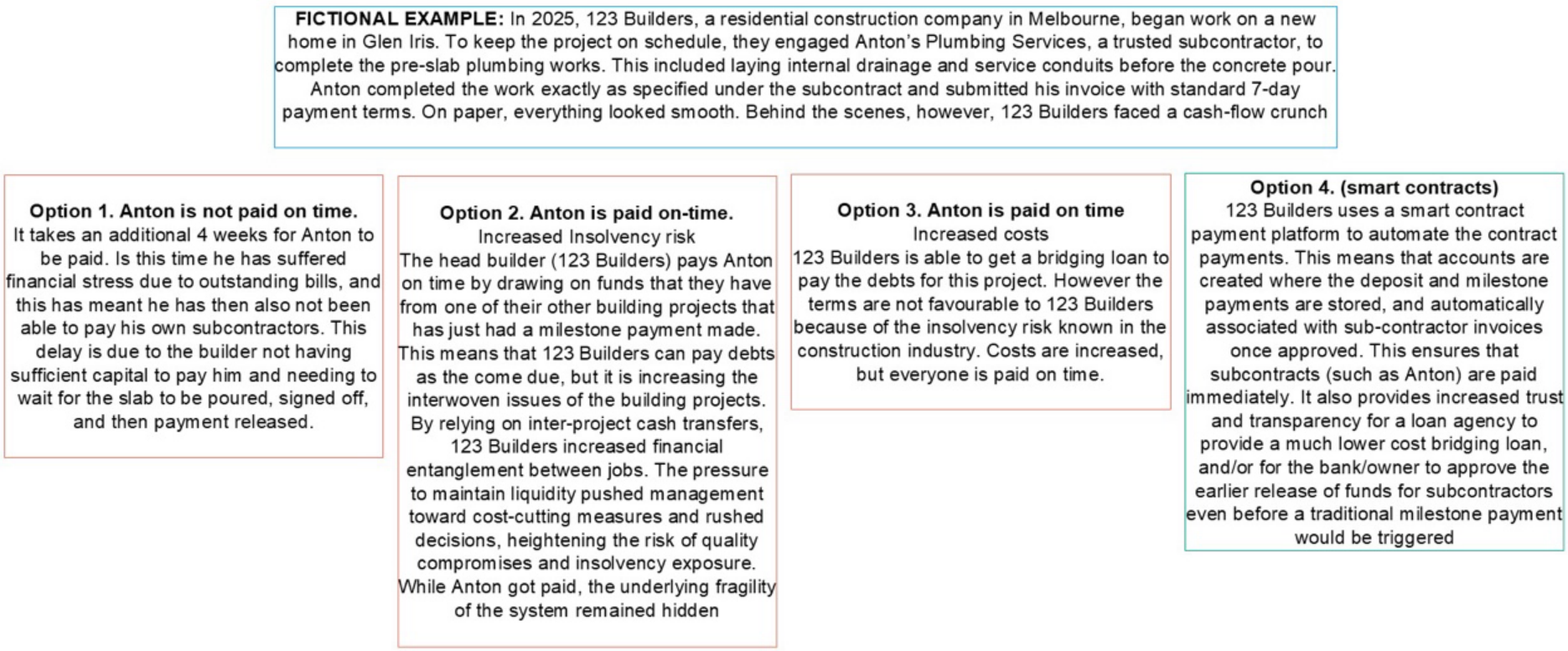

Figure 3: Fictional example: smart contract payment scenario

The figure shows that this scenario can often result in three negative options. The first is that the plumber is not paid on time, putting pressure on the contractors to meet their other financial obligations despite having correctly completed their task in the build. The second is where the plumber is paid, but the builder does this by moving money from other projects that have already met milestones. This commingling of project funds represents a significant insolvency risk as the entanglement makes the situation more dependent on the momentum of the projects and less resilient to unforeseen complications.[38] Finally, the third option is that the plumber is paid without commingling funds but rather through a bridging loan. This is an increased cost to the builder but reduces connected financial risks.

These are existing challenges in the process of construction industry payments; however, there is a potential for smart contracts to alleviate this, as shown in option 4, and as explored through the following case study of Paid.

Paid

- ***Paid (Paid.inc) is an example of payment smart contracts that do not require blockchain or cryptocurrency.***
- ***This software platform uses digital contracts to automate payment processes.***
- ***This approach increases trust that contractors will be paid in a timely manner.***
- ***It has the potential to be leveraged to get better rates from the bank, or otherwise make bridging loans if subcontractors need to be paid before project funds are available.***
- ***It has explored blockchain and cryptocurrency uses but decided against this because it is an unnecessary complication.***
- ***Paid is an active company.***

Summary

Paid (Paid.inc)[39] is a digital contract and payment management platform and app that mitigates risk caused by financial exposure on projects. It does this by providing a platform for all parties (e.g. homeowner, bank, builder, contractor, subcontractor, tradespeople, vendors) in a construction project to manage contracts and ensure payments are made in accordance with the agreed terms, in a timely manner.[40]

[38] See, for example, Building 4.0 CRC, *Project 80: Why are Insolvencies so High in the Construction Industry and What can be Done About it?* (2025) <https://building4pointzero.org/projects/80-why-are-insolvencies-so-high-in-the-construction-industry-phase-1-scoping-study>.
[39] Paid (n.d.) <https://www.paid.inc>.
[40] Paid App (n.d.) <https://app.paid.inc/signin?next=%2F>; Master Builders Australia. 'Master builders contracts | Powered by Paid.inc' (24 July 2025) YouTube <https://www.youtube.com/watch?v=ZRRbOSDlfBA>

Company Profile

Paid commenced operations in 2021 and launched the Paid application (Paid app) in 2024.[41] Initially, Paid experimented with blockchain smart contracts, but over time it moved away from blockchain and in its latest iteration has removed 'smart contracts' entirely from the website.[42] The payment and contracts platform used what it called 'smart contracts', but did not use blockchain as an underlying structure. Instead, Paid has drawn from blockchain concepts to create a hybrid system that can replicate blockchain benefits without incurring the delays or costs associated with a more robust blockchain infrastructure. As such, when considering their proposed path forward, we argue that this does not actually require the use of blockchain.

Description of Technology

Paid has two core components: digitised contracts and a payment platform.

Digitised Contracts

A key feature of the Paid platform is its approach to digitising construction contracts. In an industry where contractual obligations are complex, this feature aims to make contracts more accessible, transparent and actionable for builders, subcontractors and homeowners, while also creating a feature that integrates with the payment system.[43] This process is demonstrated in two steps: digitisation and the user experience.

Digitisation goes beyond uploading or electronically signing documents. Paid has agreements with a range of industry bodies to upload contract templates that can then be made available to users.[44] The Paid platform then analyses these contracts to fit its 'smart contract' framework, adding input fields and reorganising content to improve usability. It involves breaking contracts down into their core components: (1) particulars; and (2) clauses. These are then transformed into machine-readable formats.[45]

Particulars include project-specific inputs such as build duration, parties and insurance amounts, which users fill out directly. Clauses are then tagged, coded and linked to relevant sections of the contract, allowing them to be searched contextually within dashboards and project pages. This structure makes the contract not only easier to understand, but also easier to engage with throughout the project life-cycle.[46] From a user-experience perspective, a user in the platform can simply select the same 'traditional' contract template that they would otherwise have used, but be guided through the process more easily, then be able to plug directly into the payment system. By digitising contracts, Paid enables users to better comprehend critical elements such as variations, claims, defects, defaults and payment flows. When a variation is submitted, the system automatically

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[41] Paid App (n.d.) <https://app.paid.inc/signin?next=%2F>.
[42] See, for example, 2026 updates compared 2025 where the first words on the home page were 'Smart Contracts. Smarter Payments' and phrases such as 'Smart Contracts for every build' appeared throughout the website: Paid 'Contracts' <https://www.paid.inc/products/contracts>, included in historic versions Paid 'Contracts' (Archived 25 February 2025) <https://web.archive.org/web/20250225030949/https://paid.inc/smart-building-contracts>; Paid, 'home' (Archived 28 March 2025) https://web.archive.org/web/20250328135058/https://paid.inc.
[43] Paid, 'Subcontractor & Supplier Onboarding' (14 April 2026), YouTube <https://www.youtube.com/watch?v=SWNENTTFUg4>.
[44] See, for example, partnership with Master Builders Australia and availability of these contracts to users; Paid 'Creating Building Contracts' (21 July 2025), YouTube <https://www.youtube.com/watch?v=yGaIkD1izzg>.
[45] Paid, 'Contracts' (n.d.) <https://www.paid.inc/products/contracts>; Paid, 'Smart Building Contracts' (Archived 25 February 2025) https://web.archive.org/web/20250225030949/https://paid.inc/smart-building-contracts.
[46] Paid 'Creating Building Contracts' (21 July 2025), YouTube <https://www.youtube.com/watch?v=yGaIkD1izzg>.

updates the relevant terms and pricing, while also highlighting the implications of the change.[47] This creates a dynamic 'source of truth' that evolves with the project and reduces ambiguity.

To support this, Paid also uses the platform to interpret and communicate the meaning of contractual clauses in plain language. This is presented as segmented parts of a full document so each component is easier for users to read. It is also presented as legal information rather as legal advice, and it is clear that the users need to take responsibility for the interpretation of clauses and particulars.[48] This makes the process more manageable, by breaking down complex legal language into clearer, actionable steps. Paid does this to address the issues with builders, contractors and subcontractors not understanding the nature of the contracts to which they are agreeing, or simply assuming that it is 'standard' and they have no choice. It encourages greater engagement with the contract and reduces the risk of misunderstandings. Digitising contracts is a strategic move to reduce friction and empower users with clearer, more interactive agreements. Importantly, it creates a machine-readable version of contracts that aligns legal documentation with automated payment systems.

Payment Platform

The Paid 'payment' platform is an ecosystem of (what can be regarded as) smart contracts that allow for payment to flow directly between the various parties in the construction project as payment is made. This can use the machine-readable contracts and translate them into machine-consumable code. Paid originally called these 'smart contracts' because they facilitate the contracts and allow for some autonomous features, but they are not located on blockchains and they rely on human interactions rather than oracles to process the contracts.[49]

This is set up by onboarding all parties into the ecosystem, having them use the corresponding app, then having contracts housed in the platform. These are ideally the 'Paid digitised contracts', but simple agreements can also be made in the system.[50]

The essence of this is that the contractual framework is created, the bank agrees to pay builder 'x' amount of money for the entire project, broken into common payment gates, and the builder agrees to pay each subcontractor for their work. Then, as money flows into the platform, it is automatically assigned to each payee once the work has been verified in the system. This verification is conducted by parties based on the parameters of the contract – for instance, the plumber at the slab phase is contracted to supply $12,000 worth of work. When this is completed, images and video are taken and uploaded to the platform; this is then verified by the builder (as well as in person if needed) and, following that, the builder approves that the work has been completed. That approval then means the money is automatically moved from the builder's account on the platform to the plumber's account. The parameters of what evidence is needed will change from task to task, and it falls on the parties themselves to agree on the level of evidence they need to see. Most of this is primarily about increasing the accountability and transparency of these tasks, items that already need to be complied with through various legislation and policies, then tying compliance to the payment. The

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[47] See, for example, Paid, 'Subcontractor & Supplier Onboarding' (14 April 2026), YouTube <https://www.youtube.com/watch?v=SWNENTTFUg4>.

[48] See, for example, Paid, 'Review Building Contract' (22 July 2025), YouTube <https://www.youtube.com/watch?v=e2wjOYWkW6s>; Paid 'Creating Building Contract (21 July 2025) YouTube <https://www.youtube.com/watch?v=yGaIkD1izzg>; Paid, 'Paid Service Agreement' (n.d.) <https://www.paid.inc/service-agreement>.

[49] Paid, 'Mission' (n.d.) <https://www.paid.inc/mission>; Paid, 'Payments Built for Construction' (Archived 27 February 2025) <https://web.archive.org/web/20250227032149/https://paid.inc/payments-built-for-construction>

[50] Paid, 'Mission' (n.d.) <https://www.paid.inc/mission>; see, for example, Paid, 'Review Building Contract' (22 July 2025), YouTube <https://www.youtube.com/watch?v=e2wjOYWkW6s>; Paid 'Creating Building Contracts' (21 July 2025) YouTube <https://www.youtube.com/watch?v=yGaIkD1izzg>.

advantage of this system is that payment in the platform is made instantaneously rather than relying on the parties to decide when to send it (typically at the last day of the payment terms).[51] This can also allow for payments to occur independently of traditional milestones.

To accelerate payments in the construction industry, the Paid platform introduces a streamlined process that ensures funds are released earlier and more efficiently. At the base stage of a project, it is critical that all listed items and associated costs are verified against the original estimates. The Paid system integrates with existing workflows to confirm that these costings are accurate and reflect the actual work completed. Once the builder confirms that the stage is complete and the costs are correct, they sign off on the work. This approval acts as a formal validation, which then triggers the next step in the payment process.[52]

The Paid platform automates the distribution of funds. After both the builder and the homeowner approve the completed stage, the system initiates payment. The bank releases the funds and Paid ensures they are automatically routed to the appropriate parties. This not only speeds up the payment cycle, but also reduces administrative burden and improves transparency across the board.[53] For example: a traditional payment structure is for the slab to be the first major payment milestone; however, this milestone occurs after the underground plumbing, electrical, excavation and concreting. This means four or five subcontractors have typically done work prior to the builder being paid under the head contract. Those subcontractors will have seven-day payment terms, but the builder may not be paid from the bank for weeks after the slab, depending on when the stage is complete and what the bank's delays may be. This means that a builder needs to enter a period of negative cash flow, where they are paying for work that has been correctly completed but before they have the money to do so. This can lead to dangerous builder management practices where cash flow is moving between projects (Build A is paying for Build B, rather than Build B paying for Build B). This is an identified insolvency risk, and one that can potentially be avoided through the Paid platform. This flow issues addressed through the Paid ecosystem in two different ways: bank funded or platform funded.

Bank funded: Because of the transparency and accountability highlighted in the Paid system, there is greater confidence that the subcontractors' claims are true and accurate (i.e. that the work has been completed to a satisfactory standard). This means there is less risk in paying these subcontractors early out of the project's total payment, rather than paying them out of the budget of other projects. This means the technology may potentially enable deeper negotiations with banks to release funds differently or to offer favourable bridging loans.

Looking at the example of a plumber as a subcontractor, when they complete the work and submit a request to the builder to approve it, this approval is enough for the bank to agree to pay the plumber's fee directly. The plumbing work that typically would have been part of the slab-milestone payment is then advanced into the Paid payment platform. It is paid to the builder, and is then automatically assigned to the plumber based on the digitised contracts that verify the terms of the contract and that the task has been approved by the relevant parties. As such, payment happens immediately, is automatic through the bank without causing unnecessary tasks and paperwork and occurs within a single project rather than leveraging from others. While this is not an advertised

[51] Paid, 'No More Chasing Payments' (Webpage, Archived, 04 March 2025) < https://paid.inc/subcontractors-and-suppliers-no-more-chasing-payments/>.
[52] Ibid.
[53] Ibid.

benefit of the Paid platform, it can be seen that this is a possible future enabled by the technology because it reduces the periods of negative cash flow and reduces the risk of insolvency.

Ultimately, all parties benefit:

- The bank can pay money out sooner, allowing it to charge interest to the homeowner sooner.
- Trades subcontractors do not need to wait for the builder to pay them.
- The builder benefits because negative cash flow is not an issue.
- The homeowner benefits because money is safe and used only on this project.
- The insurance provider benefits from fewer risks of insolvency or poor practices to rush to milestones.

Alternative: Platform-funded: Paid also offers an alternative service, which it calls an 'early release of funds', where the money is temporarily lent to the project by Paid.[54] This is transferred to the requested subcontractor and, once the traditional milestone payment is made by the bank, the loaned amount is automatically repaid to Paid with minimal financial risk. This system is an important alternative that can prove the concept of the payment system as being reputable. This research speculates that this process may encourage more banks to accept the change in the status quo and be willing to change the timing of payments to ensure the best outcomes for everyone involved.

Paid on the Smart Contracts Spectrum

On the Smart Contracts Spectrum, Paid implements a C3, D3 (with some trials in D4) (see Figure 4). It emphasises the use of autonomous contracts to allow for the automatic payment of construction contracts, while not going so far as to make this through a blockchain or with cryptocurrency. This does involve data uploading and storage, but is mostly just for the proof needed to release payments. This is still an automated process at times, but it is less comprehensive than other case studies (such as BIMCHAIN), which principally focus on the data.

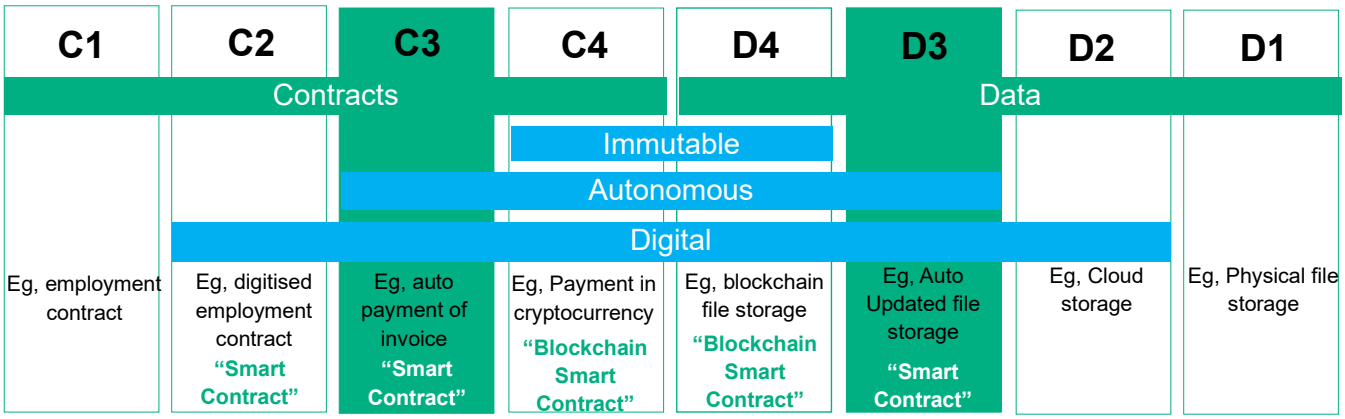

Figure 4: Smart Contracts Spectrum: Paid application

[54] Paid, 'Financial Services Guide' (n.d.) <https://www.paid.inc/fsg>.

Benefits and Challenges

In the construction industry, many laws, regulations and best practices are designed to ensure safety, quality and accountability. In practice, however, many of these rules are routinely overlooked. This can often be a result of systemic inefficiencies, lack of enforcement or pressure to keep projects moving. Unfortunately, these gaps in compliance contribute to poor practices, increased defects and a heightened risk of insolvency across the sector. The Paid platform introduces a practical solution: it ties payment directly to compliance. Rather than asking users to adopt new standards, it simply requires proof that existing standards are being met. Whether through certificates, tickets or insurance documents, the system makes these prerequisites for payment. If the required documentation is in place, the payment progresses; if not, it stalls, creating a clear incentive to comply.

Compliance with certification requirements is built into the system. For example, residential projects typically require at least three key certificates – base, frame and final – while subcontractors may need additional documentation, such as waterproofing certificates or specification sheets. On commercial sites, safety tickets and daily sign-ons are essential for site access. These can be ignored, inconsistently tracked or, when produced, never formally filed anywhere. However, Paid ensures they are visible, verified and stored for future needs. Compliance can be tied to payment.

This addresses the deeper issue of accountability. In traditional workflows, even when certificates are required, there is no guarantee that anyone sees or verifies them. For instance, underground plumbing must be inspected before backfilling, but if inspectors are unavailable, work often proceeds unchecked. Paid offers a digital alternative, allowing users to submit video evidence or documentation that can be reviewed remotely, reducing reliance on overstretched inspection teams. There is a possibility that encouraging greater compliance with creating ‘evidence’ will allow for new means of inspection and encourage regulators to rethink standards in a way that can allow for greater oversight without increased burdens. This is an issue for regulators to evaluate, but understanding the capabilities of platforms such as Paid is a crucial first step in recognising the tools available.

The Paid platform makes compliance the default by embedding it into the payment process. This subtle shift has a profound impact. It discourages the “we have always done it this way” mentality and helps raise standards across the industry. By requiring proof of compliance before money moves, the platform promotes better practices, reduces risk, and supports a healthier, more sustainable construction ecosystem.

Assessment of Practical Realities

The Paid platform does not rely on blockchain, which is a deliberate choice. While the blockchain-based smart contract has gained attention for its potential to decentralise trust and automate transactions, it has not found meaningful traction in construction. The reality is that Web 2 infrastructure is cheaper, faster and more practical for the kinds of problems Paid is solving. Blockchain transactions come with fees (transaction costs paid to validators on blockchain networks) and technical complexity, while fiat currency can be moved just as quickly at a fraction of the cost.

Blockchain does have benefits. Experiments such as Project Acacia[55] are exploring tokenisation, turning funds into yield-generating products using stablecoins such as USD Coin (USDC). These ideas are interesting, especially for future models involving private credit or global investment. For now, there is no clear use case that justifies the added complexity of blockchain. The construction

[55] See, for example, RBA and DFCRC, *Project Acacia: Exploring the Role of Digital Money in Wholesale Tokenised Asset Markets* (May 2026) <https://www.rba.gov.au/payments-and-infrastructure/central-bank-digital-currency/pdf/project-acacia-final-report.pdf>.

industry needs solutions that are simple, reliable and easy to adopt. Tokenising assets or payments only makes sense if it delivers a tangible commercial outcome – and, at this stage, it does not.

Instead, Paid takes the lessons from blockchain applications, including, transparency, traceability and decentralised verification, and applies them through more accessible means. Application Programming Interfaces (APIs) and integrations allow the platform to enforce rules, verify compliance and manage payments without needing a distributed ledger. Certificates, insurance documents and safety tickets can be validated through trusted data sources or independent arbitrators. These mechanisms achieve the same goals as blockchain, but in a way that is more compatible with how the industry currently operates.

Mapping

The scenario set out in Figure 3 can be broken down as shown in Figure 5. Of particular interest is how the case study of Paid can be integrated into this flow. Figure 5 presents select steps in the payment process (in blue), shows how they can become some of the aforementioned problems (in red), but also illustrates how they can be addressed through smart contracts (in green).

This example demonstrates some actionable steps for integrating a smart contract platform, such as Paid, into the existing payment flows of building projects. It replicates the existing structures, but allows for automated payment processes. Of particular note is the relative ease to onboard contractors and projects at the start, replicate existing contractual agreements in the digital workflows, then have progress claims automatically trigger payment when conditions are met. There is also potential to integrate more favourable bridging loans into this process.

Conclusion

Trust remains a central issue in construction; collaboration is fragmented, and it is not always clear who should be the final authority – government, companies or platforms. Blockchain offers a theoretical solution to this problem, but it is not yet scalable or cost-effective. Paid builds trust by making rules visible, tying them to payments and ensuring users cannot bypass compliance. It is a practical approach that works within existing systems. If the industry evolves and the need for decentralised finance grows, Paid has indicated that it may revisit blockchain. But for now, the focus is on solving real problems with tools that users understand and can afford.

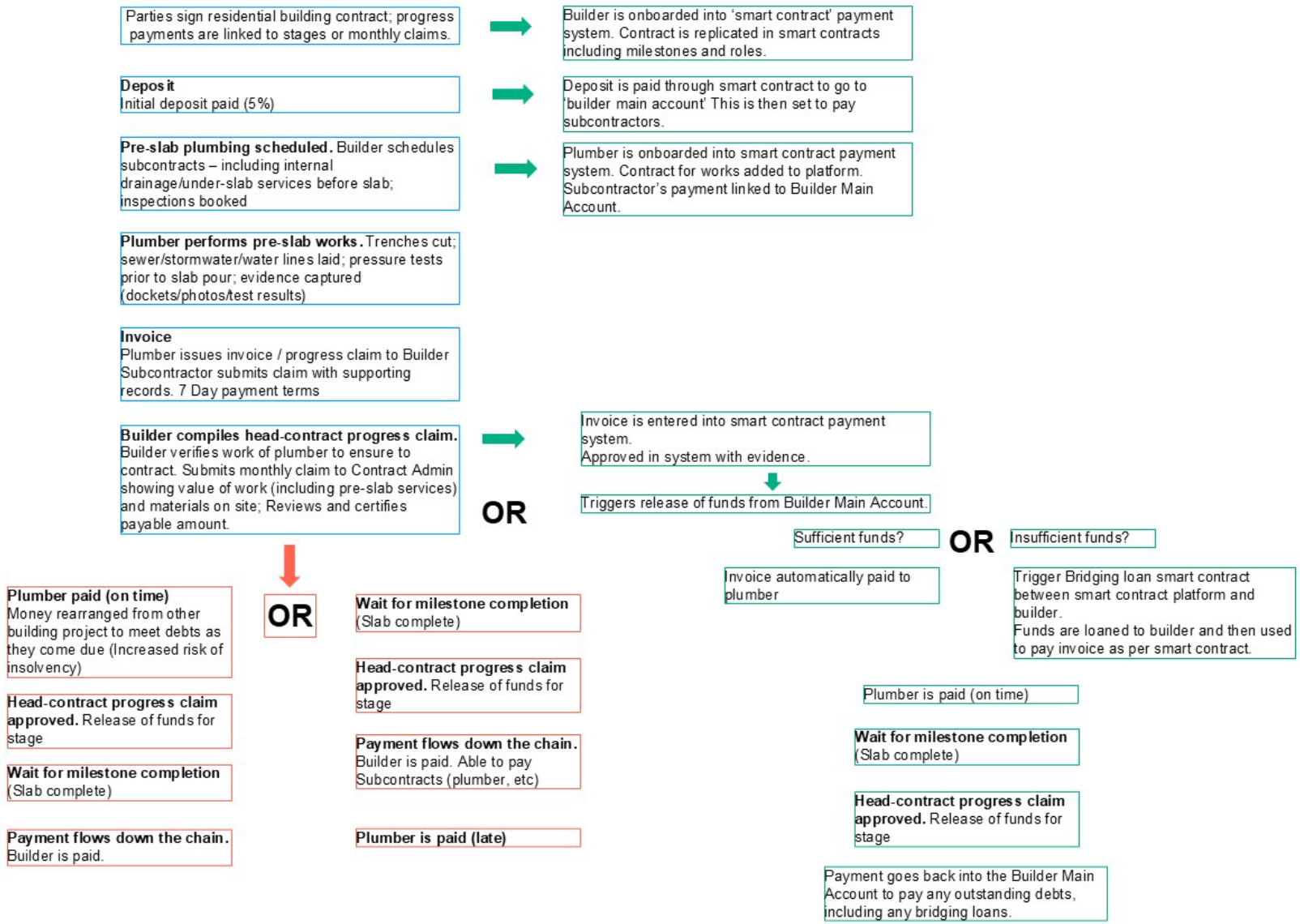

Figure 5: The payment process: problems and smart contract solutions

Smart Contracts and Supply Chain Transparency

Smart contracts can improve supply chain transparency by creating a clear, continuously updated and potentially immutable record of manufacturing and construction activities. This capability can strengthen existing data records by automating data capture or decentralising information storage, making records more reliable and trustworthy for all participants. This is explored through the BIMCHAIN case study, which illustrates how recurring supply chain fragmentation can undermine data integrity and how technology can help restore trust as supply chains become increasingly dispersed.

The Problem

Transparency is a cornerstone of trust, accountability and long-term resilience in the construction industry. Transparency commonly refers to the open and accurate sharing of information among stakeholders, builders, homeowners, subcontractors, engineers, regulators and insurers across all phases of a project. Despite its importance, transparency remains a pervasive challenge in the Australian construction sector, contributing to safety risks, financial losses and reputational damage.

When transparency fails, the consequences can be severe. Homeowners are particularly vulnerable. A recent case in South Yarra Square in Melbourne illustrates this: residents are facing nearly $25 million in costs due to defects in a building constructed in 1989.[56] These include basement drainage failures, improper load-bearing structures and defective retrofitting, issues that engineers later deemed unfit for purpose.[57] The problem is compounded by regulatory loopholes, such as the low threshold for occupancy permits, which only require a building to be ‘suitable for occupation’.[58] For everyday people without technical expertise, these nuances are invisible, exposing them to financial and safety risks.

Record-keeping

Transparency is also hindered by poor record-keeping practices. Builders and contractors struggle to maintain accurate, centralised documentation. One interviewee described the challenge:

> *And that's probably the biggest issue that any construction business has with that job management stuff – how do you keep everything in one spot to make sure that your client file is 100% accurate? Because you’ve got emails going backwards and forwards, you’ve got phone calls that happen, which you still got to document, and sometimes it’s not worth an email, you’re too busy.*[59]

This lack of centralised, reliable records can have costly consequences. In the case of Project Remediate, a NSW government initiative to replace flammable cladding on residential buildings, one tier-one builder reportedly spent $20 million investigating what materials had been used on their past projects, simply because the documentation was incomplete:

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[56] 7News Australia, ‘Dozens of Apartment Owners Pleading for Help as Their South Yarra Building Crumbles’, YouTube (25 August 2025) <https://www.youtube.com/watch?v=_uOl0yYvlKk>.
[57] Mick Pacholli, ‘South Yarra Residents Facing Financial Ruin After Decades-old Building Defects’, T*oorak Times* (21 August 2025) <https://tooraktimes.com.au/south-yarra-residents-facing-financial-ruin-after-decades-old-building-defects>.
[58] *Building Act 1993* (Vic) s 44(a).
[59] 20 February 2025 Interview (Organisation 2, Person 3).

> *I know, a large tier one (construction company) who spent about 20 million bucks working out exactly what they had put on their buildings, because they were so concerned. They were like, well, are we going to be in the firing line? And they didn't have the documentation ready to look at. They had to do a lot of investigation, spend millions working out what they'd actually put in (their buildings).*[60]

This example underscores the financial and reputational risks of poor transparency and documentation, especially when safety and compliance are compromised.[61]

Accuracy in both documentation and communication is a critical issue in the Australian construction industry. Inaccuracy has far-reaching implications for project quality, cost, efficiency and legal compliance. This challenge when it comes to assuring accuracy is closely tied to how contract variations are managed and recorded, and it reflects broader problems in technology adoption, legal interpretation and project coordination. Through interviews with industry professionals, this research has identified a consistent pattern of concern around version control, informal variation practices and the inefficiencies that result from poor information management.

Technology and Accuracy

A major contributor to inaccuracy is the limited adoption of integrated digital technologies. Many construction firms still rely on traditional methods of data management, proprietary project tools and fragmented communication systems. This leads to multiple versions of documents circulating simultaneously, making it difficult to identify the most current specifications:

> *You go on site, and you might see things that were like, 'Oh, someone didn't get informed about this change,' and so it's all according to previous plans that were not updated.'*[62]

> *In the industry, when you go through, let's just say the first part, which is design process. Elements tend to get redesigned, redrawn and remodelled, which, first of all, slows the component of the design process. Second … you don't always get the right sort of information needed for what you're designing.*[63]

This lack of version control can result in serious consequences, including financial loss, reputational damage and even legal liability. One interviewee referenced a high-profile example:

> *You just go look at some of the commercial projects out there, like the Wheel in Melbourne, where the steel was not the right product, right? So that's the stuff. That's what blockchain will stop.*[64]

The absence of a centralised, accessible platform for managing project data means that stakeholders often work from outdated or conflicting documents, increasing the risk of errors and disputes.

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[60] 12 February 2025 Interview (Organisation 4, Person 2).
[61] NSW Government, 'Replace Flammable Cladding Through Project Remediate', NSW Government (1 December 2023) <https://www.nsw.gov.au/departments-and-agencies/building-commission/replace-flammable-cladding-through-project-remediate>; NSW Government, 'Help and Resources Project Remediate' (17 November 2023) <https://www.planningportal.nsw.gov.au/help-and-resources/project-remediate>.
[62] 12 February 2025 Interview (Organisation 4, Person 3).
[63] 12 February 2025 Interview (Organisation 4, Person 3).
[64] 20 February 2025 Interview (Organisation 2, Person 4).

Contract Variations

Contract variations are a routine part of construction projects, but they are rarely managed systematically. Ideally, variations should follow a formal process – initiated by a request, approved through documentation and reflected in updated plans and permits:

> *It can be on the phone … like anything! Even texts are accepted as variation acceptance (by builders/clients) sometimes. So there has to be a formalised variation process, and the contract must be amended effectively from that.*[65]

> *And then the right process is, you vary the agreement. You vary the permit. Everything. Now the plans are varied. Everything's approved. Then away you go. Simple … But I think that's probably rare. When that all happens nicely and neatly …*[66]

In practice, variations are often communicated informally, via phone calls, text messages or verbal conversations, and may not be documented at all:

> *… might not be documented. It could be an informal chat …*[67]

This lack of formal tracking leads to disputes, especially during payment claims, when parties disagree about what was agreed to or whether a variation occurred:

> *[The client demands] 'Look, I want this change. Can you go and do it?' and then the price isn't agreed on, and then when you do it, it now becomes a messy dispute.*[68]

Variations also affect the design and manufacturing of linked components. A change in one element, such as door size, may require adjustments to wall structures or other features, then the manufacturer must coordinate corresponding updates with affected trades. Without a digitised system to track and propagate these changes, the burden falls on manual coordination, increasing the risk of miscommunication:

> *So, information comes to the site, then they have to make sense of the information … they bring it to the manufacturer, which takes some time, and then manufacturer brings it on site, there's always some miscommunication. The more channels you put through it, the more ways the information (any changes) can be lost.*[69]

The industry is certainly aware of the challenges posed by variations, data management and supply chain transparency. A fictional example of this is shown in Figure 6.

[65] 20 February 2025 Interview (Organisation 2, Person 5)
[66] 5 February 2025 Interview (Organisation 3, Person 1)
[67] 5 February 2025 Interview (Organisation 3, Person 1)
[68] 5 February 2025 Interview (Organisation 3, Person 1)
[69] 12 February 2025 Interview (Organisation 4, Person 3).

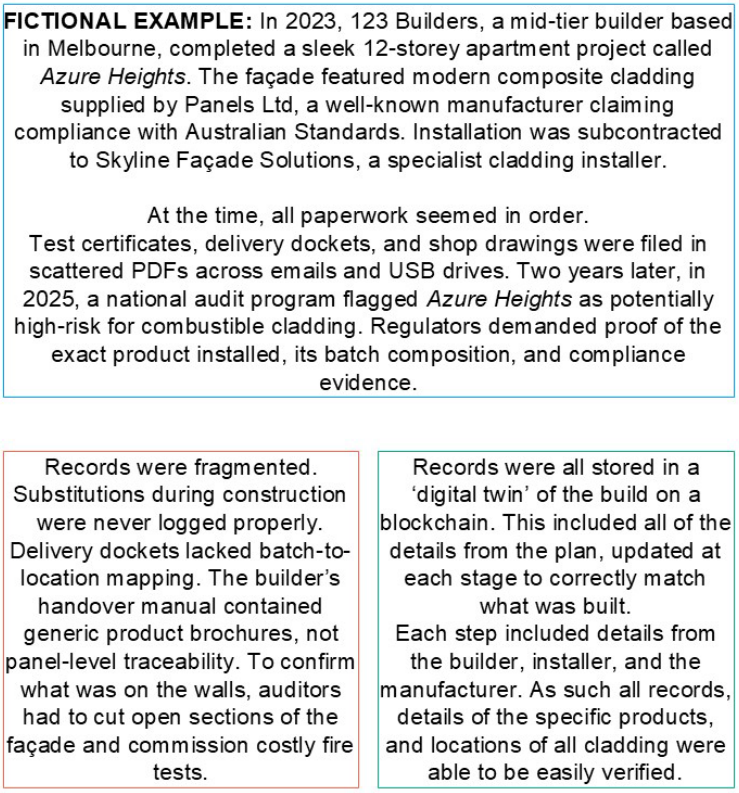

Figure 6: The cladding problem scenario: fragmented record-keeping and data integrity

This figure illustrates a scenario reminiscent of the cladding compliance and safety issues identified in Australia and the United Kingdom following the 2017 Grenfell Tower fire in London, where fragmented records and poor product traceability severely hindered post-construction compliance verification and risk remediation. This scenario of poor record-keeping is represented in Figure 6 (red panel), but there is potential for technology and smart contracts to enhance record-keeping and avoid these issues, as explored through the case study of BIMCHAIN.

BIMCHAIN

- ***BIMCHAIN (founded 2017, France) focuses on applying blockchain and smart contracts in construction***
- ***Integrates BIM with the Ethereum blockchain to enable secure, decentralised data management***
- ***Uses smart contracts to automate processes between key stakeholders (builders, engineers, trades, managers)***
- ***Aims to improve transparency, data security, accountability, lifecycle management, and payment automation***
- ***Demonstrates how blockchain can enhance BIM's effectiveness through stronger data management***
- ***One of the few commercially-oriented real-world blockchain applications in construction***
- ***Adoption remains limited; has not scaled widely across the industry***
- ***Barriers include high costs, low technological maturity, and resistant industry culture***
- ***No longer active***

Summary

BIMCHAIN is a French start-up company, established in 2017. Its core business is implementing smart contracts and blockchain technology in the construction industry.[70] The approach leverages BIM to improve construction industry efficiency, with blockchain technology used to amplify these gains. BIMCHAIN presents an important case study because it is one of the very few real-world applications of blockchain technology that was designed to be commercially available in the construction industry.[71] However, the start-up has not successfully scaled up to any widespread adoption.

BIMCHAIN connects Building Information Modelling (BIM) systems to the public Ethereum blockchain.[72] This provides a decentralised digital infrastructure for secure data storage, authentication and management in construction to support more effective building life-cycle management across the construction industry.[73] BIMCHAIN embeds smart contracts between the key stakeholders in a construction project (such as builders, engineers, trades, and project and property managers) on the Ethereum blockchain to automate actions.[74]

As a case study, BIMCHAIN is particularly relevant to this research because it demonstrates the implementation of smart contracts and blockchain technology to enhance BIM technology. By integrating BIM with blockchain, challenges such as lack of transparency, security of data, accountability, better building life-cycle management and automated payments can be addressed more effectively. In particular, BIMCHAIN maximises the potential of BIM by more robust management of data.

Despite the potential benefits of BIMCHAIN, its adoption in the real world has been significantly limited by factors such as associated costs, stakeholders' lack of technological maturity and prevailing industry culture. The key takeaway from this case study is that, while smart contracts and blockchain have significant potential for the construction industry, their feasibility in the real-world may not be viable.

Company Profile

BIMCHAIN, founded under the legal name Lutecium in 2017, is a software company based in France. It integrates BIM and blockchain technologies to secure digital processes and facilitate collaboration in the construction sector.[75] BIMCHAIN enhances BIM by linking it to blockchain to leverage the benefits of decentralisation to achieve open collaboration and data interconnection in

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[70] EU Startups, 'BIMCHAIN' EU Startups Directory (n.d.) <https://www.eu-startups.com/directory/bimchain>.

[71] MAF, 'Numerique: L'état lance sa plateforme gratuite de travail collaboratif [Digital technology: The state launches its free collaborative work platform]' (23 May 2024) <https://www.numerique.gouv.fr/sinformer/espace-presse/letat-lance-une-suite-numerique-collaborative-permettant-aux-agents-publics-de-disposer-doutils-numeriques-souverains-securises-encore-plus-performants-et-facilitant-le-travail-collaboratif-a-distance>.

[72] Building Information Management (BIM) is a software that enables stakeholders involved in a construction to store and manage a wide range of databases related to various aspects of a building. See Chris Lowe and Neil Hall, *The Usage of 3D Building Information Management (BIM) and Digital Twin Models to Support the Identification and Management of Human Factors Integration Issues* (ResearchGate, 2023) <https://www.researchgate.net/publication/372284208>.

[73] BIMCHAIN, 'About Us' (n.d.) <https://bimchain.io/about-us>.

[74] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.

[75] BIMCHAIN, 'About Us: Our Vision' (n.d.) <https://bimchain.io/about-us>; BIMCHAIN, 'FAQ' (n.d.) <https://bimchain.io/faq>; OO Lawal, 'Blockchain-enabled City Information Modeling Framework for Urban Asset Management' (2024) 3(3) *Journal of Infrastructure Intelligence and Resilience* <https://doi.org/10.1016/j.iintel.2024.100101>.

the construction sector.[76] One of its real-world use-cases is its integration with the KROQI platform (a collaborative platform for all construction professionals funded by the French government),[77] where BIMCHAIN facilitates the digitisation of processes linking operational, contractual and payment BIM data while ensuring verifiable traceability to support insurance purposes.[78]

BIMCHAIN sought to overcome limitations in BIM related to ownership of designs, project tracking, and the allocation of final responsibility among individuals.[79] It aimed to improve the reliability of BIM models by tackling issues such as weak data confidentiality, inadequate copyright enforcement and uncertainty about responsibilities, thereby improving the overall quality of BIM data.[80] BIMCHAIN sought to address this trust deficit by generating immutable digital proofs that are signed, time-stamped, immutable and permanently accessible to the authorised stakeholders.[81] Its decentralised architecture was promoted as enhancing data confidentiality and security, as information was distributed across multiple nodes and stored in encrypted form.[82]

It also asserted that it addressed poor data quality by establishing a legal accountability framework that held stakeholders responsible for the data they uploaded.[83] This is important because the potential offered by BIM technology is hindered by a lack of accurate data.[84] BIMCHAIN places the BIM model at the centre of legal and contractual processes, thereby introducing the binding component.[85] This enables legally binding proof of data transactions, making stakeholders accountable for the data they provide.[86]

BIMCHAIN's use of data smart contracts increases fluidity and trust in the process[87] because the company aims to automatically execute predefined, irreversible actions when verified events occur.[88] By facilitating this automation of actions, BIMCHAIN has the potential to foster trust between the parties, as they can rely on actions being executed once specific conditions are met.

Description of the Technology

Building Information Modelling (BIM)

BIM principles encompass a broad range of elements, including a digital representation of the physical and functional characteristics of a built asset, from design to operation, related 3D models and a repository of information associated with the construction project. It enables stakeholders in a

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[76] BIMCHAIN, 'About Us' (n.d.) <https://bimchain.io/about-us>.

[77] MAF, 'Numerique: L'état lance sa plateforme gratuite de travail collaboratif [Digital technology: The state launches its free collaborative work platform]' (23 May 2024) <https://www.numerique.gouv.fr/sinformer/espace-presse/letat-lance-une-suite-numerique-collaborative-permettant-aux-agents-publics-de-disposer-doutils-numeriques-souverains-securises-encore-plus-performants-et-facilitant-le-travail-collaboratif-a-distance>; Kroqi, 'A propos [About Kroqi]' (n.d.) <https://kroqi.fr/a-propos>.

[78] Kroqi, 'Integrations' (n.d.) <https://kroqi.fr/integrations>.

[79] AH Qureshi et al, 'Role of Blockchain and Cyber-Physical Systems (CPSs) in Execution of Sustainable Smart Construction' in *Recent Approaches of Sustainable Architecture in Arid and Semi-Arid Cities*, edited by S ElZein and A Negm (Springer, 2025) <https://link.springer.com/chapter/10.1007/978-981-95-1645-2_15>.

[80] BIMCHAIN, 'Solution' (n.d.) <https://bimchain.io/solution>.

[81] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.

[82] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.

[83] BIMCHAIN, 'Solution' (n.d.) <https://bimchain.io/solution>.

[84] BIMCHAIN, 'Solution' (n.d.) <https://bimchain.io/solution>.

[85] BIMCHAIN, 'FAQ' (Webpage, n.d.) <https://bimchain.io/faq>.

[86] Abhinaw Sai Erri Pradeep, *Blockchain-based Information Systems to Improve Design Liability Control and Security of Information Exchange Records on Construction Projects* (Doctoral Thesis, 2022) <https://researchspace.auckland.ac.nz/items/8718e638-fd25-4206-90ff-4a3b9301b109>.

[87] BIMCHAIN, 'Solution' (n.d.) <https://bimchain.io/solution>.

[88] BIMCHAIN, 'Solution' (n.d.) <https://bimchain.io/solution>.

construction project to manage information throughout the project's life-cycle, including contracts, architectural drawings and designs, approvals, milestones, procurements, progress and other relevant details.[89]

Numerous commercial software platforms have been developed to support these BIM processes, and they are now widely adopted across the Australian construction industry. Prominent examples include Autodesk Revit, Navisworks[90] and BIM 360/Autodesk Construction Cloud;[91] Trimble's Tekla Structure;[92] Bentley Systems' OpenBuildings Designer;[93] and Graphisoft Archicad.[94] These platforms provide capabilities for model authoring, coordination, collaboration and information management.

While BIM in its current form already provides a powerful framework for managing construction information, blockchain may allow these capabilities to be improved by enabling tamper-resistant records, decentralised verification and increased transparency across complex project ecosystems.[95] Blockchain technology has the potential to further enhance BIM-enabled practices by extending trust, data provenance and automation across organisational and contractual boundaries.

BIMCHAIN Technology

BIMCHAIN is a software built on Ethereum blockchain, which enables users to validate and certify BIM data.[96] At the outset of a construction project, the client formally engages the head contractor and project consultants through a contractual agreement, which is subsequently recorded within the client's BIM system. The client and the head contractor may further incorporate subcontractors or additional consultants into the system as required. The project requirements provided by the client serve as the foundation for the design, and this design basis is stored within the digital system to ensure reliable provenance.[97]

In the app, users can sign in, and log and verify data using a locally encrypted digital wallet, either via web applications or through a plugin integrated with a BIM authoring tool such as Revit or ArchiCAD.[98] BIMCHAIN can be directly integrated with a user's BIM software to secure digital workflows and the BIM execution plan.[99] The core features of BIMCHAIN are accessible via the web without requiring installation, while certain specialised add-ons must be downloaded through the user's BIM software editor program.[100] See Figure 7 for the BIMCHAIN architecture.

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[89] BIMCHAIN, 'FAQ' (n.d.) <https://bimchain.io/faq>.
[90] Autodesk, 'Revit' (n.d.) <https://www.autodesk.com/products/revit/overview>.
[91] Autodesk, 'BIM 360' (n.d.) <https://www.autodesk.com/bim-360>.
[92] Trimble, 'Tekla Structures' (n.d.) <https://www.tekla.com/products/tekla-structures>.
[93] Bentley Systems, 'OpenBuildings Designer' (n.d.)
[94] Graphisoft, 'Archicad' (n.d.) <https://graphisoft.com>.
[95] AH Hadi, RT Hazem and YS Nassar, 'Integrating Blockchain and BIM (BCT-BIM) to Promote the Construction Practices in Terms of Efficiency and Transparency' (2026) 13(1) *SSRG International Journal of Civil Engineering* 230 <https://doi.org/10.14445/23488352/IJCE-V13I1P120>.
[96] BIMCHAIN, 'BIM and Blockchain: An Alliance that Makes Sense' (n.d.) <https://bimchain.io/bim-and-blockchain-an-alliance-that-makes-sense>; BIMCHAIN, 'FAQ' (n.d.) <https://bimchain.io/faq>, question 1(d).
[97] O Lawal, 'Blockchain-enabled City Information Modelling Framework for Urban Asset Management' (2024) 30(3) *Journal of Architectural Engineering* <https://doi.org/10.1061/JAEIED.AEENG-1644>.
[98] Abhinaw Sai Erri Pradeep, *Blockchain-based Information Systems to Improve Design Liability Control and Security of Information Exchange Records on Construction Projects* (Doctoral Thesis, 2022), 97–98. <https://researchspace.auckland.ac.nz/items/8718e638-fd25-4206-90ff-4a3b9301b109>.
[99] Crunchbase, 'BIMCHAIN' (n.d.) <https://www.crunchbase.com/organization/bimchain>; BIMCHAIN, 'FAQ' (n.d.) <https://bimchain.io/faq>.
[100] BIMCHAIN, 'FAQ' (n.d.) <https://bimchain.io/faq>.

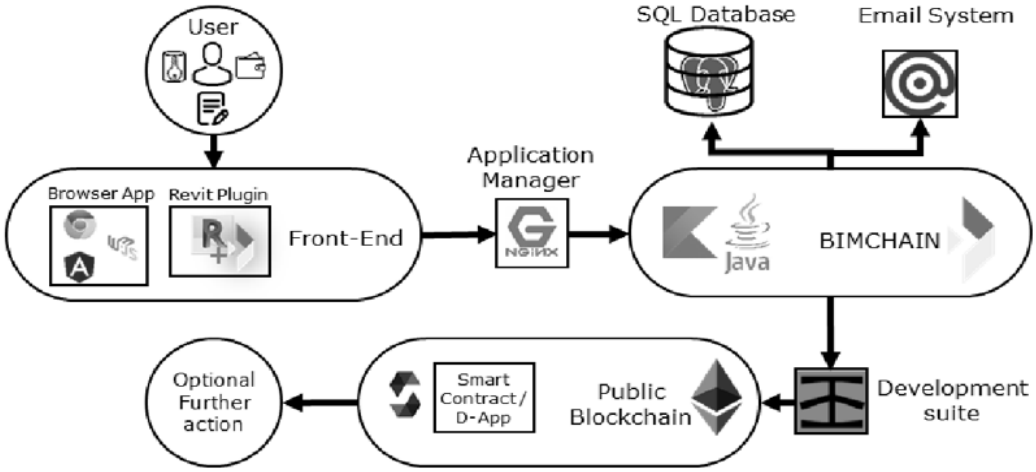

Figure 7: Architecture of BIMCHAIN[101]

BIMCHAIN systems comprise the following elements:

BIM Workflow: The project's workflow is created within the BIM system (Figure 8). This allows for the creation of events, items and permissions. Examples include the initial model of and plans for the build, the engineering structural checks and the plan as approved. This workflow allows for a singular place for the data to be stored and verified by the correct person through a series of proofs.

Proofs: BIM data are verified through a series of proofs covering ownership, context, approvals, consistency and certifications. Proofs of ownership allow users to register and digitally sign their work, creating verifiable proofs of authenticity and establishing precedence of publication. Proofs of context enable users to confirm that their contributions are produced with verifiable external inputs, while also delineating their scope of liability. With proofs of approvals, stakeholders can ensure that all users are working on synchronised versions. Proofs of consistency provide a means to establish a single source of truth, demonstrating that extracts are derived from the user's own model. Finally, proofs of certification allow users to verify their compliance with regulations by having BIM objects certified by the issuer itself.[102]

Data Vault: The BIMCHAIN workflow and BIM protocol management details are stored in BIMCHAIN's data vault.[103] This data vault is an encrypted peer-to-peer network based on file system technology.[104] The system obtains electronic signatures by attaching the proofs to a verified identity.[105] This aims to promote accountability through a single source of truth. The information can be signed and verified explicitly by authorised users through the use of their private keys.[106]

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[101] Abhinaw Sai Err Pradeep et al., *Blockchain Improving Trust in BIM Data Exchange: A Case Study on BIMCHAIN* (Construction Research Progress, 2020) <https://ascelibrary.org/doi/epdf/10.1061/9780784482865.124>.
[102] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.
[103] Abhinaw Sai Erri Pradeep, *Blockchain-based Information Systems to Improve Design Liability Control and Security of Information Exchange Records on Construction Projects* (Doctoral Thesis, 2022) <https://researchspace.auckland.ac.nz/items/8718e638-fd25-4206-90ff-4a3b9301b109>, 97–98.
[104] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.
[105] BIMCHAIN, 'Solution' (Webpage, n.d.) <https://bimchain.io/solution>.
[106] Abhinaw Sai Erri Pradeep, *Blockchain-based Information Systems to Improve Design Liability Control and Security of Information Exchange Records on Construction Projects* (Doctoral Thesis, 2022) <https://researchspace.auckland.ac.nz/items/8718e638-fd25-4206-90ff-4a3b9301b109>, 97–98.

Identity Management:[107] Access to the data vault is governed by the identity-management system. Only authorised users can reveal or prove their identity, which is verified by a trusted third party and used to ensure that commitments made within the system are legally binding.[108] As BIMCHAIN operates primarily within the European Union, identity management is governed by EU regulations, particularly the eIDAS framework, including both the eIDAS Simple Electronic Signature and the eIDAS Advanced Electronic Signature. In the Australian context, the relevant laws would be the *Electronic Transactions Act 1999* (Cth), which are mostly equivalent to the EU Regulations.

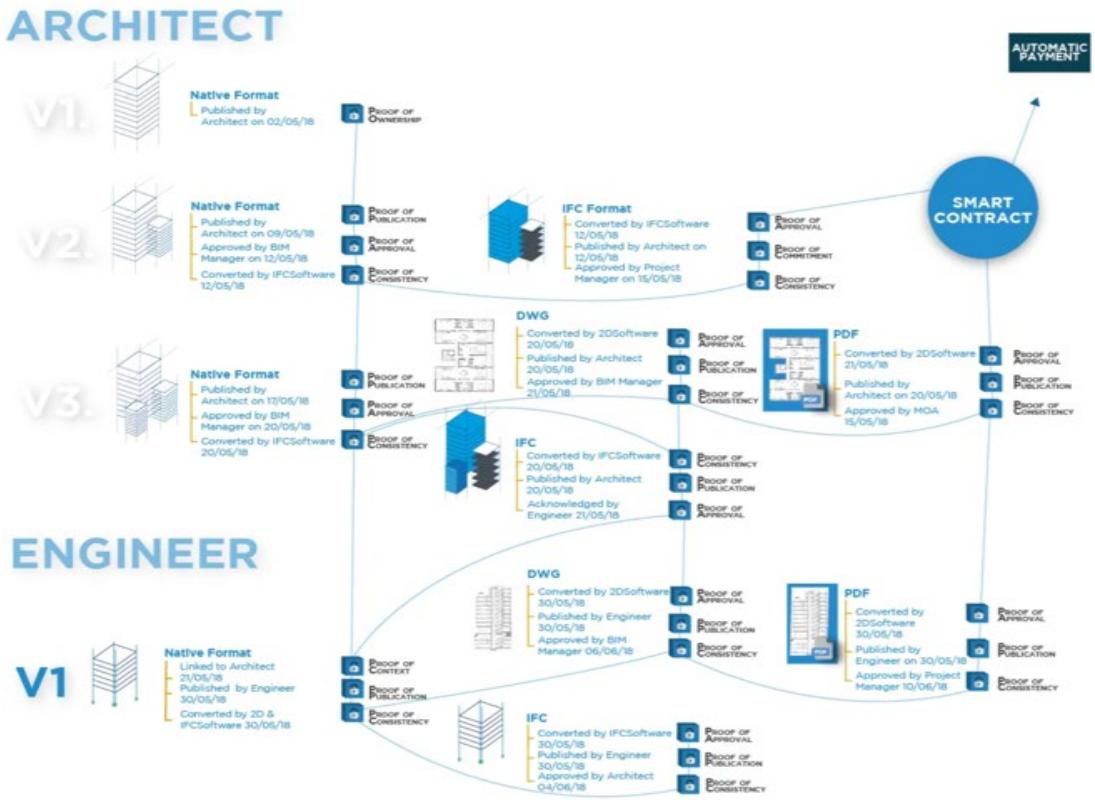

Figure 8: BIMCHAIN workflow and traceability

Note: Figure 8 shows how BIM data events are captured through the proof mechanism, stored in the encrypted data vault and linked to smart contract execution. Together these actions create a traceable, tamper-resistant audit trail of the build process.[109]

Smart Contracts

Comparing this implementation to the Smart Contracts Spectrum, BIMCHAIN is an example of a D4 use of smart contracts (see Figure 9). It uses a data-focused smart contract infrastructure that involves the uploading of data by verified parties in the supply chain to create an immutable record. It uses blockchain to elevate traditional BIM systems beyond merely the digital or automated processes to become something stored more securely.

It could be argued that this is a C3 or C4 smart contract rather than a D4. This is because the infrastructure does mention the use of 'hiring contractors through smart contracts'. However, this component of BIMCHAIN is not a core area that was expanded upon in its actual applications. Instead, it was more akin to creating permissions in the systems rather than actual contracts that involved true payments.

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[107] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.
[108] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.
[109] BIMCHAIN, 'Technology' (n.d.) <https://bimchain.io/technology>.

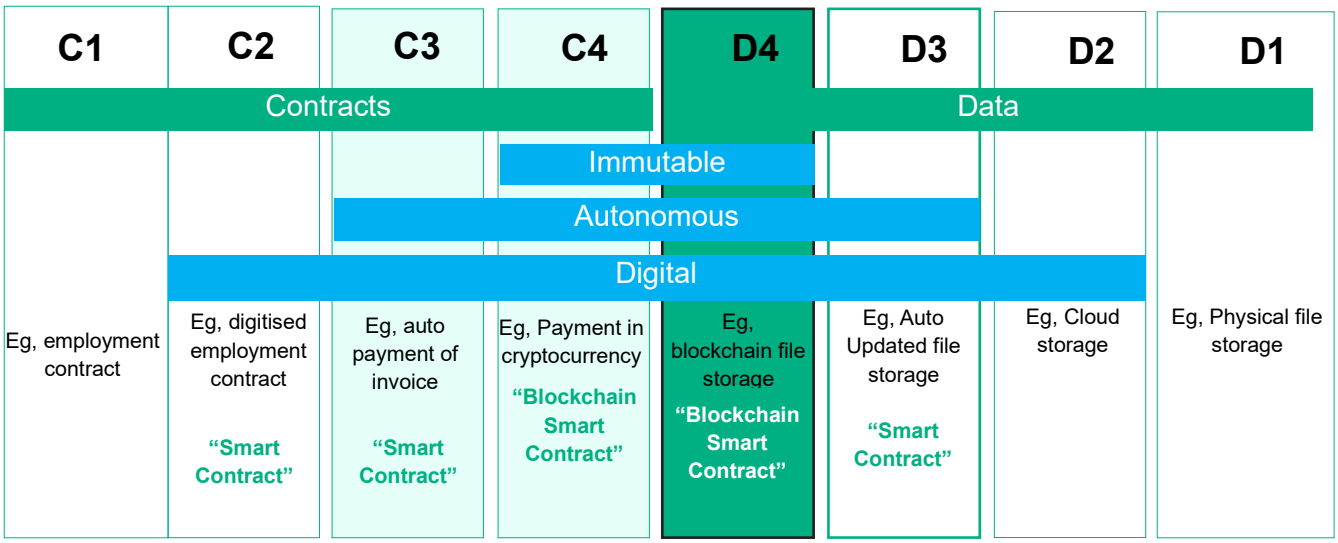

Figure 9: Smart Contracts Spectrum: BIMCHAIN Application

Benefits and Challenges

Benefits

BIMCHAIN is a real-world application that demonstrates a practical approach to implementing blockchain technology and smart contracts within the construction industry. It takes an existing principle (BIM) and attempts to enhance it with smart contracts. As such, it supports the following claims.

Decreased build costs: BIMCHAIN claims that the added benefit of blockchain could lead to up to a 20 per cent improvement in building life-cycle management.[110] Although evidence of this is limited, others have made similar claims. For instance, Dakhli estimates that blockchain could reduce total costs in the context of residential construction by approximately 8 per cent,[111] and Yu et al argue that a blockchain-based BIM model could yield positive economic outcomes by reducing the transaction costs associated with information acquisition.[112] These figures remain theoretical as BIMCHAIN was unable to scale beyond experimental applications.

Higher quality data: Traditional BIM projects store data, including contracts, payments, schedules and other relevant documentation, but this may be unreliable data.[113] BIMCHAIN addresses this issue by enabling users to export BIM data onto the blockchain, where it is recorded in a secure and transparent ledger that tracks all transactions and information. This makes tracking and authenticating information simpler.[114] According to Ali Hasan Hadi et al, 'Blockchain promotes

[110] BIMCHAIN, 'Solution' (n.d.) <https://bimchain.io/solution>.
[111] Z Dakhli, Z Lafhaj and J Laverge, 'The Potential of Blockchain in Construction' (2019) 9(4) *Buildings* 77 <https://doi.org/10.3390/buildings9040077>.
[112] W Jiang, X Zhao and J Zuo, 'Is Blockchain Cost-effective in Construction Project Management? A Systematic Review from the Perspective of Transaction Cost Theory' (2025) 33(1) *Engineering, Construction and Architectural Management* 28 <https://www.emerald.com/insight/content/doi/10.1108/ECAM-02-2024-0189>.
[113] AH Hadi, RT Hazem and YS Nassar, 'Integrating Blockchain and BIM (BCT-BIM) to Promote the Construction Practices in Terms of Efficiency and Transparency' (2026) 13(1) *SSRG International Journal of Civil Engineering* 230 <https://doi.org/10.14445/23488352/IJCE-V13I1P120>.
[114] Y Ni et al, 'Blockchain-based BIM Digital Project Management Mechanism Research' in *2021 IEEE International Conference on Networking, Sensing and Control* (ICNSC) (IEEE, 2021) <https://ieeexplore.ieee.org/abstract/document/9628068>.

collaboration between stakeholders by establishing a shared and trusted ledger, while BIM enhances coordination between teams by means of a virtual environment.'[115]

Increased security: BIMCHAIN also enhances the security and confidentiality of BIM data by leveraging blockchain technology. Blockchain enhances data security through the use of encryption mechanisms, making unauthorised access and data breaches more difficult.[116] By integrating blockchain technology, BIMCHAIN enables the use of zero-knowledge proofs,[117] allowing information to be verified by the system without disclosing the underlying data. This approach provides confidence to third parties that information is accurate and verified. At the same time, it assures builders and contractors that their data remain secure and confidential. As a result, data owners retain greater control over their information, benefiting from assured security and confidentiality of data while still retaining the ability to share their data.

Automation and efficiency: BIMCHAIN also improves efficiency by automating processes through the use of smart contracts.[118] Smart contracts verify the fulfilment of predefined conditions based on data recorded on the blockchain, enabling more timely and automated actions across the construction life-cycle. BIMCHAIN claims that this can reduce costs by replacing manual, paper-based processes.[119] Such a system, based on immutable proofs and conditional execution through smart contracts, helps to ensure that contractual obligations are fulfilled.[120] According to BIMCHAIN, such automation can also improve implementation efficiency and reduce costs by replacing more traditional paper-based processes.[121]

Challenges

The primary challenge in conducting this case-study was the limited availability of information to substantiate the claims made by BIMCHAIN. While there are examples that indicate real-world application of BIMCHAIN – such as the KROQI platform – a more detailed explanation of practical implementation of the technology is absent. The lack of literature on its real-world implementation has hindered the analysis of BIMCHAIN's true potential. Further, the absence of more recent documentation on BIMCHAIN adoption raises questions regarding its current status.

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[115] AH Hadi, RT Hazem and Y S Nassar, 'Integrating Blockchain and BIM (BCT-BIM) to Promote the Construction Practices in Terms of Efficiency and Transparency' (2026) 13(1) *SSRG International Journal of Civil Engineering* 230 <https://doi.org/10.14445/23488352/IJCE-V13I1P120>.

[116] S Perera, S Nanayakkara, MNN Rodrigo, S Senaratne and R Weinand, 'Blockchain Technology: Is It Hype or Real in the Construction Industry?' (2020) 17 *Journal of Industrial Information Integration* 100125 <https://doi.org/10.1016/j.jii.2020.100125>; Lachlan Robb, Felicity Deane and Warwick Powell, 'Panoptic Blockchain Ecosystems: An Exploratory Case Study of the Beef Supply Chain' (2020) 46(2) *Monash University Law Review* 57 <https://eprints.qut.edu.au/201385>.

[117] A zero-knowledge proof lets someone prove that a fact is true without revealing the sensitive information that proves it. In blockchain, this is achieved through a cryptographic hash where information is verified as merely 'true' or 'untrue' – it doesn't provide the information to the person asking.

[118] A Farea, 'Digital Transformation of the AEC Industry: A Review of BIM Implementation Toolkits from Leading Countries' (2026) *Smart and Sustainable Built Environment* <https://doi.org/10.1108/SASBE-07-2025-0367>.

[119] Z Dakhli, Z Lafhaj and J Laverge, 'The Potential of Blockchain in Construction' (2019) 9(4) *Buildings* 77 <https://doi.org/10.3390/buildings9040077>.

[120] AH Qureshi et al, 'Role of Blockchain and Cyber-Physical Systems (CPSs) in Execution of Sustainable Smart Construction' in *Recent Approaches of Sustainable Architecture in Arid and Semi-Arid Cities*, edited by Z ElZein and A Negm (Springer, 2025) <https://link.springer.com/chapter/10.1007/978-981-95-1645-2_15>; L Zhou et al, 'A Scientometric Review of Blockchain Research' (2020) 18(4) *Information Systems and e-Business Management* 817 <https://doi.org/10.1007/s10257-020-00461-9>.

[121] BIMCHAIN, 'Solution' (n.d.) <https://bimchain.io/solution>.

Omar et al identify 'legal uncertainties and industry adoption' as significant challenges for BIMCHAIN.[122] In particular, questions remain about the extent to which BIMCHAIN's claim about its legal enforceability can be substantiated. As noted by Abhinhaw, doubts persist over whether BIMCHAIN's assertions that it can improve data quality through a legally binding BIM model hold up, primarily because it remains unclear whether BIMCHAIN proofs would be admissible in the courts.[123]

In addition to legal concerns, BIMCHAIN has faced industry adoption challenges.[124] This issue is not unique to BIMCHAIN: Papuraj, Izadyar and Vrcelj note that the uptake of general BIM technology has been slow and below full potential.[125] Contributing factors include the digital maturity of industry stakeholders, reliance on traditional processes and the limited capacity of SMEs.[126] These same adoption principles logically are therefore amplified when also implementing blockchain systems.

BIMCHAIN's integration of smart contracts also briefly ventured into payment contracts (e.g. C4 smart contracts); however, this was met with a series of challenges. BIMCHAIN offered no further information on the implementation of these processes. In particular, when automated actions involve payments, distinct regulatory questions arise regarding the type of currency to be used. This application of smart contracts was discussed in the Paid case study.

Assessment of Practical Realities

While the BIMCHAIN case study presents a promising account of how smart contracts and blockchain technologies could benefit the construction industry, little information is available about the current status of the technology, and independent verification of its claimed capabilities is limited. Scholars such as Omar et al have highlighted that the real-world adoption of BIMCHAIN within the construction industry has been low due to factors including the high cost of technology adoption, the industry's lack of digital maturity and the prevalence of traditional practices in the industry. This reiterates the narrative that, despite extensive research highlighting the potential benefits of smart contracts and blockchain technologies for the construction sector, their practical implementation in the real-world context remains challenging.[127]

Mapping

Figure 6 can be expanded into Figure 10, in which certain events (in blue) in a build can pose certain data integrity and storage risks (in red). Using the information explored through the BIMCHAIN case study, we can attempt to rectify some of these risks with smart contracts (in green).

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[122] M Omar et al, 'A Blockchain-based Solution for High-rise Building Maintenance and Insurance Claims Using Building Information Modelling (BIM) Data' (2025) *Smart and Sustainable Built Environment* 1 <https://doi.org/10.1108/SASBE-01-2025-0028>.

[123] Abhinaw Sai Erri Pradeep, *Blockchain-based Information Systems to Improve Design Liability Control and Security of Information Exchange Records on Construction Projects* (Doctoral Thesis, 2022) <https://researchspace.auckland.ac.nz/items/8718e638-fd25-4206-90ff-4a3b9301b109>, 99–100.

[124] M Omar et al, 'A Blockchain-based Solution for High-rise Building Maintenance and Insurance Claims Using Building Information Modelling (BIM) Data' (2025) *Smart and Sustainable Built Environment* 1 <https://doi.org/10.1108/SASBE-01-2025-0028>.

[125] X Papuraj, N Izadyar and Z Vrcelj, 'Integrating Building Information Modelling into Construction Project Management: A Blockchain-based Approach' (2025) 15(1) *Buildings* 130 <https://doi.org/10.3390/buildings15010130>.

[126] A Farea, 'Digital Transformation of the AEC Industry: A Review of BIM Implementation Toolkits from Leading Countries' (2026) *Smart and Sustainable Built Environment* <https://doi.org/10.1108/SASBE-07-2025-0367>.

[127] M Omar et al, 'A Blockchain-based Solution for High-rise Building Maintenance and Insurance Claims Using Building Information Modelling (BIM) Data' (2025) *Smart and Sustainable Built Environment* 1 <https://doi.org/10.1108/SASBE-01-2025-0028>.

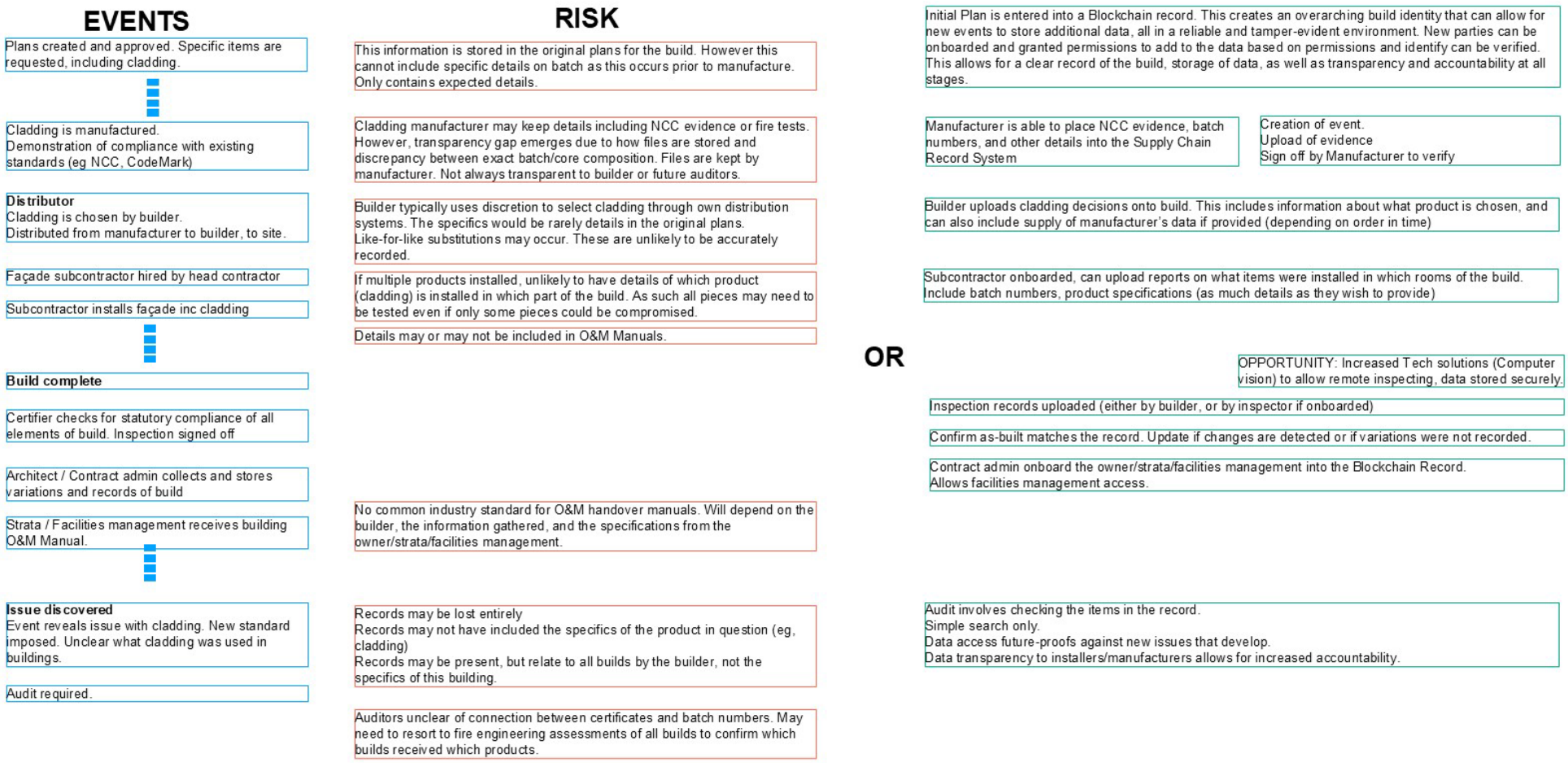

Figure 10: BIMCHAIN architecture mapping

The technology solutions (in green) are predominately already existing BIM systems that the construction system uses. However, there are some moments when a 'blockchain' system can be used to enhance and automate the smart contracts to gather and update data automatically, and to ensure a secure decentralised location for records.

Conclusion

BIMCHAIN serves as a notable example of how the benefits of smart contracts and blockchain can be integrated into the construction sector. As BIM technology becomes more widely adopted in Australian construction,[128] platforms such as BIMCHAIN represent a significant opportunity for advancing efficiency and data-management and the potential of smart contracts to enhance BIM further. Through effective data-management that relies heavily upon data integrity to both hold its users accountable, encourage better behaviour by users and provide a secure and reliable account of buildings in case it is needed at a later date. Such traceability of the data to the individual or organisation responsible for its input is especially important in the Australian construction landscape, where instances of inaccurate and unreliable reporting by stakeholders have been identified.[129]

BIMCHAIN preserves confidentiality of information through the implementation of a zero-knowledge proof mechanism. This feature is particularly important in the Australian construction context, where stakeholders such as clients, financial institutions and regulators may require verification that specific works have been completed without needing access to the actual data. Conversely, other stakeholders such as contractors and subcontractors may be willing to provide such verification while remaining reluctant to share such proprietary or sensitive information. Improving building life-cycle management could result in faster decision-making, improved accuracy and a reduced administrative burden, among other benefits.[130] This outcome is significant not only within the Australian construction industry, but also in the context of broader challenges facing the Australian economy, including the housing crisis and the prevalence of defective construction.

However, despite this potential, BIMCHAIN remains a research implementation that experiments with hypothetical applications. It is not yet viewed by industry as something sufficiently mature to adopt at scale. The benefits above and beyond traditional BIM systems therefore need to be validated if adoption of similar systems is to be successful.

Smart Contracts and Trust Tracking

Smart contracts can enhance trust between project participants through improved data integration, particularly by enabling the tracking and verification of contractor licensing and qualifications. This ensures that all individuals involved in construction activities are appropriately accredited. The OriginsNext case study illustrates how integrated data can extend transparency beyond the supply chain to the workforce itself. This increased visibility supports greater confidence in project delivery and strengthens assurance that the building, as constructed, aligns more closely with the building as planned.

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[128] Queensland Department of State Development, Infrastructure, Local Government and Planning, 'Building Industry Fairness (Security of Payment)' (n.d.) <https://www.statedevelopment.qld.gov.au/infrastructure>; Australian Government, 'Infrastructure Investment' (n.d.) <https://www.infrastructure.gov.au/infrastructure-transport-vehicles>.

[129] Australian Securities and Investments Commission, 'Crypto assets' (Information Sheet 225, n.d.) <https://www.asic.gov.au/regulatory-resources/digital-transformation/crypto-assets>; Victorian Government, 'Victorians Urged to Dob in Illegal Builders' (Media Release, n.d.) <https://www.premier.vic.gov.au/victorians-urged-dob-illegal-builders>.

[130] Ben Smee, 'Australia Building Half as Many Homes per Hour Worked Compared to 30 Years Ago', *The Guardian* (17 February 2025) <https://www.theguardian.com/australia-news/2025/feb/17/australia-building-half-as-many-homes-per-hour-worked-compared-to-30-years-ago-productivity-commission-finds>.

The Problem

Construction projects are inherently complex, involving multiple stakeholders working across different phases. Each handover, from design to build, from contractor to subcontractor, introduces opportunities for miscommunication, incomplete documentation and loss of critical information. Interviewees consistently highlighted this fragmentation:

> *The whole problem is that you're building a building in that environment where there are so many people involved … there's so many handoffs, there's so much disconnect …*[131]

This disconnect creates uncertainty. Requests for variations, changes in scope and informal communications often go undocumented, leaving stakeholders without a clear record of decisions or responsibilities. Process transparency, involving the sharing of specifications, quality standards and progress update, is essential to ensure alignment and early identification of issues.[132]

There are recurring trust issues within the construction industry related to build integrity, which in turn is linked to the qualifications of building professionals engaged. While many transparency issues stem from disorganisation or complexity, some actions are deliberately opaque. Interviewees pointed to instances of fraudulent practices, where stakeholders intentionally misrepresent information to gain an advantage, whether in contracts, payment claims or regulatory submissions. These actions erode trust and compromise the integrity of the industry.

> *If you want insurance and you want to build anything, you got to give us your building contract every single time. So, what they typically will do is … they'll send dodgy, dodgy contracts through … But because there's no connectivity with a contract, it's like, well, who's to say it's wrong?*[133]

Cases of forged documents, fraudulent permits and impersonation of officials have been documented by regulators such as the BPC.[134] These practices not only undermine transparency, but also expose insurers, regulators and clients to legal and financial risk.

The interviews reveal that transparency is not just a technical or procedural issue; it is a strategic imperative. Without it, the construction industry faces systemic risks: unsafe buildings, financial losses, legal disputes and erosion of public trust. Transparency must be embedded in every phase of a project, supported by robust documentation, digital tools and shared accountability. A fictional example of this is depicted in Figure 11 to demonstrate potential alleviation of risks and problems through smart contracts.

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[131] 12 February 2025 Interview (Organisation 4, Person 1).

[132] DA Brady, P Tzortzopoulos, J Rooke, CT Formoso and J Harbour, 'Improving Transparency in Construction Management: A Visual Planning and Control Model' (2018) 25(10) *Engineering, Construction and Architectural Management* 1277 <https://doi.org/10.1108/ECAM-06-2017-0105>.

[133] 21 February 2025 Interview (Organisation 1, Person 1).

[134] Building and Plumbing Commission (then Victorian Building Authority), 'Fake Building Surveyor Fined $60,000 after Complex VBA Investigation' (1 May 2025) <https://www.vba.vic.gov.au/news/news/2025/fake-building-surveyor-fined-$60,000-after-complex-vba-investigation>; Master Builders Association NSW, 'Builder Banned for Life after Fraud Findings' (27 June 2025) <https://mbansw.asn.au/media/industry-news>.

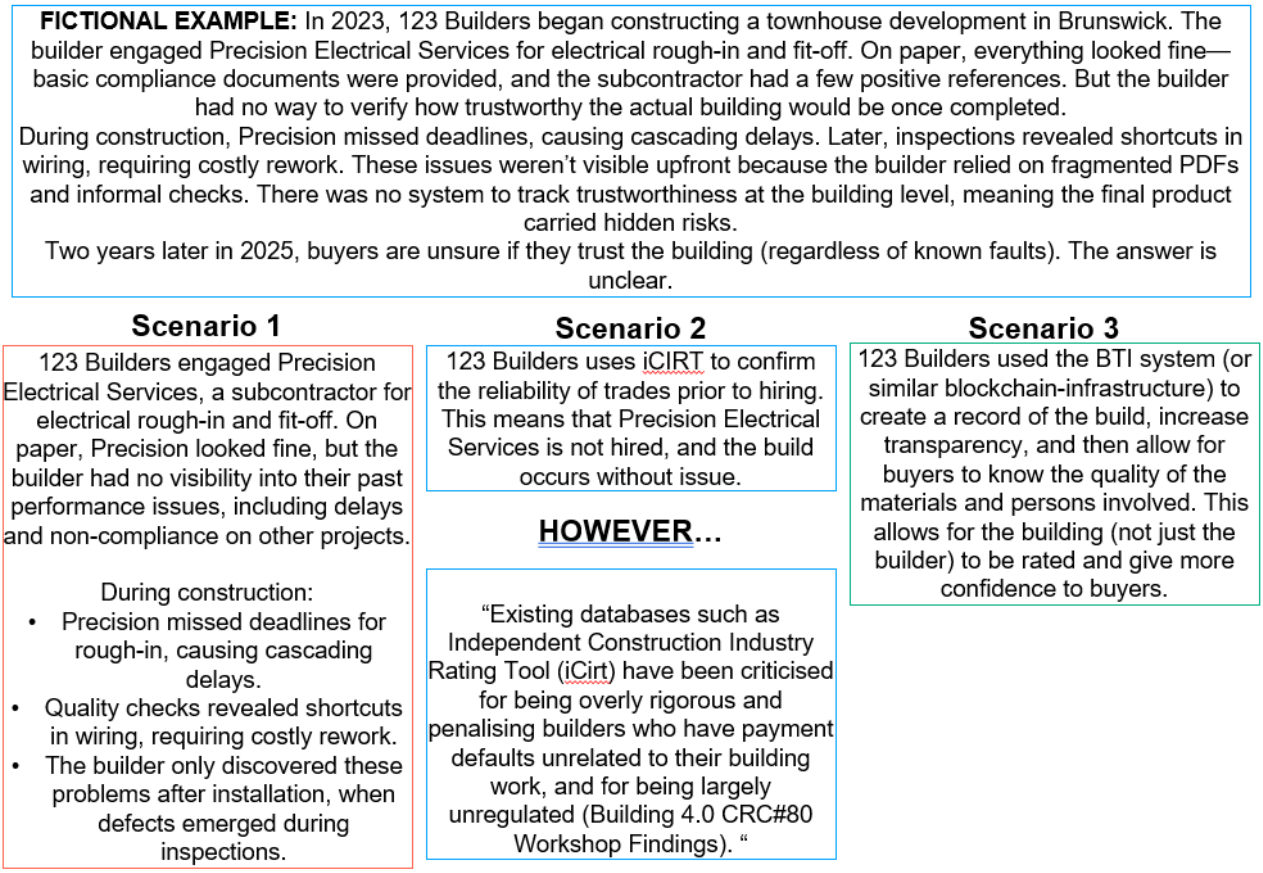

Figure 11: The construction supply chain in the OriginsNext context

Figure 11 shows an example of a disconnect between abstract qualifications and practical reliability of trades. This normally is resolved through social means, local trust and word-of-mouth; however, these solutions are not practical at scale. The red demonstrates the inherent risk that may come from this problem, where hiring an under-skilled tradesperson can lead to a range of flow-on problems. In the blue box, the example highlights where there are technological systems such as iCIRT that are deployed to attempt to resolve these problems, albeit with some limitations. Finally, the green box shows a third scenario where smart contract systems could be used to verify the reputation of tradespeople and increase the quality of the build as a whole. This third scenario is a potential application of verification systems using blockchain technology.

OriginsNext

- ***OriginsNext is an example of how blockchain smart contracts, alongside other technologies, can create a reputation system based on enhanced data-management of construction projects.***
- ***It was initially launched as 'KPMG Origins' by KPMG Australia in partnership with the NSW Office of the Building Commissioner and industry partners in 2022 in response to major defects in high-profile buildings in New South Wales.***
- ***It is a market-let digital product that enables stakeholders to differentiate between trustworthy and non-trustworthy built assets.***
- ***It uses blockchain smart contracts to create immutable data storage that enhances the supply chain and exists as a 'digital fingerprint' for the buildings.***
- ***It provides assessment of the completed building itself. This incorporates factors such as how it was built, who built it and what was built. This enhances other reputation systems that are derived purely from builder or developer reputations.***
- ***The ratings differentiate between merely compliant buildings versus high-quality buildings, rating buildings as trustworthy, leading and benchmark.***
- ***Accurate assessment of the buildings achieves benefits for different stakeholders in different ways. For instance, regulators can identify high-risk actors in the industry. Banking and financial institutions can easily assess the quality, risk and insurability of construction projects.***
- ***OriginsNext is still an active implementation.***

Summary

The OriginsNext case study illustrates a practical application of blockchain technology. Its 'Building Trustworthy Indicator' (BTI) feature highlights how blockchain can support trust and accountability in the construction industry.[135] The BTI, part of the KPMG Origins platform, leverages data on construction stakeholders, materials and relevant certifications to help stakeholders distinguish between high-quality and substandard buildings. KPMG Australia has officially transitioned the blockchain-enabled platform KPMG Origins into a standalone start-up, OriginsNext.[136] It now operates independently, as OriginsNext holds full ownership of all intellectual property and assets developed under KPMG Origins and maintains its focus on providing solutions for the construction sector.[137] KPMG Australia continues to use this technology to serve its existing clients and

[135] Centre for Smart Modern Construction, Western Sydney University, 'Roundtable – February 2023' (February 2023) <https://www.westernsydney.edu.au/centre-for-smart-modern-construction/news>; Construction Management, 'Home' (n.d.) <https://www.constructionmanagement.co.uk>; Consultancy Australia, 'KPMG Supports Blockchain Ratings Index for NSW Building Industry' (n.d.) <https://www.consultancy.com.au/news/4723>.

[136] OriginsNext, 'Building Trustworthy Indicator' (Webpage, n.d.) <https://www.originsnext.com>; K Cromley, 'KPMG Spins off Blockchain Platform as New Startup OriginsNext' *CoinTrust* (9 April 2025) <https://www.cointrust.com/market-news/kpmg-spins-off-blockchain-platform-as-new-startup-originsnext>.

[137] K Cromley, 'KPMG Spins off Blockchain Platform as New Startup OriginsNext', *CoinTrust* (9 April 2025) <https://www.cointrust.com/market-news/kpmg-spins-off-blockchain-platform-as-new-startup-originsnext>.

collaborates with OriginsNext to provide service to new clients.[138] OriginsNext maintains a collaborative relationship with the KPMG Network.[139]

Company Profile

KPMG Australia, in partnership with the NSW Government, developed the BTI in 2022 as part of the Building Assurance Solution initiative.[140] The implementation was led by KPMG in partnership with Microsoft, University of Western Sydney's Centre for Smart Modern Construction, and Mirvac.[141]

The BTI was initiated in response to a recognised policy imperative to raise building standards and reinforce trust in the built environment within New South Wales.[142] The BTI is integrated into a wider blockchain infrastructure, OriginsNext, which also includes a range of other supply chain applications, such as with SunRice[143] and Pooley Wines.[144]

The focus of the BTI on the construction industry arose because of a series of well-publicised structural and safety failures in residential apartment buildings, most notably the Opal Tower and Zetland developments, which became a point of concern for the NSW government.[145] Consequently, David Chandler OAM was appointed in 2019 as the Building Commissioner, with a mandate to improve the quality of construction in NSW.[146] In 2021, the Building Assurance Solution initiative was announced in partnership with KPMG to collate data into a comprehensive digital record, effectively creating what it called a 'digital DNA' for each building.[147]

The Building Assurance Solution was designed for implementation as a part of NSW Remediate Program, a three-year government initiative aimed at removing life-safety risks by removing combustible cladding on high-risk Class 2 buildings identified by the NSW Cladding Taskforce.[148]

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[138] OriginsNext, 'News' (n.d.) <https://www.originsnext.com/news>.
[139] OriginsNext, 'News' (n.d.) <https://www.originsnext.com/news>.
[140] Kane Bridge News, 'Not Sure about that Apartment Purchase? Check out the New Digital Tool Bringing Surety to Buyers' (5 December 2023) <https://kanebridgenews.com/not-sure-about-that-apartment-purchase-check-out-the-new-digital-tool-bringing-surety-back>.
[141] Consultancy Australia, 'KPMG Supports Blockchain Ratings Index for NSW Building Industry' (n.d.) <https://www.consultancy.com.au/news/4723/>; Designing Buildings, 'Building Trustworthy Indicator (BTI)' (Wiki, n.d.) <https://www.designingbuildings.co.uk/wiki/Building_Trustworthy_Indicator_BTI>.
[142] B Dabu, 'World-leading Construction Assurance Tool in the Works' Real Estate Business (n.d.) <https://www.realestatebusiness.com.au/tech>.
[143] KPMG Australia, Building Trustworthy Indicator (Methodology Document, 2022) <https://kpmgorigins.com/hubfs/BTI%20Methodology-3.pdf>.
[144] KPMG, 'Blockchain in Agriculture' (2020) <https://kpmg.com/ky/en/home/insights_new/2020/05/blockchain-agriculture.html>.
[145] P E D Love and J Matthews, 'Quality, Requisite Imagination and Resilience: Managing Risk and Uncertainty in Construction' (2020) 204 *Reliability Engineering & System Safety* 107116 <https://doi.org/10.1016/j.ress.2020.107116>.
[146] Designing Buildings, 'Building Trustworthy Indicator (BTI)' (Wiki, n.d.) <https://www.designingbuildings.co.uk/wiki/Building_Trustworthy_Indicator_BTI>.
[147] Designing Buildings, 'Building Trustworthy Indicator (BTI)' (Wiki, n.d.) https://www.designingbuildings.co.uk/wiki/Building_Trustworthy_Indicator_BTI; Andrew Birmingham, 'How KPMG Mirvac and ASX Use Blockchain to Build Trust in the Property Sector' *ITnews* (8 August 2022) <https://www.itnews.com.au/video/cover-story-how-kpmg-mirvac-and-asx-use-blockchain-to-build-trust-in-the-property-sector-583727>.
[148] Australian Sustainable Built Environment Council, 'NSW Government Building Assurance Solution Tool' (n.d.) <https://www.asbec.asn.au/news-items/nsw-government-building-assurance-solution-tool>; NSW Planning Portal, 'Project Remediate' (n.d.) <https://www.planningportal.nsw.gov.au/help-and-resources/project-remediate>.

This led to the launch of the BTI in 2022 as a response to concerns about the poor building quality of high-profile developments in New South Wales.[149]

The BTI enabled greater building supply provenance by allowing stakeholders and relevant parties to track all the information related to the building.[150] The conceptualisation of BTI was underpinned by this vision to create a 'Digital DNA' of a building that would allow stakeholders to effectively map materials used, construction processes followed and stakeholders involved in a construction project.[151] This ensures effective tracing of components related to a building throughout the life-cycle of the project.

Description of the Technology

OriginsNext has two core components relevant to the construction industry. The first is the construction industry implementation. This is the BTI that uses a range of data points to attribute a trust rating to building projects. This is supported by the overarching blockchain architecture of OriginsNext.

The Application: BTI

The KPMG Origins BTI is a rating platform that enables stakeholders to see the trustworthiness of a building – that is, the quality of the building construction. It is a market-driven building technology product that helps users distinguish between reliable and unreliable buildings.[152] The technology enables users to compare similar or very different buildings across a range of standard variables.[153]

The BTI seeks to translate the concept of 'trust' in the built environment into a measurable, evidence-based indicator. The main objective of the BTI is to make construction processes more transparent by systematically capturing data on participants, materials and certification practices across the building life-cycle. By encapsulating evidence about the participants (such as builders, contractors, subcontractors, architects, engineers and tradespeople), the materials used in construction and the certificates and documents related to the building, the BTI seeks to promote transparency in relation to built assets. This assists stakeholders to differentiate between high-quality and low-quality built assets.[154] It is underpinned by the policy goal of restoring trust within the building industry ecosystem by promoting transparency in relation to built assets. The BTI is also seen as a mechanism to promote accountability among the industry participants in relation to their compliance with required

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[149] H Gao and L Zou, 'How to Improve Customer Trust in Residential Quality: An Analysis of Quality Information Disclosure Strategies Considering Blockchain' (2025) 151 (9) *Journal of Construction Engineering and Management* <https://ascelibrary.org/doi/full/10.1061/JCEMD4.COENG-16593>; B. Reed, 'Sydney Olympic Park: Opal Tower and Surrounds Evacuated after "cracking" Sounds', *The Guardian* (24 December 2018) <https://www.theguardian.com/australia-news/2018/dec/24/police-operation-in-sydney-olympic-park-after-cracking-heard-in-apartment-tower>.

[150] Denise Chevin, 'Can a Blockchain Assurance Tool Build Trust in Residential Construction?' *Construction Management* (5 June 2025) <https://constructionmanagement.co.uk/blockchain-assurance-tool-build-trust-in-residential-construction>.

[151] W Arnott, 'NSW and KPMG Develop tool to Determine Building Compliance', *Inside Construction* (20 July 2021) <https://www.insideconstruction.com.au/section/professional-services/nsw-and-kpmg-develop-tool-to-determine-building-compliance>.

[152] Centre for Smart Modern Construction, Western Sydney University, 'Western Sydney' (28 February 2023) <https://www.westernsydney.edu.au/centre-for-smart-modern-construction/news>.

[153] M Bleby, 'How Trustworthy is Your Building?', *Australian Financial Review* (24 June 2021) <https://www.afr.com/property/commercial/how-trustworthy-is-your-building-20210621-p5830v>.

[154] Kane Bridge News, 'Not Sure About that Apartment Purchase? Check out the New Digital Tool Bringing Surety to Buyers' (5 December 2023) <https://kanebridgenews.com/not-sure-about-that-apartment-purchase-check-out-the-new-digital-tool-bringing-surety-back>.

regulations, thereby improving overall construction quality and strengthening trust between stakeholders in the construction sector.

The foundational component of the BTI is its two-stage assessment mode: 'trustworthy as designed' and 'trustworthy as built'.[155] The first stage, trustworthy as designed, evaluates compliance of designed building components with applicable regulatory and technical standards in terms of design specifications, material selection and compliance pathways.[156] The second stage, trustworthy as built, includes assessment of whether the buildings have been delivered in accordance with those specifications. The evidence relies upon verified evidence such as inspection records, as-built documentation and installation certifications.[157]

The types of information processed include:[158]

- details of stakeholders involved in the construction process, including track records of builders and subcontractors involved
- origin and quality of building materials
- construction methods used in the process, and
- all relevant certificates throughout the construction life-cycle, including design, construction and commissioning of buildings.

Data are provided and calculated in a series of stages. The first stage includes document upload and conversion.[159] In this stage, the qualitative data provided by stakeholders are converted into quantitative variables based on set metrics of completeness, quality and verification status of evidence. This data are self-reported by verified stakeholders. The degree of trust for documentation provided depends on the properties of the document.

The second stage is the calculation phase; this involves observing the risk from the construction process, the components involved in the build and the specific risks linked to those building it. These variables are used to calculate scores at the level of individual construction systems, thereby reflecting their compliance and performance. The risk relationship calculation involves evaluating the interdependence of each system in relation to the others, rather than as isolated components. The trustworthiness distribution of the building element is calculated by considering the trustworthiness distribution of each construction system and their interdependencies.[160]

The final stage includes an output that comprises a scaled composite indicator, often expressed as a rating. At this stage, the historical profile of the participants involved is also taken into consideration by the calculation engine. Such historical metrics of performance and trustworthiness include the iCIRT rating.[161] This enables comparability across projects and supports risk-based decision-making. As such, the overall output is a combination of these stages of data, the ability to see the

[155] Kane Bridge News, 'Not Sure About that Apartment Purchase? Check out the New Digital Tool Bringing Surety to Buyers' (5 December 2023) <https://kanebridgenews.com/not-sure-about-that-apartment-purchase-check-out-the-new-digital-tool-bringing-surety-back>.
[156] KPMG Australia, Building Trustworthy Indicator (Methodology Document, 2022) <https://kpmgorigins.com/hubfs/BTI%20Methodology-3.pdf?hsLang=en>.
[157] KPMG Australia, Building Trustworthy Indicator (Methodology Document, 2022) <https://kpmgorigins.com/hubfs/BTI%20Methodology-3.pdf?hsLang=en>.
[158] Centre for Smart Modern Construction, Western Sydney University, 'Western Sydney' (28 February 2023) <https://www.westernsydney.edu.au/centre-for-smart-modern-construction/news>.
[159] KPMG Australia, *Building Trustworthy Indicator* (KPMG, 2022), 18–19.
[160] KPMG Australia, *Building Trustworthy Indicator* (KPMG, 2022), 19.
[161] iCIRT (Independent Construction Industry Rating Tool), 'Home' (n.d.) <https://icirt.com>.

original documents, calculations derived from how it was built and the external iCIRT rating of the individuals involved in the build.

The Infrastructure: KPMG Origins[162]

Blockchain and smart contracts are core elements of the BTI's integration into OriginsNext's architecture. Blockchain technology is used to create tamper-resistant, immutable records of supply chain events. Blockchain is combined with traditional systems – cloud services and AI – so users do not need to interact with wallets or tokens. The design supports permissioned access, meaning only authorised parties (e.g. suppliers, auditors, regulators) can view or write data.[163]

The BTI is supported by KPMG's blockchain technology, KPMG Origins, from an implementation perspective.[164] KPMG Origins is a blockchain-based system designed to streamline data exchange and coordination across organisations and industries. It is a distributed ledger technology application in the Syfini environment using the ASX infrastructure.[165] Other applications supported by the KPMG Origins platform include KPMG Origins Asset Impact and KPMG Origins Integrated Waste Tracking system, which focus on the construction, waste management and agriculture sectors.[166]

As mentioned above, the data are provided by manufacturers, developers and other participants involved in the project and are stored on the platform.[167] Through the application of the decentralised aspect of the blockchain-technology, different stakeholders (e.g. designers, builders, developers and certifiers) retain commercial control over the data they hold, and these data can be trusted to have come from those specific sources.[168]

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[162] While the resources available detailing the description of the Building Trustworthy Indicator is scarce, inference can be drawn from KPMG's other blockchain-based transparency platforms. See A Birmingham, 'How KPMG Mirvac and ASX Use Blockchain to Build Trust in the Property Sector', *ITnews* (8 August 2022) <https://www.itnews.com.au/video/cover-story-how-kpmg-mirvac-and-asx-use-blockchain-to-build-trust-in-the-property-sector-583727>. Namely blockchain-based track and trace platform to provide transparency and traceability for supply chain for food industry trialled by Canegrowers, SunRice and Mitchell Wines. See, for example, Ledger Insights, 'KPMG Launches Blockchain Supply Chain Solution' (28 November 2019) <https://www.ledgerinsights.com/kpmg-blockchain-food-traceability>.

[163] K Cromley, 'KPMG Spins off Blockchain Platform as New Startup OriginsNext', *CoinTrust* (9 April 2025) <https://www.cointrust.com/market-news/kpmg-spins-off-blockchain-platform-as-new-startup-originsnext>.

[164] Ledger Insights, 'KPMG Launches Blockchain Supply Chain Solution' *Ledger Insights* (28 November 2019) <https://www.ledgerinsights.com/kpmg-blockchain-food-traceability>.

[165] Consultancy Australia, 'KPMG Supports Blockchain Ratings Index for NSW Building Industry' (n.d.) <https://www.consultancy.com.au/news/4723>.

[166] K Cromley, 'KPMG Spins off Blockchain Platform as New Startup OriginsNext', *CoinTrust* (9 April 2025) <https://www.cointrust.com/market-news/kpmg-spins-off-blockchain-platform-as-new-startup-originsnext>.

[167] M Bleby, 'How Trustworthy is Your Building?', *Australian Financial Review* (24 June 2021) <https://www.afr.com/property/commercial/how-trustworthy-is-your-building-20210621-p5830v>.

[168] M Bleby, 'How Trustworthy is Your Building?', *Australian Financial Review* (24 June 2021) <https://www.afr.com/property/commercial/how-trustworthy-is-your-building-20210621-p5830v>.

Smart Contracts

Looking to the smart contract spectrum, the OriginsNext platform is an example of a D4 (and sometimes D3) use of smart contracts (Figure 12).

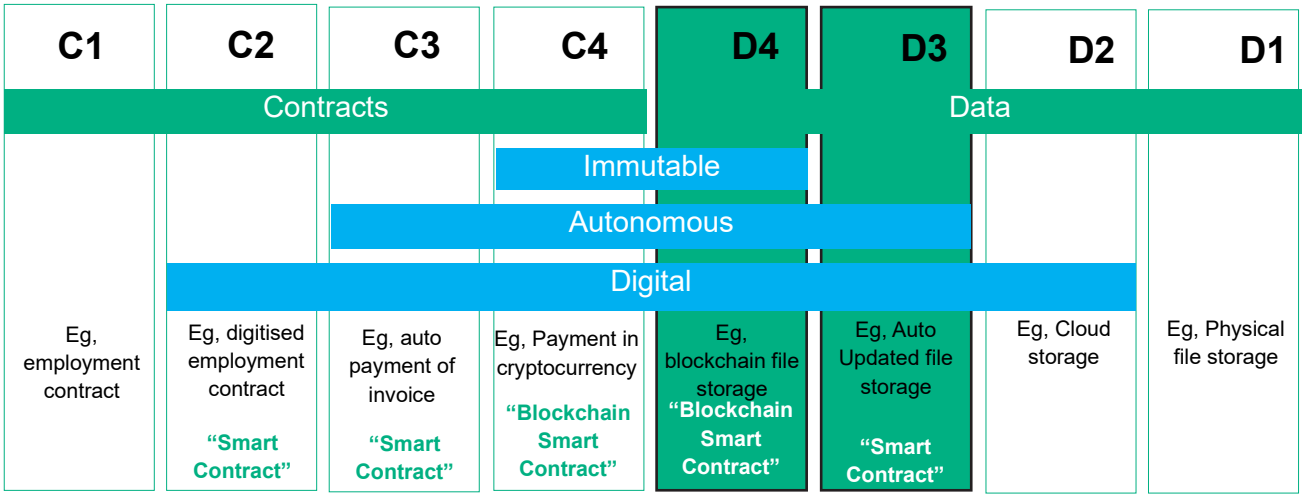

Figure 12: Smart Contracts Spectrum: OriginsNext Application

This is a data-focused smart contract infrastructure. It involves the uploading of data by verified parties in the supply chain to create an immutable record, which contributes to the reputation scoring of the platform. However, blockchain is only one component of that system and other sources and technologies are drawn upon to create a more holistic system.

Benefits and Challenges

The BTI provides transparency to stakeholders about the trustworthiness of a building based on how it was built, what it was built with and who built it.

Unlike the other rating instruments, such as iCIRT, that measure the trustworthiness of entities engaged in the construction business, the BTI measures the quality of the building itself.[169] Rating systems that measure building professionals may be useful to assess building vendor compliance and past performance, but they do not necessarily provide analytics on the quality of the final built product. By measuring the reliability of a building in terms of key metrics and by utilising industry-developed calculations to determine the trustworthiness of a building, the BTI supports informed stakeholder decision-making.

The use of blockchain technology is especially significant, as it ensures accurate and reliable data are provided by the stakeholders due to its immutable nature. All records are stored on the blockchain, including records of who uploaded the data and whether any changes have been made to the data. If incorrect information has been uploaded on the blockchain or any changes have been made to the existing information, stakeholders can identify the inaccuracies with complete transparency, ensuring that all relevant parties are accountable. Therefore, the BTI ensures that reliable and accurate information is captured on to the platform.

Assessment of Practical Realities

[169] iCIRT (Independent Construction Industry Rating Tool), 'Home' (n.d.) <https://icirt.com>.

OriginsNext is a realistic application of blockchain technology in the construction industry. It is more than 'hypothetical', as the overarching technology has been tested in a number of areas (rice, wine, etc.), then applied to the building industry for a few test builds in collaboration with the government. Despite the benefits discussed above, there is little information available online, which makes a comprehensive assessment of the technology difficult. However, based on secondary accounts, many industry experts have praised the benefits of the Building Trustworthy Indicator, especially its transparency and traceability aspects.[170] This is also substantiated by the creation of a separate dedicated entity in the form of OriginsNext to continue services offered.

Practical reasons have prevented deeper use of the OriginsNext platform, including changing political priorities and the 'spinning off' of OriginsNext from KPMG necessitating time to rebuild capabilities. At the time of writing, OriginsNext is still a live entity and intending to grow and continue to offer smart contract and blockchain solutions within the Australian construction industry, something that makes it unique.

Mapping

The fictional case study in Figure 11 can be expanded into Figure 13, which highlights the implementation steps for using smart contracts in a similar way to OriginsNext. A series of inherent issues and risks exist (red box), which can potentially be solved through technology such as iCIRT (blue box) or alternatively be resolved more comprehensively through smart contracts (green box).

Figure 13 shows how smart contracts can integrate some of the benefits of platforms such as iCIRT but combine them with wider data from different proprietary systems in a way that enhances transparency rather than risking the proliferation of errors in black-box systems. This also has the potential to go further and engage with Zero Knowledge Proofs and advanced forms of data security to further protect privacy and allow for more trust in the systems that themselves perpetuate or question trust narratives.

Conclusion

The KPMG Origins BTI case study helps us to understand the implementation of blockchain technology in the context of the Australian construction landscape. The BTI uses the trust of blockchain (as well as other technology) to achieve more than non-blockchain systems (e.g. iCIRT). This allows for supply chain data, builder integrity data and direct evidence to rate the trustworthiness of a built asset in an evidence-rich environment. In contrast to existing systems that primarily rate building contractors, it rates the built asset itself, thereby creating a 'digital DNA' of the building. The BTI measures trustworthiness in terms of both the design component 'Trustworthy as Design' and the built product 'Trustworthy as Built'. Ultimately, it demonstrates the potential of data-focused smart contracts to enhance trust in supply chains and reduce the gap between the building-as-planned and the building-as-built.

[170] D Chevin, 'Can a Blockchain Assurance Tool Build Trust in Residential Construction?', *Construction Management* (5 June 2025) <https://constructionmanagement.co.uk/blockchain-assurance-tool-build-trust-in-residential-construction>.

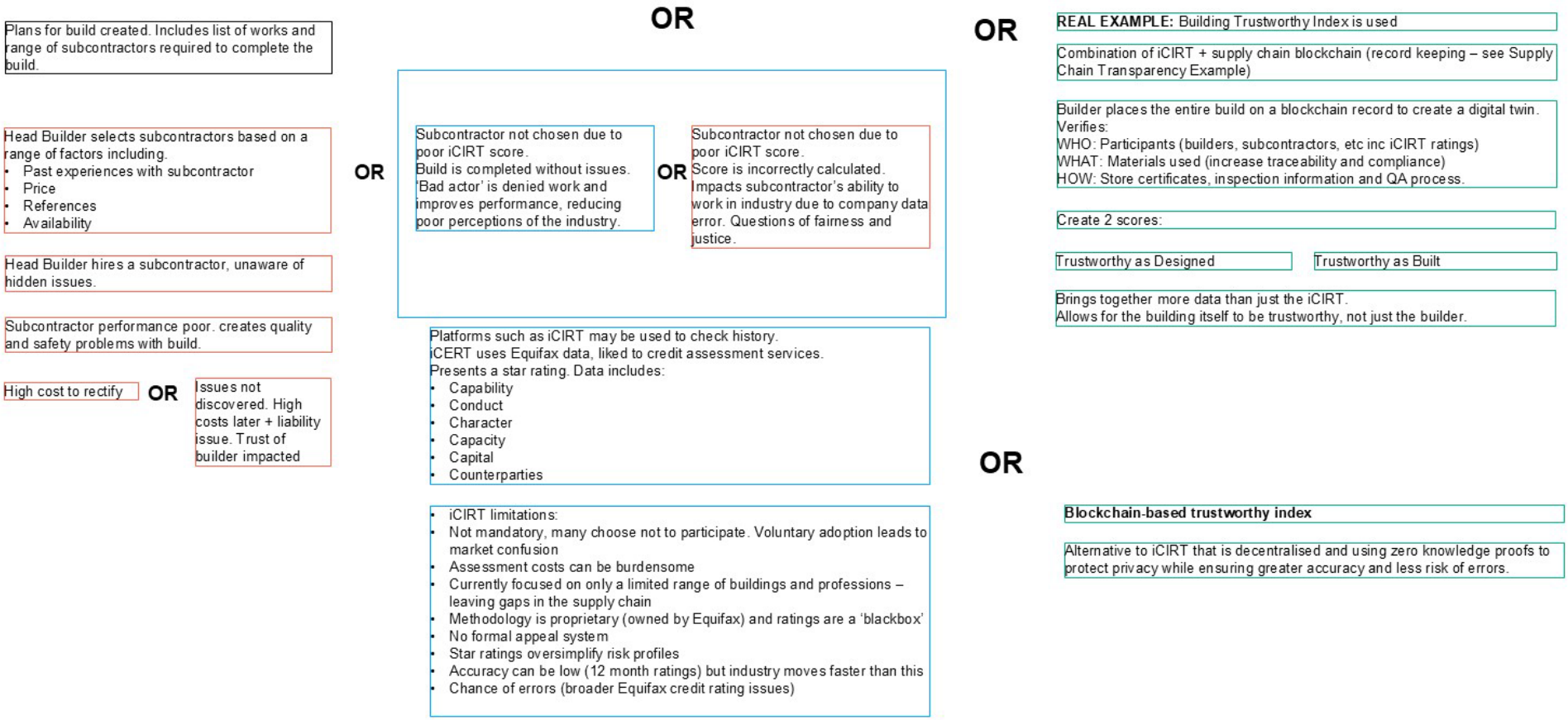

Figure 13: Smart contracts integrating iCIRT credential data with supply chain provenance

5. ADOPTION CHALLENGES

This section explores specific challenges to adopting blockchain smart contracts in the construction industry. While this technology has the potential to resolve industry challenges, key barriers exist that prevent widespread integration. These are addressed in three sections.

This discussion focuses on the potential for smart contracts to facilitate payment. The following includes data from the case study results and incorporates consideration of the regulatory regime as of May 2026.

There is potential for smart contracts to automate payments upon completion of agreed milestones in the construction industry. This system must be legally compliant and, depending on how the smart contracts are designed, their management may amount to financial services, which may require the holding of an AFSL. However, the Australian legal regime is still in a state of flux. Besides the legal compliance, the value of smart contracts is seen in automated payments that could be trustworthy, seamless and legally enforceable, so the payment asset must be both programmable and stable. CBDCs are uniquely suited to fulfilling this role.

This discussion engages with blockchain smart contracts, namely the immutable, autonomous, digital expressions of smart contracts that are designated in this report to be C4 and D4 iterations (blockchain smart contracts) (see Figure 14).

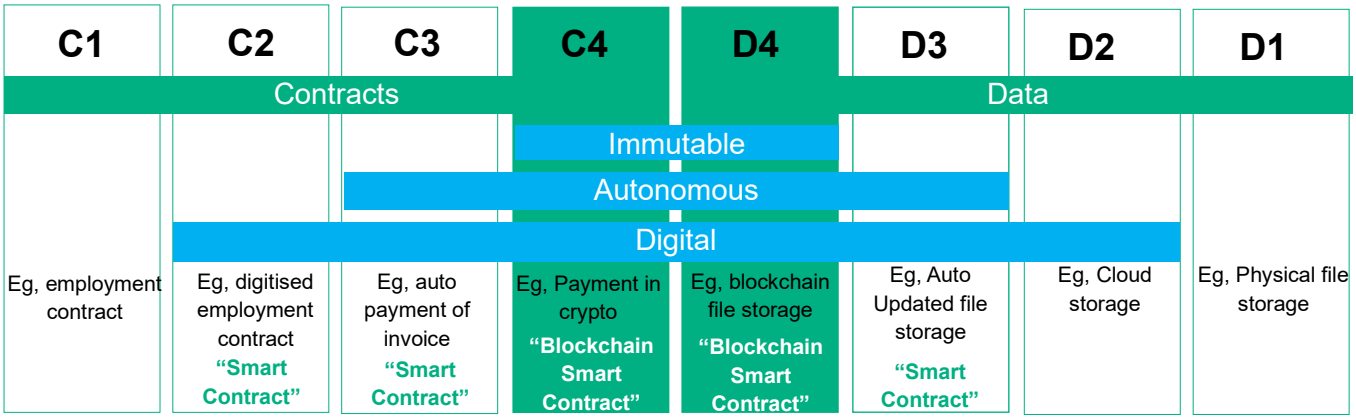

Figure 14: The Smart Contracts Spectrum (C4, D4 Highlight)

The case studies do not demonstrate practical examples of what could be called blockchain smart contracts. As discussed, Paid is C3 and D3, BIMCHAIN is D4, with some small parts including C3 capabilities, and Origins Next is D4 with many parts operating as D3. It is therefore important to consider what a C4 and D4 platform could look like, and what some of the challenges to this may be.

Fully Integrated Blockchain Smart Contracts

Smart contracts are created through code that automatically executes agreed contractual terms when certain conditions are met. In the construction industry, they offer the promise of potentially automating progress payments upon the completion and certification of specific project milestones. By reducing delays in payment, smart contracts can help to reduce counterparty risk, improve cash flow and mitigate the risk of insolvency. This is particularly

important for subcontractors and SMEs that are disproportionately affected by delayed or unpaid claims. Beyond financial benefits, smart contracts also allow for secure, tamper-resistant records of contract performance, offering a clear audit trail for compliance, certification and dispute-resolution.

By contrast, fully integrated blockchain smart contracts (i.e. C4, D4) operate on a blockchain that secures the data in a seemingly unbreakable chain. These contracts not only automate performance, but also embed execution, enforcement and payment within the same decentralised infrastructure. For example, payments may be made in cryptocurrencies or tokenised assets, and contract performance may be verified through on-chain data or trusted external 'oracles'. This integration reduces reliance on intermediaries, as both the contractual logic and the transfer of value occur within the blockchain itself. As a result, fully integrated smart contracts can offer a higher degree of transparency, immutability and trust minimisation. However, they also introduce additional complexities such as volatility in token value, regulatory uncertainty and the need for participants to engage with blockchain-specific tools and protocols.

In the construction context, this distinction is significant. While digitised smart contracts may be adopted more readily in the short term due to compatibility with existing legal and financial systems, fully integrated blockchain contracts represent a more transformative model that could reshape how risk, payment and trust are managed across the project life-cycle.

As explored in the case studies, smart contracts can be used to enhance how contract payments are made. Through a C4D4 blockchain application, payments can be made in the form of cryptocurrency, stablecoins or CBDCs that are instantaneous. The contracts can also be executed automatically on a blockchain that verifies that payment conditions are correctly met; payment is then instantaneously released.

Smart contracts can also enhance supply chain transparency by providing a clear, updated and (potentially) immutable record of the manufacture and construction of a building. Through a C4D4 blockchain application, the entire build can be replicated in a digital environment on a blockchain. This ensures that each piece of data is secure and immutable, allowing for full and trustworthy accounting of all variations and confirming that the building-as-built is truly representative of the record kept.

Smart contracts can allow for increased trust in individuals through increased data integration. Through a C4D4 blockchain application, the blockchain platform can integrate regulators as verified oracles, which can expand the ability to verify credentials and form more trust in the quality of builds.

However, to fully embrace blockchain smart contracts, there would need to be a clearer mandate to create a blockchain infrastructure – either a new blockchain, or an instance of an existing system, such as RedBelly[171] – and this would need to be integrated with existing flows, BIM systems and regulators. This is no small task.

[171] Redbelly, 'Home' (n.d.) <https://redbelly.network>.

Three key adoption challenges must be addressed before full implementation is possible. These challenges are not recommendations, but form the basis of the adoption discussions discussed in this chapter:

- **Legislative uncertainty:** There must be greater clarity from regulators about how smart contracts and digital assets are treated in Australia for the purposes of issuing, exchanging and paying in digital assets.
- **Digital asset decisions:** Blockchain smart contracts need to be paid for according to use, this requires tokens and wallets. There must be clarity about the function of these tokens and whether these should be cryptocurrencies, stablecoins or CBDCs, with each raising a different legal and social challenge.
- **Industry adoption**: There must be a sufficiently widespread adoption for the blockchain platform to gain legitimacy and be integrated widely enough so the integrated smart contracts can be a benefit rather than merely 'adding a new app'.

These three areas form the following sections of this report.

Adoption Challenge: Legislative Uncertainty

A key barrier to adoption is the regulatory environment within which blockchain technology must operate in Australia. For construction firms exploring smart contract payment systems, the regulatory environment directly affects whether automated payment triggers are legally enforceable, whether platforms require financial services licensing and whether risk can be transferred responsibly under existing law.

Australian Digital Assets Regulation

Australia has long been viewed as a proactive jurisdiction in the fintech and blockchain innovation space. However, despite early enthusiasm, its regulatory approach to digital assets and smart contracts has been marked by hesitancy and fragmentation.

In the mid-2010s, Australia positioned itself as a global leader in blockchain exploration, with ASIC and the CSIRO's Data61 producing early studies on blockchain's potential.[172] The enthusiasm led to exploratory trials across multiple sectors, including trade, health and finance, and helped attract substantial investment and startup activity. Yet formal regulatory engagement remained tentative.

In 2022, the Australian Treasury initiated a 'token mapping exercise', intended to establish a taxonomy of crypto assets and guide future legislative reforms. The token mapping report, released in 2023, outlined a categorisation of digital assets based on their function, security tokens, utility tokens and stablecoins, and attempted to map these categories against Australia's existing financial services laws.[173] This exercise was widely welcomed by industry but ultimately did not result in immediate legislative clarity.

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[172] RT Hanson, A Reeson and M Staples, *Distributed Ledgers: Scenarios for the Australian Economy Over the Coming Decades* (Data61, CSIRO, 2017) <https://www.csiro.au/-/media/D61/Files/17-0087_DATA61_REPORT_DLTStrategicForesightStudy_76pp_WEB_170605.html>.
[173] Treasury (Australian Government), *Token Mapping* (Consultation Paper, 2023) <https://treasury.gov.au/sites/default/files/2023-02/c2023-341659-cp.pdf>.

In April 2026, the Australian Parliament passed the *Corporations Amendment (Digital Assets Framework) Act 2026*, marking the first comprehensive attempt to regulate the digital asset sector.[174] While representing an important step towards legislative clarity, this specifically addressed the licensing and regulation of intermediaries such as cryptocurrency exchanges and digital asset custody providers. This brings them within the existing Australian Financial Services Licence (AFSL) regime, rather than directly regulating smart contracts or blockchain-based contractual arrangements themselves.

Ultimately, blockchain and smart contract systems must navigate existing legal structures, which were not designed with decentralised digital technologies in mind. This includes areas such as contract law, financial services regulation and payment systems, with each introducing its own set of interpretive challenges. The lack of clear, enforceable definitions and regulatory treatment for digital assets has created compliance uncertainty for entities seeking to develop blockchain-based solutions for industries such as construction, where legal enforceability, financial accountability and risk mitigation are paramount.

AFSL Regime

Central to Australia's financial services regulation is the requirement that any entity offering or dealing in financial products must hold an AFSL. The AFSL regime is administered by the Australian Securities and Investments Commission (ASIC), and determines which activities and instruments fall within the definition of a 'financial product'.

Under this framework, blockchain-based tokens, depending on their design and function, may be classified as a type of financial product. For example, if a digital token is structured to provide access to future profits or resembles an investment in a managed scheme, it may be treated as a 'security' or 'interest in a managed investment scheme' under the *Corporations Act 2001* (Cth).

This classification has significant implications for the use of smart contracts in construction. If tokens used within a smart contract system function purely as a utility – for example, giving access to project information or functioning as a transactional medium for milestone-based payments – they may fall outside the definition of a financial product.[175] However, this is not always clear-cut. The Treasury's token mapping report highlighted the ambiguity that exists around the classification of utility tokens and stablecoins, noting that their treatment depends heavily on context, functionality and even user expectations.

In construction-specific use cases, questions arise about whether:

- a token used to transfer payment between contracting parties constitutes a security, a form of digital cash or a payment facility
- a blockchain-based platform used to manage project milestones and trigger payments constitutes a 'non-cash payment facility', a type of financial product requiring an AFSL
- a digital token linked to a specific project (e.g. enabling access to verified completion data or escrow conditions) might require disclosure obligations under existing securities law.

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[174] *Corporations Amendment (Digital Assets Framework) Act 2026* (Cth).

[175] Australian Securities and Investments Commission, *Crypto-assets* (Information Sheet 225, n.d.) <https://www.asic.gov.au/regulatory-resources/digital-transformation/crypto-assets>.

These uncertainties create significant barriers for construction industry adoption. Without clear regulatory guidance, construction firms, platform developers and investors face the risk of breaching financial laws inadvertently or, conversely, avoiding innovation due to compliance concerns. For construction businesses specifically, token classification determines whether adopting a blockchain payment system requires an Australian Financial Services Licence, whether token transfers constitute taxable events and who carries legal responsibility as the financial services entity.

ASIC's Enforcement Approach and the Emerging Crisis of Clarity

In recent years, ASIC has adopted an increasingly active stance in supervising digital assets.[176] While its early engagement with blockchain technology focused on education and guidance, its current enforcement-led approach has heightened uncertainty in the market.

A key point of reference is ASIC's publication of Information Sheet 225 (INFO 225), which outlines when crypto asset-related products may fall within the scope of financial regulation. While INFO 225 provides useful examples and definitions, its guidance remains high level and often lacks specific applicability to novel or hybrid use cases, such as those found in construction-focused smart contracts.

This uncertainty has been compounded by ASIC's recent enforcement actions against companies including Finder Wallet and Block Earner, both of which operated in the digital asset space. In these cases, ASIC alleged that the companies were offering financial products without a licence. However, both companies challenged these findings, and significantly, ASIC lost both appeals in court.

In *Finder Wallet Pty Ltd v ASIC*,[177] the Federal Court held that Finder's yield-bearing crypto product did not constitute a financial product under the current definition. Similarly, in *ASIC v Block Earner*,[178] the court found the digital offering in question was not a managed investment scheme or other regulated instrument. These rulings have undermined the regulatory certainty that ASIC sought to provide, revealing inconsistencies in interpretation and the limitations of applying traditional financial product categories to new technological arrangements.

In 2026, the High Court unanimously allowed ASIC’s appeal in *ASIC v Web3 Ventures Pty Ltd*,[179] holding that Block Earner’s “Earner” product was a “financial product,” where the Court emphasized a substance-over-form analysis. Critically, the reasons proceed from the statutory text and structure rather than ASIC guidance, and as such INFO 225 is not referenced. The Court’s approach underscores that Chapter 7 definitions are deliberately broad and may capture novel crypto arrangements. This judgment narrows the earlier readings by overturning the Full Court’s position in Web3/Block Earner (while leaving the separate Finder Wallet outcomes to turn on their own statutory definitions, such as “debenture”), and clarifies that hybrid, smart-contract-driven products can fall within financial product regulation even when

[176] A Kirkland, ‘Crypto and Digital Assets: Policy, Regulation and Innovation’ (Speech, 20 March 2024) <https://www.asic.gov.au/about-asic/news-centre/speeches/crypto-and-digital-assets-policy-regulation-and-innovation>.
[177] *ASIC v Finder Wallet Pty Ltd* [2024] FCA 228.
[178] *ASIC v Web3 Ventures Pty Ltd* [2025] FCAFC 58.
[179] *ASIC v Web3 Ventures Pty Ltd* [2026] HCA 21.

marketing language suggests otherwise. Given the recent nature of this decision, its full impact on the industry is yet to be fully realised.

The cumulative effect of these enforcement wins and losses has raised concerns about the regulator's interpretive framework and the broader system's ability to address new forms of digital innovation. Stakeholders, ranging from fintech developers to institutional users, now face a volatile regulatory climate where product classification, legal obligations and licensing requirements are unclear and subject to change.

These legal setbacks expose two truths:

1. **Inconsistent interpretations:** Courts and regulators diverge on how existing statutes apply to programmable assets.
2. **Regulatory under assertion:** By losing high-profile cases, ASIC has inadvertently signalled that its current framework may be ill-suited to governing digital assets, leaving market participants without clear rules.

For construction smart contracts, this regulatory instability translates into planning paralysis. A platform may operate legally under one interpretation today, only to face enforcement under another tomorrow. The risk of retrospective licensing demands, penalty notices and mandatory disclosures is genuine. For industries such as construction, where trust, risk-mitigation and legal enforceability are foundational concerns, this lack of clarity is particularly problematic. A smart contract platform that automates payments may suddenly fall within the definition of a financial product if the underlying digital asset is reinterpreted as a security or payment facility. This could impose AFSL requirements on developers or contracting parties, with substantial compliance costs and legal risks.

These regulatory challenges underpin Recommendations G3 (Engage in discussions with Treasury and ASIC) and C4.2 (Adoption must start from authorities), which call for construction industry participation in regulatory discussions to ensure digital asset frameworks reflect the practical realities of construction contracting.

Adoption Challenge: Digital Asset Decisions

Smart contracts in blockchain systems are created, verified and executed by 'paying' certain members of the blockchain to create and verify the 'block' that contains the smart contract information. While data could automatically be created into a new block, the data-security strengths of blockchain are derived partly from the consensus needed to create the next block. This is referred to as 'proof', such as a proof of work or a proof of stake. Proof of work is where participants, known as miners, compete to solve complex cryptographic puzzles; the first to solve the puzzle earns the right to add the next block to the chain and is rewarded for their computational effort. Proof of stake is a mechanism whereby participants are selected to validate new blocks based on the amount of cryptocurrency they have 'staked' or locked into the network, reducing energy use and aligning incentives with honest network behaviour. In each of these examples, there is a need for the community to reach consensus about who has the right to create the next piece of the record, and to agree that some form of payment is needed to reward or pay for this. In Ethereum, this is referred to as the 'gas fees'.

This means that for a functional blockchain system that accepts, secures and implements smart contracts, some form of payment would be needed for each block created and for the data to be

stored, verified and executed. This introduces a design challenge for anyone attempting to create blockchain smart contract infrastructure. It raises the issue of the payment method and asks who is responsible for it. It also introduces the complications of cryptocurrency.

Cryptocurrency is a broad term and encompasses many different types of digital assets. It can have practical uses, such as to fuel smart contracts (e.g. Ethereum) or be a store of information as the token represents a real-world asset (e.g. NFTs)[180] or may be focused more exclusively on financial value (akin to a currency that is speculated upon, such as Bitcoin).

CBDCs

For the Australian construction industry, CBDCs represent a significant potential development in payment infrastructure. Construction projects typically involve complex, multi-party payment chains, with subcontractors exposed to significant cash flow risk from delayed payments. A government-backed digital AUD would enable smart contracts to release payments automatically at verified milestones, providing a legally compliant and auditable alternative to relying on private stablecoins or cryptocurrency. CBDCs are also directly relevant to government-funded infrastructure projects, where payment compliance, traceability and tax reporting are regulatory requirements.[181] Industry participants exploring digital payment systems should monitor CBDC developments closely and engage with Treasury to ensure that any CBDC framework reflects the needs of the construction sector.

The construction industry has a direct stake in CBDC development for several reasons. Construction projects involve sequential milestone-based payments flowing between multiple parties, with significant cash flow exposure for subcontractors. If Australia adopts a government-backed digital currency, these payment flows could be automated through smart contracts: payment could be programmatically released when verified milestones are met, reducing the need for manual administration, bank intermediaries and disputes over timing. Beyond payment efficiency, CBDCs are relevant to the construction industry in several ways: government procurement may come to require traceable digital payment instruments for funded projects; security of payment legislation intersects with digitised payment triggers and how automated releases are treated legally; and tax reporting obligations are more straightforward when every transaction is recorded on a government-managed ledger. The industry could also lobby government to ensure CBDC design accounts for construction payment cycles and subcontractor protections, consistent with Recommendations G3 and C4.2.

Stablecoins are a type of cryptocurrency designed to maintain a stable value by being pegged to a reference asset, usually a fiat currency like the US dollar (e.g. USDT, USDC), or sometimes commodities such as gold.

[180] NFTs (non-fungible tokens) are unique digital assets (as opposed to a cryptocurrency) that are stored on a blockchain. Common examples are typically linked to art, music or virtual goods.

[181] See, for example, L Robb et al, 'Cryptophobia: Dystopian and Utopian Realities of Cryptocurrency Bans and Regulatory Reactions to Blockchain: A Case Study of Nepal' (2025) 7(3) *Law, Technology and Humans* <https://doi.org/10.5204/lthj.3986>; Sandra Waliczek et al, *Central Bank Digital Currency Global Interoperability Principles* (Geneva: World Economic Forum, 2023) <https://www3.weforum.org/docs/WEF_Central_Bank_Digital_Currency_Global_Interoperability_Principles_2023.pdf>.

Central Bank Digital Currencies (CBDCs) are digital forms of a country's official currency, issued and regulated by its central bank. Unlike cryptocurrencies, CBDCs are backed by the government and represent a direct claim on the central bank, offering the stability of fiat money with the efficiency of digital transactions

Australia's Progress on a CBDC

Australia is actively exploring CBDCs as a strategic response to declining cash use and the rise of private digital currencies. In 2023, the Reserve Bank of Australia (RBA) and the Digital Finance Cooperative Research Centre conducted a pilot testing 16 real-world CBDC use cases across the finance, energy and agriculture sectors.[182] Project Acacia, launched in July 2025, extended this work to wholesale CBDCs and tokenised asset markets, with trials completed in early 2026 and a final report released in May 2026.[183] The RBA's position is that there is no compelling case for a retail CBDC at present, but wholesale CBDCs are identified as a strategic priority for improving financial market efficiency and enabling programmable money. Specifically, 'generating these benefits will require a coordinated effort across industry and the public sector to further facilitate the development of tokenisation innovations',[184] and they remain committed to 'responsible innovation at scale'.[185]

The construction industry in Australia stands to benefit from the digitisation and automation of payments via smart contracts. However, current legal and regulatory uncertainties – especially concerning the use of digital assets – remain a bottleneck to innovation. These uncertainties are directly relevant to Recommendations C4.5 (Payment system must be approved) and G6 (Advocate for a digital Australian dollar and CBDC-compatible payment infrastructure). Given the risks associated with relying on foreign or private stablecoins, the absence of a digital AUD greatly limits the potential for legally compliant, government-aligned smart contract implementations. A domestic CBDC could address these issues by providing a stable and legal payment asset, enabling secure, real-time settlements and supporting programmable conditions for milestone-based payments.

For the Australian construction industry, fully automated blockchain payment systems face significant legal and commercial barriers until a government-backed digital AUD is available. Engaging with Treasury and RBA initiatives, as recommended in G6, and advocating for payment legislation that recognises automated triggers, as recommended in G8, represent the most direct path to enabling smart contract payment systems in Australian construction.

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[182] RBA and DFCRC, *Australian CBDC Pilot for Digital Finance Innovation* (2023) <https://www.rba.gov.au/payments-and-infrastructure/central-bank-digital-currency/pdf/australian-cbdc-pilot-for-digital-finance-innovation-project-report.pdf>.

[183] RBA and DFCRC, *Project Acacia – Exploring the Role of Digital Money in Wholesale Tokenised Asset Markets* (May 2026) <https://www.rba.gov.au/payments-and-infrastructure/central-bank-digital-currency/pdf/project-acacia-final-report.pdf>.

[184] RBA and DFCRC, *Project Acacia – Exploring the Role of Digital Money in Wholesale Tokenised Asset Markets* (May 2026) <https://www.rba.gov.au/payments-and-infrastructure/central-bank-digital-currency/pdf/project-acacia-final-report.pdf>, 1.

[185] RBA and DFCRC, *Project Acacia – Exploring the Role of Digital Money in Wholesale Tokenised Asset Markets* (May 2026) <https://www.rba.gov.au/payments-and-infrastructure/central-bank-digital-currency/pdf/project-acacia-final-report.pdf>, 1.

Adoption Challenge: Industry Adoption

Drawing together the insights from the interviews and the broader analysis of industry challenges, the viability of smart contracts as a financial solution needs consideration. While many participants saw promise in automating payments, improving transparency and reducing risk, these ideas must be weighed against the realities of Australia's legal and regulatory environment. The financial problems identified, which include insolvency, poor payment practices and cash flow stress, are deeply embedded in the structure of the industry, and any technological solution must operate within the bounds of existing financial law. This includes navigating complex issues around financial product classification, ASIC enforcement powers and the uncertain legal status of programmable money.

Cautious Optimism and Realistic Expectations

While many interviewees were optimistic, others took a more conservative view. They acknowledged the potential of smart contracts, but emphasised the complexity of construction and the need for human oversight:

> *We started building blockchain contracts for construction … we need to pivot this and take everything that's great about blockchain … but it doesn't necessarily need to be distributed.*[186]

> *You really need some sort of Oracle, some sort of arbitrary truth around that stage gate, very difficult to deal with in the real world.*[187]

Finally, while crypto-based payments were seen as elegant in theory, concerns about volatility and public trust remained:

> *So, I can see the elegance of using crypto, because the whole thing can translate the contract … But I think the communities are still quite reserved with crypto because of the fluctuations and things like that.*[188]

While many interviewees expressed enthusiasm about the potential of smart contracts and blockchain to improve financial processes, not all responses were optimistic. Several participants admitted to having limited understanding of the technology, and some discussions revealed confusion around its terminology and practical application. Blockchain was often associated with cryptocurrency, which carried negative connotations, particularly around volatility, complexity and lack of trust. This scepticism extended to concerns about whether such solutions were even necessary, or whether they might introduce more problems than they solved. Some interviewees worried that implementing blockchain-based systems could be expensive, difficult to integrate with existing workflows or too technical for widespread adoption. Others questioned whether automation could truly replace human judgement in complex contractual relationships. These reservations highlight the need for clearer education, better user interfaces and a more grounded approach to integrating digital tools into construction workflows.

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[186] 21 February 2025 Interview (Organisation 1, Person 1).
[187] 21 February 2025 Interview (Organisation 1, Person 2).
[188] 5 February 2025 interview (Organisation 3, Person 2).

Smart Contracts Without Blockchain

A core finding of this report is that full blockchain implementation is not always necessary or appropriate for the Australian construction industry. The case studies demonstrate that most of the efficiency and transparency gains attributed to blockchain can be achieved through digitised or automated smart contracts, without the added complexity of distributed ledger infrastructure. The practical question is not whether to use blockchain, but where on the smart contract spectrum a proposed solution should sit, and whether the benefits of blockchain specifically justify the additional cost, technical overheads and regulatory exposure it entails.

This is demonstrated most clearly by Paid (Figure 15), in which payment smart contracts do not require blockchain or cryptocurrency.

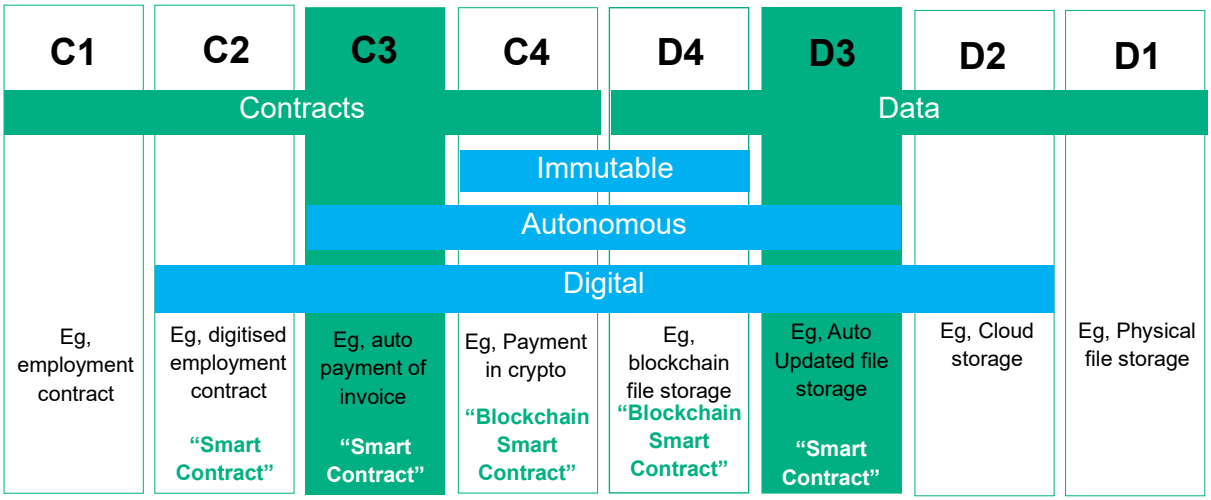

Figure 15: The Smart Contracts Spectrum **(C3, D3 Highlight)**

The Paid platform does not rely on blockchain, and that is a deliberate choice. While blockchain-based smart contracts have gained attention for their potential to decentralise trust and automate transactions, they have not found meaningful traction in commercial construction. The reality is that Web 2 infrastructure is cheaper, faster and more practical for the kinds of problems Paid is solving. Blockchain transactions come with gas fees and technical complexity, while fiat currency can be moved just as quickly at a fraction of the cost.

That is not to say blockchain has nothing to offer. Projects such as Acacia are exploring tokenisation, turning funds into yield-generating products using stablecoins such as USDC. These ideas are interesting, especially for future models involving private credit or global investment. For now, there is no clear use case that justifies the added complexity of blockchain. The construction industry needs solutions that are simple, reliable and easy to adopt. Tokenising assets or payments only makes sense if it delivers a tangible commercial outcome, and at this stage it does not.

Instead, Paid takes the lessons from blockchain, transparency, traceability and decentralised verification, and applies them through more accessible means. APIs and integrations allow the platform to enforce rules, verify compliance and manage payments without needing a distributed ledger. Certificates, insurance documents and safety tickets can be validated through trusted data

sources or independent arbitrators. These mechanisms achieve the same goals as blockchain, but in a way that is more compatible with how the industry currently operates.

Trust remains a central issue in construction; collaboration is fragmented, and it is not always clear who should be the final authority – government, companies or platforms. Blockchain offers a theoretical solution to this problem, but it is not yet scalable or cost-effective. Paid builds trust by making rules visible, tying them to payments and ensuring that users cannot bypass compliance. It is a practical approach that works within existing systems. If the industry evolves and the need for decentralised finance grows, Paid has indicated that it may revisit blockchain. For now, the focus is on solving real problems with tools that users understand and can afford.

6. BLUEPRINT AND RECOMMENDATIONS

The final part of this report presents a 'blueprint' that explicitly interacts with each stage of the smart contract spectrum and lists practical steps and recommendations for future directions and how these stages of smart contracts can be adopted.

This 'blueprint' is a restatement of the smart contract spectrum, now integrated with recommendations and considerations for those businesses and individuals who may wish to consider the use of smart contracts. The rationale for these suggestions is presented in the body of the report above and is derived from combinations of the case studies and discussions. It is presented in discrete stages (e.g. C1, C2), but composite categories (e.g. C3 D4) are a more likely application. Some of these recommendations overlap, as often the same steps may be necessary to implement a blockchain smart contract (C4) as it would a blockchain data smart contract (D4). These recommendations should therefore be read holistically. See Figure 16.

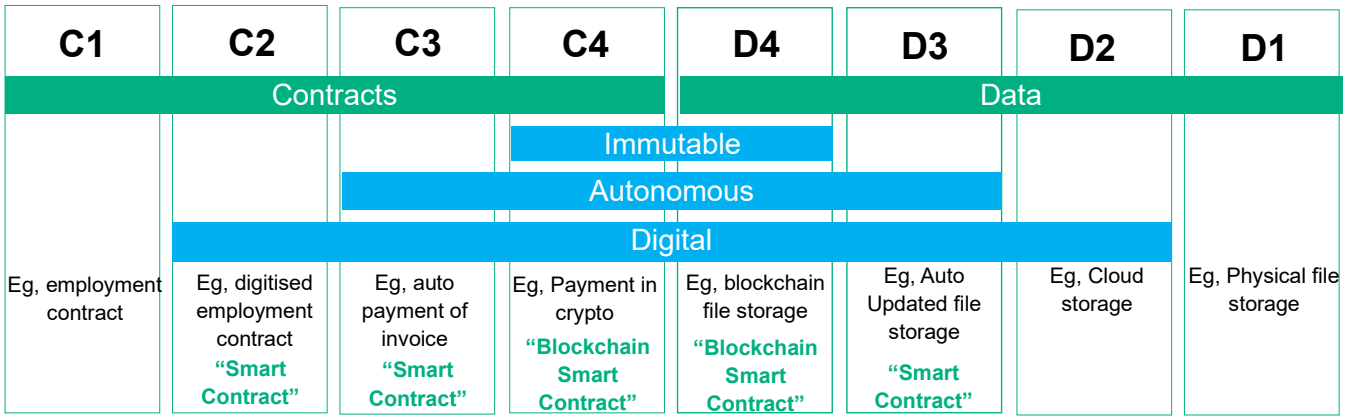

Figure 16: The Smart Contracts Spectrum for Blueprint

C1: Physical Contracts

A physical contract represents traditional contracting without embedded technology. The agreement is drafted in natural language, printed, physically signed and performed through human action. While technology may be used to prepare the document, it plays no role in execution or enforcement.

For example, a contractor and principal execute a signed paper contract setting out scope, timeframes and payment milestones, administered manually throughout the project.

This is currently the industry standard.

C2: Digital Contracts (Smart)

A digital contract is a legally binding agreement presented in electronic form. Often described as 'smart contracts', these are better understood as machine-readable contracts: the contract remains written in natural language, but is enhanced by digital tools such as search, hyperlinks, annotations or AI-based explanations. The contract itself is not programmed and does not self-execute.

For example, a contractor accesses a searchable digital contract PDF with hyperlinks to drawings and explanatory notes, hosted on a project platform.

Currently, this is somewhat commonly adopted throughout the industry.

To further implement digital contracts into the construction industry, there is a need for contract providers to create digitised versions. This is currently done by entities such as MBAV, as well as through partnership with providers such as Paid. Wider adoption of digital contracts is recommended because they streamline agreements by making them faster, more secure, and easier to track and enforce. There is a suggestion that a deeper engagement with AI tools can further enhance this.

C3: Automated Contracts (Smart)

An automated contract links a digital contract to software systems that automate parts of contract performance. While the legal contract remains written in natural language, specific functions, such as notifications, approvals or payments, are executed automatically through applications when predefined conditions are met. These systems rely on central platforms and trusted operators, and their records can generally be modified or overridden. Automated contracts should be distinguished from smart legal contracts: although automation is driven by code, legal rights and obligations still require a traditional written contract alongside the automated system.

*For example, a progress payment is automatically triggered by a project management app once the superintendent uploads a completion certificate, in accordance with the underlying written contrac*t.

To engage with automated contracts, building companies can collaborate with existing technology companies (such as Paid) to run trials in their projects and determine whether it can work with existing flows. This will require adoption by contractors and subcontractors, and should be approached gradually and alongside education that details how the platforms work and whether they come with risks.

Recommendation C3.1 – Audit contracts to determine what can be automated: Start by reflecting on the substance of the contracts you are seeking to automate. Separate what remains in natural language (rights, discretion, obligations) from what can be reliably automated. Automation should be confined to objective, verifiable conditions to avoid disputes at the interface between code and contract.

Recommendation C3.2 – Standardise events: Define the events that activate automation (e.g. certification, milestone completion) and integrate them directly into project platforms. This ensures contractual mechanisms, such as notices or payments, are executed as part of normal workflows, rather than administered manually. At an individual level, this can mean a single company adopts consistent terminology in systems and contracts. However, it is recommended that this consistency be adopted across the entire industry to ensure better interoperability of systems. The evolution/advancement of real time autonomous sensing of construction resources and activities will allow for reliable bridging of off-chain and on-chain information, where these systems can act as a digital 'oracle' to verify whether specific conditions are met.
Recommendation C3.3 – Build in fail-safes: Any automated system must allow for intervention. Clear protocols should exist for pausing or correcting automated actions, and users need to understand how and when to exercise that control. Trust in automation comes from knowing it can be managed, not just relied upon.
Recommendation C3.4 – Ensure automation is contractually valid: The legal contract must expressly recognise system-generated actions (e.g. automated notices or payment triggers) as valid. Without this, automation may function operationally but remain legally uncertain. This requires updating any 'wet' contracts with a clear reference to the digital contract as being a valid and binding contract.
Recommendation C3.5 – Experiment and adopt slowly: Introduce automation in discrete areas before scaling. This allows the interaction between legal terms and system behaviour to be tested and adjusted without exposing the project to unnecessary risk.
Recommendation C3.6 – Educate: The adoption of wider-scale contract automation (including integrations with AI) needs to be accompanied by clear education. This should be approached with caution and overseen by contract issuing bodies (such as MBAV) to ensure translations and interpretations are not misleading.

C4: Blockchain Contracts (Smart)

A blockchain smart contract is an automated contract whose execution logic and record-keeping are embedded directly into a decentralised blockchain infrastructure, such as Ethereum. Once deployed, the contract executes according to its coded rules without reliance on a central platform operator. Transactions and outcomes are recorded immutably on the blockchain, often involving digital assets such as cryptocurrencies or stablecoins.

For example, funds are locked into a blockchain based contract at the start of the project and released automatically when an agreed certifier (or digital oracle) records completion, with the transaction permanently recorded on the ledger.

To adopt blockchain smart contracts, a dedicated blockchain platform must be created – for example, on RedBelly – which then offers payment smart contracts. This will require deciding on the appropriate digital asset to facilitate the 'gas fees' on the platform, which may involve CBDCs or stablecoins but remains uncertain at this time.

This requires a close watch of Australia's approach to CBDCs and whether legislative certainty is provided around the trustworthiness of third-party stablecoins pegged to the Australian dollar.

Recommendation C4.1 – Enhance industry consistency: Continue building from the consistency in terminology, as recommended for C3. However, this will also require establishing 'trustworthy' and consistent oracles and certifiers. These mechanisms need to be carefully structured so that real-world events are reliably captured and payments are executed as intended.

Recommendation C4.2 – Adoption must start from authorities: any C4 system with blockchain integration can only succeed if the regulators are a validator of the data and endorse its use. This requires the onboarding of regulators and industry authorities into a C4 blockchain system. This may reveal a need to focus on greater education and awareness of the technology, as well as how a system such as this interacts with policies.

Recommendation C4.3 – Align legal frameworks: Parties must address how on-chain execution is recognised legally, who bears responsibility for coding errors or failed inputs and how disputes are managed. This step effectively replaces the role of central administrators in C3 systems. These agreements need to be reflected in the smart contract, and ideally also replicated in a traditional wet contract to ensure proper integration of the smart contract by reference.

Recommendation C4.4 – Adopt incrementally: Early use should focus on tightly scoped applications (e.g. escrow-style progress payments), with interfaces that abstract technical complexity from users. Gradual rollout allows legal, technical and commercial risks to be tested before wider adoption.

Recommendation C4.5 – Payment system must be approved: The token payment system must be approved before any widespread adoption to ensure ease of access and reduce the risk of misrepresenting the worth of digital assets. However, this adoption cannot occur until there is greater clarity about the legal status and viability of CBDCs and stablecoins in Australia.

D1: Physical Data Storage

Physical data storage involves managing project information in paper form, stored in filing cabinets or on-site repositories. While simple and familiar, this approach is vulnerable to loss, damage, duplication and limited access.

For example, printed drawings and specifications are stored on site, with updated versions distributed manually and superseded documents remaining in circulation.

This is not an industry practice recommended here. Most operations have moved to digital data storage, or at least are digitising physical documents and retaining both.

D2: Digital Data Storage

Digital data storage involves creating and storing project information electronically, typically on local servers or basic cloud repositories. This improves accessibility and duplication, but remains largely passive: files are stored rather than actively governed, and version control depends on human discipline.

For example, BIM models and drawings are shared via email or cloud folders, with version control managed through file naming conventions.

This is current industry standard. This is continuing to be refined with increased adoption of BIM systems

D3: Automated Data Storage (Smart)

Automated data storage uses cloud-based platforms to actively manage data through software logic. In construction, this commonly occurs through BIM-enabled Common Data Environments (CDEs), which automate workflows such as version control, approval states, clash detection and notifications. Despite being 'smart', these systems remain centrally administered.

For example, a revised BIM model uploaded to a CDE automatically supersedes prior versions and notifies relevant consultants.

D3 adoption is primarily organisational and process driven. Here are several suggested steps that can be taken to enhance adoption and ensure smoother transitions:

Recommendation D3.1 – Standardise platforms: Adoption starts with consistency. Projects need to commit to a single CDE and enforce uniform naming conventions, metadata structures, and versioning protocols (e.g. aligned with ISO 19650). Without this, automated functions become unreliable or meaningless. If intending to build a C4D4 platform, it is recommended that this blockchain-enabled BIM/CDE platform is a mandate for consistent use. It is noted, of course, that this is an ideal, and mandating specific tools and platforms is not practical.

Recommendation D3.2 – Automate easy areas first: The real value of D3 sits in workflow automation. Approval pathways, submission processes and responsibility matrices should be configured directly within the platform so documents and models move automatically between parties. This removes the need for manual coordination and reduces delays caused by informal or inconsistent processes.
Recommendation D3.3 – Integrate wider systems: The CDE should not operate as a standalone document repository. It needs to be connected to program and cost systems so events such as model approvals or design changes inform scheduling updates and payment processes. This is what turns automated storage into an operational tool rather than just a record-keeping system. For example, a model approval could automatically update program milestones or trigger progress claim preparation. This should ideally also operate in tandem with steps for the adoption of C3 and C4 smart contracts and may be subject to adoption of digital asset in payment systems.
Recommendation D3.4 – Educate: Most breakdowns at this level come from poor use. Teams need to understand not just how to use BIM tools, but how to manage workflows, permissions and approvals within the CDE. Provide targeted training not just in BIM modelling, but in workflow configuration, permissions management and digital sign-offs. Adoption depends less on software availability and more on user capability.
Recommendation D3.5 – Embed contractual recognition of digital workflows: For D3 systems to be relied upon, their outputs must carry formal weight. Ensure contracts formally recognise CDE outputs (e.g. model approvals, revision states) as authoritative documents. This reduces disputes about whether digital actions constitute formal approvals.
Recommendation D3.6 – Audit and continuously refine workflows: Adopters of D3 systems should regularly review approval times, bottlenecks and user behaviour, and allow workflows to be adjusted and improved over time, rather than becoming rigid or inefficient.

D4: Blockchain Data Storage (Smart)

Blockchain data storage records data events on a decentralised ledger, providing immutability, traceability and resistance to unilateral alteration. Rather than storing full datasets, blockchains typically record verified proofs, timestamps and references to trusted data states. When combined with blockchain smart contracts, data states can trigger automated downstream outcomes.

For example, approval of a BIM model issue is recorded on a blockchain, creating an immutable audit trail of when and by whom the model was approved.

While D3 is organisationally driven, D4 adoption is ecosystem and infrastructure driven (interoperability, legal reform and trust frameworks).

Recommendation D4.1 – Clearly establish what is on-chain v off-chain: Not everything needs to be placed on the blockchain. An important first step should be auditing all processes and datasets to determine what items will benefit from the security, trust and verification of a blockchain. For instance, full datasets should remain in CDEs, with blockchain used to record proofs, timestamps and approvals. This preserves efficiency while capturing the core benefit of immutability. Focus on high-value, low-ambiguity events, such as approvals, certifications and key contractual milestones. Defining these events upfront ensures consistency and avoids cluttering the ledger with low-value data. In determining what should be on-chain or off-chain, it may be important to note that humans serving as 'oracles' (someone having to physically verify whether a condition is satisfied) via digital contracts can be time consuming and error prone. Building compliance inspection and meeting progress payment milestones are two examples. Future tech aims to remove off-chain activity, but the current generation of real-time autonomous sensing of construction resource/activity data is still not advanced enough to reliably bridge off-chain/on-chain and verify whether conditions have been met.

Recommendation D4.2 – Create with User Experience (UX) focus: Blockchain should operate in the background, with events automatically written on-chain from the CDE via system integration. Users should not need to engage directly with blockchain tools for the system to function. If the platform is difficult to use, or is overtly blockchain focused, this may be a barrier to adoption and understanding.

Recommendation D4.3 – Align governance and legal frameworks with the system: Clear rules are required regarding who can validate and write to the ledger, alongside contractual recognition of blockchain records as evidence of approvals or performance. Without this alignment, the system lacks enforceability.

Recommendation D4.4 – Adoption and endorsement by key entities: As discussed with regard to C3 and C4 adoption, there is a clear need for this platform to be adopted by regulators and key entities in the construction industry. This signals trust, but also allows for regulators and approving bodies to provide data and verification of areas such as credentials and licensing. Furthermore, where blockchain interacts with payments or tokenised assets, compliance with financial services regulation, taxation and payment laws becomes critical. This remains a limiting factor on full-scale adoption.

Recommendation D4.5 – Start slow: Implementation should begin with controlled use cases and expand gradually. This allows technical, legal and operational issues to be resolved before broader deployment.

General Recommendations

In addition to the specific recommendations for each type of smart contract adoption, we make a number of general recommendations (denoted by 'G') derived from the case studies and discussion presented in this report.

Recommendation G1 – Smart contract education and terminology

There should be a more comprehensive understanding of smart contracts and their applications to the construction industry, including an awareness of the different types of smart contracts and how these vary in scale and technical sophistication. To this end, it is recommended that the Smart Contracts Spectrum presented in this report forms the basis for consistent terminology in this space.

Recommendation G2 – Conduct a national review into the use of smart contracts in construction.

This should involve cross-state institutions collaborating to share knowledge and experiences of how various entities (technology companies, construction companies, individuals) are currently using smart contracts in internal practices. This should be conducted to share knowledge, better understand the extent of adoption or mal-adoption across the industry and establish consistent terminology across the states.

Recommendation G3 – Engage in discussions with Treasury and ASIC

The building industry must engage more deeply with the activities of Treasury and ASIC in their regulation of smart contracts and digital assets. To date, involvement from the industry itself has been sporadic, and this must improve as the construction industry is potentially a key stakeholder and should ensure its experiences and opinions are part of the national conversation.

Recommendation G4 – Link technology literacy to education

We recommend an increased focus on technology literacy in education requirements for the building industry. This connects to broader recommendations made by other projects and should allow for greater understanding of the potential technology, as well as awareness of its limitations. An increase in education is a key step to otherwise enhancing the reliability of payment, supply chain transparency and trust-enhanced systems in the industry in a manner that does not create complacency.

Recommendation G5 – Greater industry investment in technology

Invest in integrated digital systems across the construction life-cycle to allow continuous visibility of project performance, financial position, and emerging risks. Strengthening this digital backbone would enable earlier detection of financial strain, improve information flow between project participants and support more informed decision-making. For smaller contractors in particular, this kind of transparency can reduce exposure to upstream insolvency risks and provide a more stable operating environment. This investment should be made with an awareness of smart contracts as detailed in this report.

Recommendation G6 – Advocate for a digital Australian dollar and CBDC-compatible payment infrastructure

Engage with Treasury and RBA initiatives, including Project Acacia, to ensure that construction payment needs shape any future digital currency framework.

Recommendation G7 – Develop national construction data interoperability standards

Collaborate across industry and government to establish consistent CDE protocols and data structures that enable cross-organisation smart contract integration.

Recommendation G8 – Reform security of payment legislation to recognise automated payment triggers

Advocate for reform of the *Security of Payment Acts* to give automated and smart contract-triggered payment claims the same legal standing as manual payment claims.

Future directions: Those in the construction industry are encouraged to engage with the Blockchain Spectrum and the Blueprint/roadmap to help them guide future actions and to see potentially when conditions are right to adopt the next ‘level’ of smart contract integration. Additional research is recommended to track the longitudinal adoption of smart contracts within the construction sector.

7. CONCLUSION

The report has found that smart contracts could address key inefficiencies in Australia's construction industry; however, full blockchain adoption remains technically, regulatorily and infrastructurally premature.

The Australian construction industry faces well-documented structural challenges: persistent insolvency risk, cash flow stress, supply chain opacity and the informal management of contractual variations. This report has examined the potential of smart contracts and blockchain technology to address these challenges, drawing on industry interviews, case study analysis and a review of the current regulatory and technology landscape. The evidence base confirms that the technology holds genuine promise, but also that adoption remains at an early stage and that the conditions for full blockchain implementation are not yet in place for most Australian construction projects.

The central finding is that meaningful improvements to transparency, trust and payment reliability do not require full blockchain implementation. Platforms such as Paid demonstrate that automated payment systems (C3) can be deployed within existing legal frameworks and deliver practical benefits today. The BIMCHAIN and OriginsNext case studies show that blockchain-based approaches (C4, D4) offer genuine value in specific contexts, particularly where immutable audit trails and multi-party accountability are paramount. However, the implementation of these approaches remains technically demanding and is dependent on conditions, including ecosystem-wide adoption and access to a reliable digital payment instrument, that are not yet in place for most Australian construction projects.

Full blockchain adoption (C4/D4) remains a medium- to long-term proposition. Its viability depends on three interconnected conditions: legislative clarity around the status of digital assets and the application of existing financial services regulation; the emergence of a trusted domestic payment instrument, whether a central bank digital currency or a regulated Australian dollar stablecoin; and the development of a construction-grade blockchain platform capable of meeting the sector's compliance, scale and operational requirements. Australia's progress on Project Acacia and the introduction of the *Corporations Amendment (Digital Assets Framework) Bill 2026* are encouraging developments, but the gap between regulatory experimentation and industry-ready infrastructure remains significant.

The recommendations in Section 6 are structured to support a phased and practical adoption pathway for smart contracts in the construction industry. Industry participants are encouraged to begin with the lower-risk, higher-readiness steps associated with digital and automated contract systems (C2 and C3), while remaining informed about developments in digital asset regulation and CBDC policy that will shape the feasibility of full blockchain adoption over the coming years. The goal is not merely to adopt new technology, but to build the transparency, accountability and trust required to underpin a more productive and resilient construction sector.

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