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# Literature Review challenges for emerging technologies

*Research in Progress*

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## **Abstract**

The path to academia begins with a Ph.D. A student must then navigate the publish or perish path to prove worthy of a highly prized tenured position. In seeking to balance research in fast-paced (even hyped) areas against the tension to mature our discipline, one might feel overwhelmed and struggle with acceptance to IS academic circles. This paper presents three challenges faced in the early stages of a personal Ph.D. journey. In particular, when studying rapidly evolving technologies such as blockchain, and how some of these challenges may even be overcome with a viable blockchain solution.

**Keywords:** literature review, blockchain, non-traditional, emerging technologies.

## 1 INTRODUCTION

The field of Information Systems (IS) is often critiqued for its youth and lack of research rigour in (Benbasat and Zmud 1999; Okoli and Schabram 2010). Much has been written to help mature our discipline and provide recommendations for increasing this rigour (Hart 1999; Levy and Ellis 2006). Okoli and Schabram (2010) state there are three types of literature reviews. First, literature reviews for the purpose of scholarly publication; Second, stand-alone literature reviews, and; Third, of which category this literature review fits, literature reviews that serve as an “anchor for an academic thesis or dissertation” (Okoli and Schabram 2010, p. 2). Conducting a literature review for a doctoral thesis serves multiple purposes, including an introduction to the scholarly tradition and etiquette (Hart 1999) and therefore learning how to join the club (Potts et al. 2017).

This research in progress paper seeks to present the findings of my literature review on blockchain technology interwoven with three main challenges faced along the way, as I hope to be welcomed into this club. I have encountered many challenges (and am likely to encounter more) as I have sought to undertake and complete this literature review. As such, I welcome discussion in ways of overcoming some of these challenges. Such challenges are not new, in fact, I was lucky enough to find many like-minded IS scholars who are progressing an open dialogue and seek solutions for these same challenges. This paper is structured around my journey thus far to completing a systematic literature review on blockchain technology and presenting those findings. I then present the three main challenges I encountered along that journey and conclude with ideas for potential solutions and future research.

## 2 IN THE BEGINNING

After 20 plus years in a challenging IS career, I finally decided to commence a journey to achieve a Ph.D. in Information Systems. This was born from my desire to begin an academic career. I learnt that competition for academic positions is intense. Factors for recruitment include publication in respected journals, excellent teaching evaluations, industry engagement and service. I also learnt that there were many moderating and mediating factors to also consider including the research institution, supervisors, your gender, the social acceptance of peers, and even your thesis topic and research method.

Prior to my application submission and acceptance, I interviewed a number of potential supervisors from various institutions. I learnt that each institution had very different application processes. These processes were for institutions in the same country and the same state. The processes within my home country are very different to many other countries around the world, but I learnt fast that regardless, I would have to compete and succeed for a space at conferences and within journals with my international peers if I was ever to be considered for an academic career. I feel very fortunate to live no more than 20 km (12 miles) away from a top world-ranked research institution and to have my application accepted and begin my first step toward joining the club.

## 3 LEAD UP TO CONFIRMATION

To become a confirmed Ph.D. candidate, a student must document, present and defend their research proposal. The research proposal must include an introduction, motivation, research questions, literature review, discuss the research method, provide any potential early findings and a plan for completion. My topic was well motivated due to many industry practitioners trying to find the problem for the solution (Fridgen et al. 2018). I then began my literature review, in search of my anchor, and my introduction to scholarly tradition and etiquette.

### 3.1 Systematic Literature Review

As stated in the introduction, IS is often critiqued for its youth and lack of rigour in undertaking literature reviews, and as such, papers and books have been published on how best to undertake systematic literature reviews. Exemplars of systematic literature reviews within IS often limit searches to journals of a similar style and ranking as MIS Quarterly (Bandara et al. 2011; Levy and Ellis 2006; Okoli and Schabram 2010). Relative to my Ph.D. thesis and following the guidelines recommended for systematic literature reviews by Levy and Ellis (2006) results in 66 articles available for analysis (see Table 1 below).

Highly ranked journals<sup>1</sup> (ranking B or higher) within the assigned discipline of 0806 – Information Systems were selected. 102 journals were searched using blockchain as the key term. 162 articles were

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<sup>1</sup> As rated by the Australian Business Deans Council (ABDC) – refer to <https://abdc.edu.au/research/abdc-journal-list/>

found from a total of 31 unique journals. The articles were then further reviewed, and 96 articles were excluded due to various reasons as outlined in Table 1. The remaining 66 articles were then analysed.

Steps	Description
Selection of journals	Journals within the ABDC list of 'B' rating or higher with the following codes: o806 – Information Systems This resulted in 102 target journals.
Identification of articles	The advanced search function within Google Scholar was used as the search engine, each journal was searched within "Return articles published in:" and "with all of the words" "blockchain". The results were collated, removing duplicates, and ensuring only the 102 target journals were included, resulting in 162 articles for analysis from 31 journals.
Review and categorisation of articles	Articles were first reviewed for relevancy to the topic at hand. The query was broad to cast a sufficiently wide net; however, this captured many irrelevant articles. 96 articles were excluded, due to the following reasons: Reference to blockchain in future research section only Single statements within the article and pre-fixed by 'such as' Author details was the only reference to blockchain A reference was the only link to blockchain Not actually research articles, but letters to the editor (or similar) 66 relevant articles remained for further analysis.
Analysis of results	The 66 articles were analysed.
Presentation of results and agenda	Identified results, gaps and trends are presented to help develop an agenda for future research.

Table 1 - Systematic Literature Review Process

### 3.1.1 Analysis of articles

As with any research topic in emerging technologies, literature is sparse and has only just begun to gather momentum and be published within high quality journals. O'Leary's (2008) article helped frame and analyse the type of research articles. O'Leary presented how research and research styles can vary depending on the particular technology's placement on the Gartner Hype Cycle. Blockchain has certainly experienced the rise and fall of the Gartner Hype Cycle<sup>2</sup>. In 2013 the Gartner hype cycle had no mention of cryptocurrencies or blockchain. 2014 saw the first mention of cryptocurrencies but blockchain was not seen on the curve until 2016. 2018 has then seen blockchain begin the descent into the Trough of Disillusionment (Petty 2018). O'Leary (2009) suggests that research will mature in line with the Gartner curves, from "What is it?" research, to design science methods, to case studies, and then on to empirical analysis.

In October of 2008 the first paper associated with Bitcoin was released to a cryptographic mailing list (Nakamoto 2008). On 3 January 2009, following a design science methodology, the first instantiation of Bitcoin was launched with its genesis block. Nakamoto's (2008) paper, published under a pseudonym, would be classified as a research-in-progress paper available within an open source forum. Many digital currencies had been created prior to Nakamoto's work; however, this was the first paper suggesting a way to solve the double-spend problem (a problem dogging prior digital currencies). Ten years later there are an expanding number of Bitcoin-type instantiations (over 2000) (*Cryptocurrency Market Capitalizations* 2018), a growing number of research papers, as well as Gartner noting that blockchain has entered the Trough of Disillusionment (Crosby et al. 2016).

Having collected blockchain-related literature in support of my thesis, it was categorised, analysed, and compared with the findings of O'Leary's (2008) study. Figure 1 provides a chart comparing the types of blockchain literature being published over the past six (6) years. In 2016, Blockchain was first seen on the Gartner Hype Cycle and was already within the peak of inflated expectations position. "During the peak of inflated expectations, students, faculty and other researchers are likely to begin to ask and anticipate how the technology will influence companies that they know or impact traditional processes." (O'Leary 2008, p. 244). Research on such technologies will, generally, be dominated with positive case studies.

<sup>2</sup> Refer to charts - <https://whatitallboilsdownto.files.wordpress.com/2017/08/gartner-hype-cycle-2014-to-20171.jpg>

Figure 1 includes a further level of granularity, with a distinction shown between traditional (W) and non-traditional (G) articles. Figure 1 highlights that the first traditional literature review in an academic journal was 2017. Use cases first appeared in 2016, but with many only published in late 2017. Case studies have started to appear in 2018, with no empirical studies yet to be published. However, what can be seen from the separation of traditional and non-traditional literature was that similar research was published many years prior when using non-traditional publication outlets. The non-traditional literature was generally being published as much as two years earlier than the traditional literature. Questions were being asked from practice as to how the technology will influence (their) companies. Research Institutes, Chief Scientists, Private practice (e.g., EY, KPMG, PwC, etc.,) were consistently in positions to answer practice questions earlier on each stage of the hype cycle. Further, our colleagues in Computer Science (CS) had already found problems with the ‘original’ blockchain technology and were solving those problems, *and* publishing design science research. At the same time, IS was attempting to define what a blockchain is and how best to use it! By the time IS had defined a blockchain and how to use it, the technology had already morphed and no longer did a blockchain have to have blocks (e.g., XRP) or be in an open environment (e.g., permissioned versus permissionless – R3 Corda vs Bitcoin).

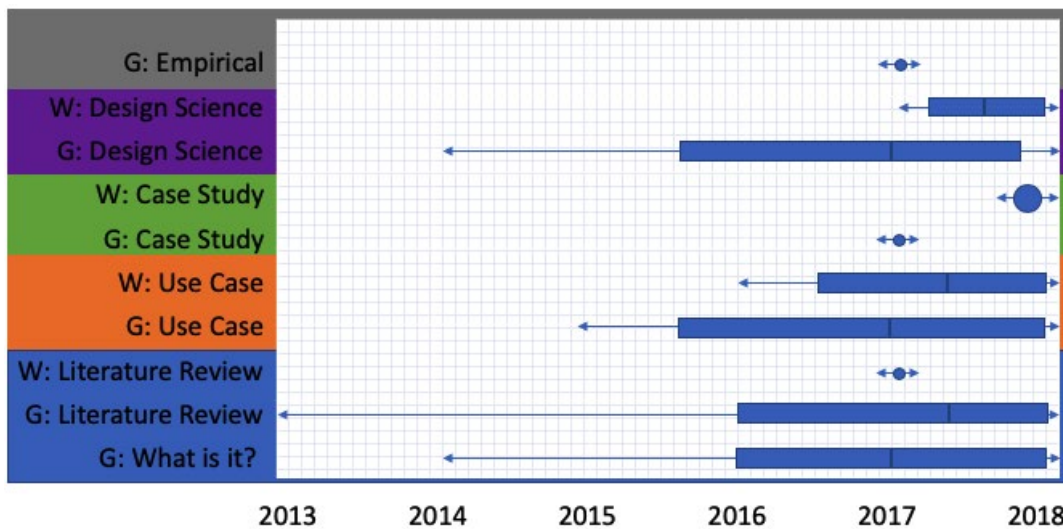


Figure 1- Types of research and year of publication

As I continued to explore the traditional and non-traditional sources of literature using tools such as Leximancer, different themes become apparent. Figure 2 shows the analysis of both traditional and non-traditional literature using Leximancer textual analysis software. The same settings were used in both analyses. Traditional literature was focused on bitcoin, mining, transactions, data, technology, and use. While non-traditional literature was focused on blockchain, ledgers, financial, and contracts.

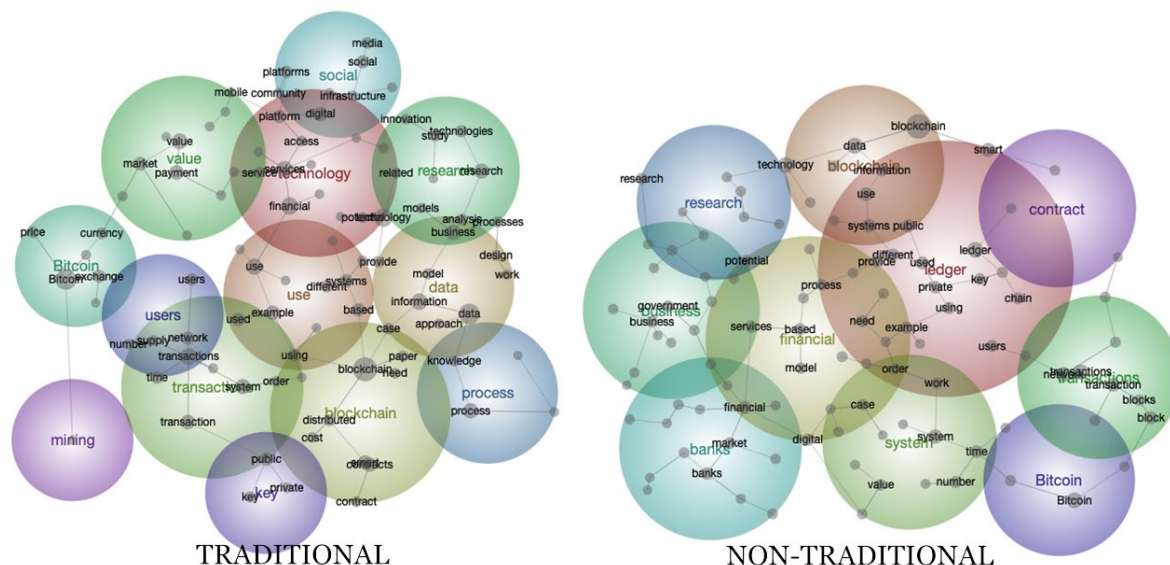


Figure 2 - Traditional versus Non-Traditional Themes

When comparing traditional and non-traditional literature I began to question my ability to undertake research that would, indeed, aid industry, as well as contribute to literature when the technology was so fast-paced. At a recent doctoral consortium, I recall statements of ‘avoid the hype topics’ due to some editors fascination with theory (Dennis 2019) but here I am in the middle of one! While all of this is challenging, I have learnt a lot and have a number of research topics that I would be interested in pursuing, in the hope that I can contribute to the next generation of research.

## 4 MY THREE MAIN CHALLENGES

As such my three challenges that I have had to face but yet to fully overcome include: Challenge 1: Recruitment, Reward, and Recognition, Challenge 2: Publication lag time, and Challenge 3: Relevance to Practice.

### Recruitment, Reward, and Recognition

Position descriptions for Lecturer positions state evidence of a research pipeline. Naturally, I have felt the urgency and pressure to publish. As such I have attempted to navigate the often confusing, conflicting, and contradictory process of research in progress submission for conferences as the first step for a journal submission. One experience ending in rejection recommended that my paper should have been submitted to a different track. Due to my co-author being a track chair and seeking to avoid potential conflicts of interest, I was only permitted to submit to the general track.

Additionally, research published at leading conferences appears to involve primary supervisors as lead authors on publications, thereby securing his or her Ph.D. student publications as co-author. This has not been empirically tested, but perhaps this does warrant further investigation.

### Publication lag time

The desire and need to publish one’s research links with the second challenge of publication lag time, but it does present two unique problems. The first problem is one of currency and impact. Publication delays often mean that definitions and understanding come faster through non-traditional sources. For example, Rauchs et al. (2018) provides the following definition of distributed ledger technology (DLT) and stating that DLT requires a separate definition to blockchain due to differences, below:

*“A DLT system is a system of electronic records that*

- i. enables a network of independent participants to establish a consensus around*
- ii. the authoritative ordering of cryptographically-validated (‘signed’) transactions*
- iii. persistent by replicating the data across multiple nodes, and*
- iv. tamper-evident by linking them by cryptographic hashes.*
- v. The shared result of the reconciliation/consensus process - the ‘ledger’ - serves as the authoritative version for these records*

*The goal of a DLT system is thus to produce a set of authoritative records that are validated and executed via a multi-party consensus process that involves the participation of multiple separate entities - all in the absence of a central authority”* (Rauchs et al. 2018, p. 24)

The terms, blockchain and distributed ledger technology (DLT), used to explain the technology were and, still are often used interchangeably. Standards bodies continue to struggle to define what exactly a blockchain is and what DLT is, and if they are, indeed, different (Hyland-Wood and Khatchadourian 2018; Standards Australia 2017). The research undertaken by Rauchs et al. (2018) at the Cambridge Centre for Alternative Finance presented, above, makes clear the properties DLT should possess.

The second problem is that journal submission and publication dates don’t really tell the full story. I have been advised to aim always for a research in progress paper at a conference first, then gain feedback, and then aim for a suitable journal. Depending on the conference and journal, a smooth process may take at least one year from completed research to publication. However, if you aim for, say, MIS Quarterly, the timelines are irrelevant as acceptance rates are as low as 2%.

After learning more about the purpose and aims for some of the journals, I am quite accepting that I may never achieve a publication in some journals. My topic of viable use cases for blockchain technology has strong industry linkages and increasingly, the readership for such high ranked journals does not usually include corporate Information Systems Managers. This does not mean I don’t seek to publish high quality research, but it does mean I would like to see practical applications of my research in industry. This ties in with my third challenge of relevance to practice.



### Relevance to Practice

Academic literature and, in particular, information systems research has been challenged in relation to its relevance to practice (Benbasat and Zmud 1999; Robey and Markus 1998). The lack of consumption by industry can be attributed to readability and timeliness matters. MIS Quarterly “has as a stated editorial mission of publishing research targeted at information system managers”. As a practicing IS Manager, MIS Quarterly is *not* my journal of choice for relevance to my practice. This is also evident from the decline of readership from those within industry (Benbasat and Zmud 1999). However, a primary goal of many IS academics is to have their research published in high quality journals like MIS Quarterly and consequently build their reputation and career. Robey and Markus (1998) suggest the support of non-traditional outlets, such as Sloan Management Review among others, however, such outlets rarely align with incentive or promotion schemes.

My desire to have my research influence industry was due to my personal experiences as an industry practitioner. Over the course of many years, I have seen many IS projects fail or have significant cost and time overruns. My research topic on viable use cases for blockchain technology is to help decision makers make informed decisions aligned with governance processes in relation to the much-hyped technology. However, there is a delicate balance to be achieved around the industry need for timely information and fulfilling the requirements of a doctoral program.

## 5 FURTHER RESEARCH

Undertaking research in relation to recruitment, promotion opportunities, and job destinations for IS Ph.D. graduates in light of their journal publications would an interesting study. After reading IS research and attending Doctoral Consortiums, it is quite apparent that IS students around the globe are actually very unique and there is no longer a ‘traditional’ student (Avison and Preies-Heje 2005). Making recruitment decisions even more challenging when attempting to compare and select Ph.D. graduates.

Some of my other challenges have sparked other potential options and solutions. One solution and research topic may be a little controversial. As I completed my literature review, I found others who thought along similar lines. Avital (2018) presents a use case where peer reviews could be conducted using blockchain technology. Blockchain is often touted as being able to disintermediate processes. Could journal and publishing houses be fully disintermediated? If one was no longer competing for publication in highly ranked journals (e.g., Basket of Eight), but one’s research was reviewed by your peers, ranked as being of A\*, A, B or C quality, and made available on a blockchain for a fitting access charge – would such a system provide a sufficient incentive for undertaking peer reviews? Could or should research be open-source and available to be accessed by all? Should promotions be judged on the quality of one’s research rather than one’s ability and tenacity to navigate the time delays and vagaries of the peer-review process to be published in a high ranked journal? Should peer reviews remain anonymous, but at the same time be transparent to all? Would the issues surrounding ego, bias, and time delays be resolved? First, though I must finish my Ph.D. But I do think that this would be a tremendous and, in all likelihood, disrupting project in which to be involved. Would we be willing to disrupt ourselves? And would I still be welcome in the club if I sought to disrupt the research publication ecosystem with what could be perceived as a viable use case for blockchain technology?

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