
Research Methodologies to Support the Development of Blockchain Standards

Madeleine Maslin, Millicent Watt and Christopher Yong

*Research Team for the Smart Contracts Working Group
(TC-307/IT-041 Blockchain and Distributed Ledger Technologies), Australia
E-mail: cayong@protonmail.com*

Received 18 April 2019;
Accepted 17 June 2019

Abstract

This paper dissects the research methodologies implemented by the Research Team for the Smart Contracts Working Group (TC-307/IT-041 Blockchain and Distributed Ledger Technologies) in developing standards to inform best practice in the design and use of blockchain and distributed ledger technologies. In doing so, it explores the origins of blockchain standardisation and outlines the high-level methodology for conducting and delivering research in this rapidly evolving space.

Using three case studies, this paper shows how different tasks give rise to, and benefit from, specialised methodologies. These case studies also highlight a number of challenges and opportunities, and demonstrate how a flexible research approach can increase efficiency and generate findings that are likely to influence blockchain standardisation at a global level.

Case Study 1 describes our research into the legal status of smart contracts and the challenge of delivering clear findings about unclear subject matter. Case Study 2, which involved examining the sufficiency of existing regulatory frameworks in the supply chain and trade facilitation context, illustrates how rigid formatting specifications can impact the content of findings. In contrast,

Journal of ICT, Vol. 7.3, 249–268. River Publishers

doi: 10.13052/jicts2245-800X.734

This is an Open Access publication. © 2019 the Author(s). All rights reserved.

Case Study 3 concerns a project to incorporate the United Nations Sustainable Development Goals into new and existing Standards and shows how researchers' knowledge can be harnessed as a valuable source of information in its own right.

Finally, this paper extrapolates practical lessons for researchers who are interested in developing standards for emerging technologies, or simply undertaking much needed research into this area.

Keywords: Blockchain, distributed ledger technology, Smart Contracts Working Group (TC-307/IT-041 Blockchain and Distributed Ledger Technologies), case study, research methodology, authority agnosticism, research partnership.

1 Introduction

1.1 Background: New Technology, New Solutions, New Challenges

Blockchain is an emerging digital technology that allows users to create tamper-proof records of data and transactions [1].¹ By combining the interoperability of the Internet with the security of cryptography, distributed ledger technology (**DLT**) offers a faster, safer way to verify information, establish trust, and transfer value across geographical borders [2]. While the initial buzz surrounding blockchain revolved around cryptocurrencies and the financial services industry, blockchain applications continue to evolve and positively transform a range of sectors and functions, from money transfers to vote casting, managing medical records to recording changes of property ownership [3]. Even so, widespread uptake has been slow and much of the discussion of this new technology focuses not on analysis of its present applications, but on its potential and transformative capacity [4].

Against this backdrop, lawmakers are considering the extent to which existing regulatory frameworks provide suitable oversight of transactions using blockchain, or whether there is a need to develop “bespoke” regimes [5]. A critical aspect of this inquiry is research. For the Smart Contracts Working Group (TC-307/IT-041 Blockchain and Distributed Ledger Technologies) (**Working Group**), this involves determining what these technologies are

¹Technologists generally prefer the plural ‘blockchains’, however, we have adopted the singular ‘blockchain’ as it is the term more widely accepted by the community.

being used for, postulating how those uses will evolve in the future, understanding what regulations are applicable to their design and use globally, and identifying opportunities and roadblocks for further development [6].

1.2 Existing Blockchain Standards

In December 2016, Standards Australia was selected by the International Organization for Standardization (**ISO**) as the Secretariat for ISO Technical Committee 307 [7], which involves leading the development of international Standards on blockchain and DLT. These new international Standards will sit at the top of the Standards hierarchy, which is split into three categories as set out in Figure 1:

Although compliance is not compulsory, unless backed by government enforcement measures, Standards are crucial for the development and quality management of emerging technologies due to the following:

- Standards enable businesses and consumers to trust new products and technologies;
- Standards focus on outcomes rather than processes, to support innovation and widespread adoption of emerging technologies; and
- Standards can inform laws, regulations and judicial considerations.

Importantly, Standards are required to respond effectively to global regulatory requirements, market needs and technical developments. While guidance has been provided, such as through the United Kingdom's Cryptoassets Taskforce Final Report and the Australian Taxation Office's GST Rulings, the scope of work being undertaken by the Working Group and its Research Team is novel as it is the first internationally coordinated standardisation of blockchain and DLT.



Figure 1 The Standards Hierarchy.

1.3 The Challenge of Researching Emerging Digital Technologies

Despite lingering uncertainty about the capacity for blockchain and DLT solutions to solve tomorrow's problems, the body of research into these technologies is growing. Nonetheless, this is a dynamic field and experts with specialised knowledge of the design, use and implications of DLT are as diverse as the platforms on which their contributions are distributed. A key challenge for researchers is, therefore, locating valuable, publicly available information. To illustrate, in November 2008, the white paper "Bitcoin: A Peer-to-Peer Electronic Cash System", created by Satoshi Nakamoto, provided the first description of how the double-spending problem could be prevented by a peer-to-peer network. Notably, this article was published not by an academic in a peer-reviewed journal, but by an anonymous author, via a cryptography mailing list.

While experts on established products and industries are easily identified, experts on emerging digital technologies are not. Consequently, we have been open-minded in determining which sources should be considered 'authoritative'. We describe this approach, which involves reviewing and relying upon a range of both *traditional* sources (such as journal articles and industry reports) and *non-traditional* sources (such as blogs by technology start-ups), as 'authority agnostic'. Authority agnosticism should be adopted when investigating new technologies, where the only material available is produced by the community of creators, users and observers. For example, at the time of writing this article, information about sk-SNARKS, a novel form of zero-knowledge cryptography, is limited to the blogosphere. Importantly, user-generated resources – such as podcasts and non-peer-reviewed articles – inform us about how uses of blockchain and DLT are evolving, and help to ensure that our research accounts for a wide range of perspectives.

1.4 Scope of Research Undertaken by the Research Team

The Research Team's contributions are driven by the Working Group's Technical Specification on Smart Contracts (**Technical Specification**), the purpose of which is to inform the public about important considerations when developing and using blockchain and DLT-enabled smart contracts. Broadly, our research for the Working Group has focused on three primary areas, each of which required its own unique adaptation of our core methodology:

Law: Commencing with an investigation of the legal status of smart contracts, as illustrated in **Case Study 1**, these findings provided context for the Technical Specification.

Standards: This included evaluating the compatibility of Standards in the supply chain and trade facilitation (SCTF) context with blockchain or DLT, as illustrated in **Case Study 2**.

United Nations (UN) Sustainable Development Goals (SDGs): This project aimed to condense the UN's 17 SDGs into a template to be reflected in all ISO Standards, so that sustainability underpins growth in every area regulated by Standards. As illustrated in **Case Study 3**.

2 Research Methodology

2.1 General Principles: Our Research Strategy

Since the formation of the Research Team, in early 2018, we have contributed more than 12 discrete research memoranda in response to requests from the Working Group. In the course of researching and delivering these contributions a generally applicable process has taken shape, as outlined in Figure 2:

A fundamental aspect of this process is communication: between the Research Team and the Working Group, but also with other teams researching and drafting Standards at the international level. The main channels that enable communication include:

Research Team meetings: To reduce information asymmetry and encourage collaboration. Extending meeting invitations to peers and associates, who work with emerging digital technologies, provides valuable insights into recent trends and sentiments among users.

Working Group meetings: To ensure we receive feedback and keep abreast of developments and projects coming through the pipeline. These meetings offer exposure to experts in the field and help to bridge knowledge gaps between technologists and legal practitioners.

ISO Meetings: At ISO Meetings in London (May 2018) and Dublin (May 2019), members of our team interacted with Standards delegations from across the globe. These meetings enable drafting 'sprints', where Working Groups assist their international counterparts to gather information and finish drafts.

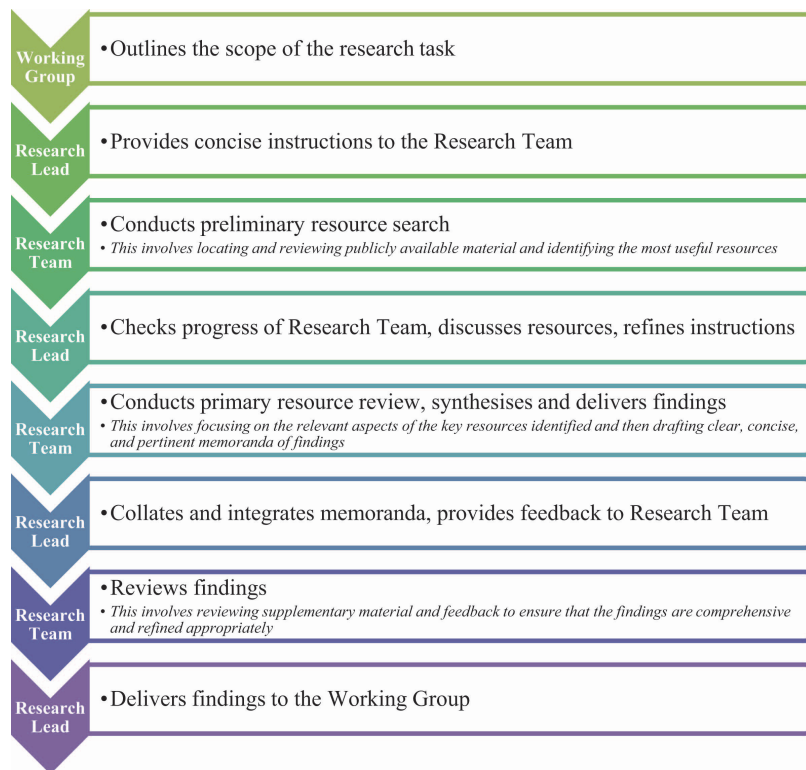


Figure 2 Research Strategy.

In parts 2.2 to 2.4, below, we explore three case studies of tasks undertaken by our Research Team. For each task, we followed the steps outlined in Figure 2 above. What the case studies show are the phases of the research process, from receiving instructions through to delivering our findings, and how our methodologies adapted to account for the inherent challenge of researching a dynamic space.

2.2 Case Study 1: Smart Contracts and the Law

Task: To undertake research into the legal recognition of smart contracts in international jurisdictions.

Purpose: To gain an overview of the legal status of smart contracts, identify the aspects and uses of smart contracts that may require further regulation, assess the availability of information, and understand how and why the legal status of smart contracts differs between jurisdictions.

Approach:

Phase 1: Making Sense of a Broad Topic

At the outset, noting the broad scope of the question, we established wide parameters for finding useful information. In addition to public search engines (e.g. Google), the Research Lead identified wide scoped databases (e.g. Lexology and Medium) to supplement the more ‘traditional’, subscription-based legal databases (e.g. CCH IntelliConnect and Westlaw). The goal was to be authority agnostic, locating material that was publicly available, and not just strictly academic. Our extensive preliminary literature review enabled us to focus on the most relevant and credible sources.

As the task description could be viewed through various lenses, team members took differing approaches to identifying source material. For example, one researcher accounted for multiple perspectives on the legality of smart contracts, looking beyond strict government recognition and considering: whether lawyers recognise transactions effected by smart contracts as enforceable, whether businesses recognise smart contracts as a valuable tool, and whether courts and legislatures have recognised smart contracts at all (see Figure 3 below).

1 Recognition as enforceable and legally binding ‘contracts’

“The law generally presumes that commercial contracts are intended to be legally binding, even where computers play a part in the bargain.”¹ Provided the “traditional elements of a binding contract”² are satisfied, “there is no reason why a smart contract will not constitute a legally binding agreement.”³

Smart contracts are often split into two categories: “a smart contract initiated by the parties to it” and a “separate ‘follow-on’ contract that has been brought about by performance of the smart contract itself.”⁴ This latter type, wherein “the code is the contract”,⁵ may not be legally enforceable in some jurisdictions.⁶ This is because “the terms exist only in machine readable code”,⁷ and there may be ambiguity about identity of the parties and whether they have capacity to contract.⁸

¹ Mark Giancaspro, *That contract your computer made could get you in a legal bind* (11 April 2018) The Conversation < <http://theconversation.com/that-contract-your-computer-made-could-get-you-in-a-legal-bind-94583> >.

² Michael Bacina, ‘Smart contracts in Australia: just how clever are they?’ (2017) 36 New South Wales Law Society Journal 78 < <https://lawsociety.cld.bz/e/LSJ-August-2017/78> >.

³ Gaye Middleton, above n 1, citing Matthew McMillan and Ken Wong, ‘Blockchain and smart contracts: the dawn of the internet of finance?’ (March 2016) *Henry Davis York — The Wrap* < www.hdv.com.au/our-insights/insights/the-wrap-march-2016 >.

⁴ R3 and Norton Rose Fulbright, ‘Can smart contracts be legally binding contracts? – An R3 and Norton Rose Fulbright White Paper’ (White Paper, R3 and Norton Rose Fulbright, November 2016) < <https://sites-nortonrosefulbright.vuturvex.com/596/14051/uploads/r3-and-norton-rose-fulbright-white-paper-full-report-144581.pdf> >.

⁵ Michael Bacina, above n 2.

⁶ R3 and Norton Rose Fulbright, above n 4.

⁷ Michael Bacina, above n 2.

⁸ *Ibid.*

Figure 3 Excerpt of Research Memorandum, Showing Referencing.

Phase 2: Identifying Credible Sources of Information

The absence of legislation and case law specifically addressing smart contracts reduced the question of their legal status to one of professional opinion, rather than legal fact. This led us to ask *who is an expert?* and *what kinds of publications can speak authoritatively on this matter?*

The challenge of obtaining sufficient information to draw conclusions was addressed in a number of ways, such as:

1. By broadening our approach, so that we analysed specific types and uses of smart contracts, as well as their legal elements (such as “offer” and “acceptance”) in line with contract law.
2. By referring to sources that recognised and promoted the technology, as well as ones that questioned or discredited it.
3. By adopting an authority agnostic approach, meaning that traditional concepts of credibility were ignored and everything from open-access blogs to journal articles was considered (the footnotes in Figure 3 give an indication of the variety of sources).

We also developed clear specifications for how sources should be identified. In a table addendum to our memoranda, we recorded the databases and search parameters used (e.g. “smart contract” AND jurisdiction) (see Figure 4), enabling team members to review each other’s methods and the Working Group to clearly see our process.

Phase 3: Delivering Clear Findings without Giving Clear Answers

Each team member had one week to prepare a 500-word memorandum containing any findings they found particularly helpful, with references for every assertion of fact. This was accompanied by the table addendum, identifying the sources used and how and where they were accessed. Excerpts from one of these memoranda are shown in Figures 3 and 4.

| | | |
|---------------------------|------------------|---|
| HeinOnline | 'smart contract' | Jerry Hsiao, ““Smart” contract on the blockchain – paradigm shift for contract law?” (2017) 14 <i>US-China Law Review</i> 685. < https://heinonline.org/HOL/Page?collection=journals&handle=hein.journals/uschinalrw14&id=681 > |
| CCH IntelliConnect | 'smart contract' | Australian Securities and Investments Commission, ‘Evaluating Distributed Ledger Technology’ (Information Sheet No 219, Australian Securities and Investments Commission, 20 March 2017) |

Figure 4 Excerpt of Table Addendum, Showing Databases and Search Terms.

This mode of delivery enabled us to provide an overview of the various opinions held about the legal status of smart contracts and to identify the most authoritative sources on the matter. Rather than being a primary source of

information, our summaries were instead an index of useful sources – making statements and identifying where that information came from. This ensured our findings were clear and relevant, without presenting opinions as facts, and was particularly important where key information came from non-traditional sources.

2.3 Case Study 2: Blockchain in Supply Chain and Trade Facilitation

Task: This task had two components. First, locate publicly available information on SCTF Standards and regulations from Europe, the United States, Australia and China (**RT1**). Second, identify and provide concise summaries of any reports, publications or studies that explore the use of blockchain in SCTF, including in containerised freight, digital supply chains, and agriculture and food provenance (**RT2**).

Purpose: To identify the Standards and government regulations that apply within these jurisdictions, and how DLT is being used to facilitate trade and improve supply chain efficiencies, in order to understand how an international Standards regime should be developed.

Approach:

Phase 1: Identifying the Key Research Focus from Broad Instructions

The question was formulated by the Working Group, who communicated it to the Research Lead along with information about several international SCTF Standards, which offered context as to what did and did not need to be summarised for RT1. Each Research Team member was then allocated a jurisdiction. The Research Lead identified the ‘pain point’ we sought to resolve, which was that it was difficult for the Working Group to access, navigate, and easily understand relevant public information about the topic.

Phase 2: Locating Authoritative and Relevant Public Information

The implicit first step of RT1 was to analyse the legislative and regulatory processes within each jurisdiction, and identify the effect of any existing rules. For RT2, the Research Team had greater discretion to locate and identify novel or interesting use cases.

Similar to Case Study 1, we used an authority agnostic approach to identify credible sources. Nonetheless, we faced obstacles in accessing Standards subject to restrictions and pay walls, as well as those in other languages, particularly in the case of China. We noted these limitations in our findings, so that the Working Group could safely draw accurate conclusions about the nature and effect of SCTF regulations around the world.

Phase 3: Iterative Discussions as to the Format of Deliverables

For RT1, we were instructed to deliver research memoranda of 500–1,250 words. Since we had worked individually on our assigned jurisdictions, with minimal discussion about how to deliver our respective findings, our draft memoranda were all delivered in varying formats. For example, the China memorandum was presented as a tabulated outline of Standards and regulations, an excerpt of which is at Figure 5. In contrast, the Europe memorandum was a short-form summary of findings, similar to the style described in Case Study 1.

| Topic | Standard | | Types | Law/Regulation | |
|-----------------------|-----------------|--|---------------------|---|--|
| | Title | Description | | Title | Description |
| Containerised Freight | GB/T 34594-2017 | Supply chain applications of RFID – Freight containers | Administrative Laws | Maritime Code Of The People's Republic of China | Article 43 – the carrier or the shipper may demand confirmation of the contract of carriage of goods by sea in writing. |
| | GB/T 1413-2008 | Series 1 freight containers. Classification, dimensions and ratings | | Detailed Rules for the Implementation of Waterway Freight Transport Contracts (2011 Revision) | Contractual obligations for all for-profit cargo transport activities in coastal waters, rivers, lakes and other navigable waters in the People's Republic of China. |
| | GB/T 17273 2006 | Freight containers. Container equipment data exchange (CEDEX). General communication codes | | | Contractual obligations regulating rail, including military and international multimodal transportation. |
| | GB/T 1836 1997 | Freight containers. Coding, identification and marking | | Regulations of the People's Republic of China on Managements of International Freight Forwarders (1995) | International freight forwarding obligations. |

Figure 5 RT1 Annexure – Summary of SCTF Standards and Regulations in China.

Fortunately, this diversity in approaches produced valuably nuanced information. For ease of comparing and analysing the material for each jurisdiction, however, it was critical to address the differences in format. Accordingly, the Research Lead instructed that memoranda should contain both a short-form summary of findings and a table of relevant Standards and regulations.

We leveraged the lessons from RT1 in our approach to RT2. For RT2, we established a clear format, being 120–180 word summaries of sources, containing the following:

- a) a hyperlink in the document title;
- b) a description of the publication in one to two sentences; and
- c) a statement as to the document’s relevance to the Working Group.

An example is shown at Figure 6.

AUSTRALIA

1. Risks and Opportunities for Systems Using Blockchain and Smart Contracts (2017) CSIRO Data61

This leading report by Data61 of the Commonwealth Scientific and Industrial Research Organisation’s (CSIRO) explores opportunities for distributed ledger technologies (DLT) and blockchain technologies in a modern context. By establishing fundamental principles, this report discusses the feasibility of adopting practical solutions derived from blockchain-based systems.

This report is relevant to the Supply Chain and Trade Facilitation (SCTF) study group as it details how supply chain management (especially from an agricultural perspective) may be transformed. By considering the interoperability, latency, integrity, confidentiality and scalability of existing processes, and the functionalities of DLT and blockchain-based solutions, this report proffers several blockchain-based solutions for supply chain management.

Figure 6 RT2 Summary of Findings on Publications in Australia.

These formatting decisions helped to solve the Working Group’s pain point. By delivering concise and impactful summaries in a searchable excel spreadsheet, separated by jurisdiction, we enabled the Working Group to navigate easily through the expanse of information available. Our findings showed that, broadly speaking, current SCTF Standards are technology agnostic. This underpinned the Working Group’s conclusion that the Technical Specification was an appropriate way to support a sustained uplift of blockchain technology in the SCTF context.

2.4 Case Study 3: United Nations Sustainable Development Goals

Task: To prepare a document that briefly summarises the 17 SDGs and describes how Standards may help to achieve or address the strategies identified to fulfil the SDGs.

Purpose: To determine the content of the SDGs and investigate how they could be incorporated into international Standards. This project also looked at how blockchain and Standards could work together to facilitate sustainable development.

Approach

Phase 1: Defining the Deliverables and Scope of Inquiry

At the outset of the UN SDGs project, the Working Group set up a working document containing information about the context of the project and the steps to be completed, and a timeline for completing each stage. It also contained clearly labelled tables, into which findings could be inserted, meaning that the work of the Research Team was directly incorporated into the Working Group’s draft.

The first step involved reviewing the 17 SDGs, the supporting information and associated analysis, and distilling that content into the table provided. This required clearly setting out each of these goals (see Figure 7) and how Standards could be used to achieve them. The scope of inquiry was limited to information from the Sustainable Development Goals Knowledge Platform,² a publicly accessible website providing comprehensive information about the SDGs.

2. The Sustainable Development Goals

| Number | Name | Short form description |
|--------|----------------------------|---|
| 1 | No Poverty | End poverty in all its forms everywhere |
| 2 | Zero Hunger | End hunger, achieve food security and improved nutrition, and promote sustainable agriculture |
| 3 | Good health and well-being | Ensure healthy lives and promote well-being for all at all ages |

Figure 7 SDGs Data Entry.

²See Sustainable Development Goals Knowledge Platform, <https://sustainabledevelopment.un.org/>.

Phase 2: Smart Data Entry – Review, Synthesise, Analyse

Once we had captured the basic information set out in Figure 7, the next step was to review the accompanying literature, describe a strategy identified by the UN for meeting each goal, and consider how Standards might help to deliver that strategy (see Figure 8 below).

2. The Sustainable Development Goals

| Number | Name | A strategy identified by UN | How Standards might help achieve strategy |
|--------|------------|--|--|
| 1 | No Poverty | By improving social protection. Social protection refers to the systems that need to be implemented to help alleviate the suffering of disaster-prone countries and provide support in the face of great economic risks. These systems will help strengthen responses by afflicted populations to unexpected economic losses during disasters and will eventually help to end extreme poverty in the most impoverished areas. | A main challenge for achieving social protection is establishing a coherent strategy and clear system, to ensure that support can be provided quickly, efficiently and comprehensively. Standards can help to address this challenge and achieve social protection by ensuring that the systems implemented are refined, uniform, and capable of rapid, widespread development. |

Figure 8 Thinking Deeper, Strategies Identified and How to Achieve Them.

Although this task was more about data entry than research, the researchers still added significant value by exercising judgement, based on our understanding of the capabilities of blockchain technology, as to how blockchain could be applied to advance the agenda of the SDGs.

Phase 3: Outcomes

In response to the Working Group’s proposal, the ISO has updated its New Work Item Proposals document, used for the development of international Standards, to include checkboxes identifying which of the SDGs (if any) the proposed Standard will support.

3 Lessons for Researchers

3.1 Reflection: Challenges

Our approach, over the course of more than 12 months, has changed considerably as we learned from our mistakes, became more familiar with the

subject matter and, critically, began to identify broadly applicable challenges and opportunities in how we conducted our research. The following are some of the high-level challenges that we encountered:

Ensuring our research findings were globally relevant: The goal is and must always be to produce thorough, up to date information, which is globally applicable, and accounts for future developments in the technology. This is easier said than done in circumstances where uses of and attitudes towards the technology diverge and are continuing to develop.

Transparency throughout the research process: A lack of clarity around task expectations can lead to time inefficiencies and reduce uniformity in how findings are delivered. Despite this, as we found in Case Study 2, working in silos also allows researchers to apply their own mind to a research task, and can generate valuable ideas for optimising findings.

Large volumes of public information: This challenge is the tip of a large and problematic iceberg, which includes difficulties around identifying experts, dealing with a lack of information specific to certain industries and jurisdictions, locating sources which adequately canvass legal and technical aspects, and finding information that is relevant, recent and credible.

Obsolescence of information due to ongoing developments: The field of blockchain and DLT is constantly evolving, giving rise to resource obsolescence (that is, where information in ‘traditional’, ‘authoritative’ sources, including books and peer-reviewed journals, quickly becomes out of date, as technologists and regulators continue to break new ground).

Accessing information behind pay walls or in private partnerships: Key experts and information are not always to be found in the public domain, which means researchers must either limit themselves to what is publicly available, or leverage their academic and professional connections to obtain appropriate access to restricted databases.

3.2 Looking Ahead: Opportunities

Reflecting particularly on the case studies described above, we identified a number of opportunities for ensuring our methodologies continue to generate thorough, accurate findings, which add value. Some of the key matters with the potential to improve our approach include:

Identifying key stakeholders: If our research is to produce findings that are useful to the Working Group and to those affected by the Standards

it creates, it is critical to speak with stakeholders who have an interest in the development and regulation of blockchain technology. In our case, these stakeholders include:

- *Experts*, who understand both the legal and technical aspects of the technology;
- *Businesses*, which are exploring new ways for the technology to create value for their clients; and
- *Individuals*, who are using the technology in their lives and work.

Identifying key sources: Going forward, a fundamental preliminary step for each task will be identifying source materials that are authoritative and publicly available. As discussed in Case Studies 1 and 2, it is important to approach this step with an open mind, looking at traditional as well as non-traditional sources, which can be equally valuable.

Developing and refining research questions: The goal of breaking down broad research questions into manageable component topics requires effective communication between the Working Group, Research Lead, and Research Team. A modern research team benefits from the coordinated use of modern communication and collaboration methods. Online support tools, such as Google Drive and Slack, enable teams to communicate, share content, work simultaneously on documents, and stay up to date throughout the project life cycle.

Adopting agile processes: There are many ways to manage and offset the challenges of researching fast-moving technologies. This includes undertaking regular fact-checking, discussing broad trends, and being prepared to adapt the approach to making and delivering findings where necessary. Again, support tools like Slack allow teams to share articles, updates, questions and concerns, and to remain agile in how they think about and deliver the fruits of their research. Equally, mixing up the approach, and alternating between working individually and collaboratively, helps to ensure comprehensiveness.

Effective, long-sighted planning: A key aspect of planning is to ask: *What information does the Working Group actually need, and how do they want it to be delivered?* To be effective, team members need to have context for tasks, be aware of deadlines, and deliver findings in a format that can be understood and used by the Working Group. Arranging a whole-team discussion at the outset of any new task enables researchers to troubleshoot, clarify, and reach mutual understandings about the task instructions, expectations and purpose.

Regular meetings: Even where workflow enters a lull or the team is waiting for further instruction from higher up the pipeline, regular team meetings help everyone to keep abreast of developments, identify challenges and opportunities, and maintain momentum.

3.3 Engaging with Blockchain Users and Researchers

Perhaps paradoxically, there was overlap between many of these challenges and opportunities. This was because each challenge we faced or subsequently identified in turn presented an opportunity to develop and improve our processes. The most significant of these matters was seeking and incorporating input from stakeholders. While Working Groups themselves are comprised of academics and professionals with expertise in the subject area, it is nonetheless important for us to obtain input from a wide range of external stakeholders. For our purposes, these ‘external stakeholders’ fall into two main groups: users and researchers.

The advantages of identifying and collaborating with **users**, such as technologists, lawyers, engineers and technology entrepreneurs, are patent. When researching a subject as dynamic as blockchain, interacting with those who are using that technology, often in ways that have the potential to revolutionise industries, is critical to ensuring our findings are truly comprehensive. Equally, as researchers, we have no agenda beyond seeking and acquiring the best information, which generally means that people are happy to speak to us, sharing their views with candour and generosity.

Perhaps the greatest opportunity we have identified for improving our efficacy and experience as researchers lies in engaging with the latter group: **other researchers**. By working together, researchers affiliated with different organisations, from the public, private, not-for-profit and education sectors are able to:

- share information, resources and space;
- increase efficiencies by avoiding duplication in research efforts;
- concentrate efforts on bigger questions by building larger, more diverse teams; and
- work collaboratively to generate greater value more quickly.

There are many examples of blockchain research partnerships. At Stanford University, members of the engineering, law, and economics faculties created the Stanford Center for Blockchain Research, which is sponsored by six leading organisations in the blockchain space. The Center was born out of

the need for a focused research effort on crypto-currencies and blockchain technologies. In Australia, similar interdisciplinary research consortia include the RMIT University Blockchain Innovation Hub, as well as periodic meet-ups, such as the Sydney Node of the Computational Law and Blockchain Festival. Our Research Team has benefitted from chances to meet and work with experts and researchers by attending Working Group and ISO Meetings. Such meetings have allowed us to share insights and resources, and to improve efficiencies across multiple projects. Going forward, we will continue to grow our network of research partners, starting with our professional and academic circles and building from there.

3.4 Some Wisdom for Blockchain Researchers

If we, as researchers, are to continue to provide meaningful support to the development of Standards in the field of emerging technologies, our methodologies must include, as a guiding principle, the ability and inclination to evolve. We have distilled all we have learned into three areas for development, which we recommend to other researchers in this field:

Adopt an authority agnostic approach to the literature: Remain flexible in approaching tasks, developing methodologies, and selecting ‘authoritative’ source materials. A document’s value lies as much in what it tells us about perceptions of the technology, as in the legal or technological facts it establishes.

Work with stakeholders: This includes both users and research partners. The former helps to inform and guide research; the latter expands resources and increases exposure to different and more effective research practices. Look beyond the diverse mix of the Working Group to users and researchers from a range of sectors. In each case, these people and groups can bring new, diverse and valuable perspectives to your research.

Communicate: With the Working Group, with stakeholders, and, most importantly, with your fellow research team members. It might seem obvious, but communication is the simplest way to ensure your team is being as efficient as possible and that precious volunteer time is well spent. Equally, understanding the needs, aims and constraints of the people delegating the tasks is critical to delivering findings that will inform and enhance the documents for which they were intended.

4 Conclusion

Researchers play a pivotal role in supporting the development of Standards for DLT-enabled technologies. We have found that valuable findings come to light as a result of implementing responsive and adaptable methodologies, which leave room for researchers to be guided by their own knowledge and interpretation of a given question or area. This attitude must be balanced against the need for continuous engagement with the Working Group and external stakeholders, and the duty to provide findings that are both informed and informative. Looking beyond the ever-expanding universe of blockchain and DLT, it remains paramount for those researching and drafting Standards to remember that international Standards should encourage global participation, so research should be undertaken and findings prepared with a global audience in mind.

Comparing the broad research process outlined in Figure 2 to the nuanced approaches taken in each of the case studies, it becomes clear that there is no precise playbook for conducting research in the context of Standards. The steps we outline are instead more of a checklist, to remind our Research Team and other researchers of the importance of approaching tasks with rigour and an open mind. Our specific methodologies are examples that can be used to guide future research projects. Broadly speaking, however, the cornerstones of our methodology are straight forward: clear communication, timetabled sprints, iterative information gathering processes, delivering concise findings, and qualifying outcomes to account for the impossibility of ever totally ‘covering the field’.

Acknowledgements

The authors would like to thank Dr Pip Ryan, guest editor of this special issue of the Journal of ICT Standardization and chair of the Smart Contracts Working Group (TC-307/IT-041 Blockchain and Distributed Ledger Technologies). Dr Ryan’s support for young lawyers, who have an interest in Legal Tech and a curiosity about how to unite the aims of law, sustainability and commercial efficiency, is a continuing source of inspiration and encouragement.

References

- [1] X. Xu, I. Weber, M. Staples, “Architecture for Blockchain Applications”, Springer International Publishing, 2019.

- [2] *Blockchain: The New Technology of Trust*, Goldman Sachs, Insights, 17 July 2017 <https://www.goldmansachs.com/insights/pages/blockchain/>.
- [3] *Blockchain is coming everywhere, ready or not*, Bloomberg, Research and Analysis, 1 October 2018 <https://www.bloomberg.com/professional/blog/blockchain-coming-everywhere-ready-not/>.
- [4] C. Henly, S. Hartnett, B. Endemann, B. Tejblum, D.S. Cohen, “Energizing the Future with Blockchain”, *Energy Law Journal*, 39, 197–232, 2018.
- [5] C. Leonard, “Blocking the Blockchain”, *International Financial Law Review*, April 2016, 35, 58–59, 2016.
- [6] E. Koehn, “Regulators have ‘missed the boat’ on ICO rules, experts warn”, *Sydney Morning Herald*, 1 February 2019.
- [7] SA, “Australia to Lead International Blockchain Standards Committee”, Sydney, Australia: Standards Australia, 15 September 2016 <https://www.standards.org.au/news/australia-to-lead-international-blockchain-standards-committee>.

Biographies



Madeleine Maslin is a commercial litigation lawyer at Australian law firm, Lander and Rogers. Prior to this role, she was Tipstaff to the Honourable Justice Robertson Wright in the Supreme Court of New South Wales. Madeleine holds a Bachelor of Arts (French; Media Communications) and Juris Doctor from the University of Melbourne. While at Melbourne Law School, she designed and built a legal app for national charity, Justice Connect. The app, which provides not-for-profit organisations with information about tax concessions, was launched on Justice Connect’s website in 2017. Madeleine is a member of the Neota Logic Alumni Association and has been volunteering as a researcher for the Smart Contracts Working Group since early 2018.



Millicent Watt is a Construction (Major Projects) paralegal at Australia's first global law firm, Baker McKenzie. She holds a Bachelor of Commerce (Economics) and Laws (Hons) from Macquarie University. In 2016, Millicent contributed to the Blockchain Creative Clusters, a workshop program held over several months, held at the University of Technology Sydney. Since 2017, she has been freelancing as a researcher in emerging tech and regulation, and began volunteering as a researcher in the Smart Contracts Working Group in early 2018.



Christopher Yong is a corporate and commercial lawyer at the Australian law firm, Holding Redlich, and holds a B BUS LLB (Hons 1) from the University of Technology Sydney. His research thesis considered the likely impacts smart contracts would have on civil litigation in Australia. Christopher co-founded the University of Technology's Blockchain Creative Cluster, a workshop program held over several months, in 2015 and has been the Research Team Lead of the Smart Contracts Working Group since 2017. He leads four Australian-trained lawyers to provide research, analytical and administrative support for the development of globally recognised standards for Smart Contracts. Christopher is also the co-author of a symposium report published in Stanford's Journal of Blockchain Law and Policy.