Columbia University
Graduate School of Arts & Sciences
Human Rights Studies Master of Arts Program

Blockchain as an Instrument for Human Rights Business Practice

Amanda Graham

Thesis adviser: Lara Nettelfield

Submitted in partial fulfillment of the requirements for the degree of Master of Arts

January 2018

ABSTRACT

Over the last decade, a promising technology has raised global attention: blockchain. Predictions and testimonies to its potential are promising. However, despite this proliferation of material, there continues to be limited empirical analysis of its positioned values and a demonstrated need to understand and overcome the limitations of the technology. This thesis analyses two current applications of blockchain for human rights business practice and argues that in order for its true value to be realized, traditional legal and regulatory functions and systems of accountability must not be substituted with technology. With a literature review supplemented with primary research, I gather qualitative analysis to reveal avenues to be taken into consideration for future applications of the technology in supply chain initiatives as well as current evolutions of blockchain's current applications.

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CHAPTER 1: Introduction

> *"Accurate and timely information is an indispensable tool and an essential precondition for effective responsive action and the promotion of human rights, whether by organizations, individuals, government, or international institutions."*
>
> - *Jamie Metzl*[1]

Technology has been pivotal in furthering human rights such as access to information, services and education.[2] It has been perceived as either a tool to promote or suppress human rights, depending on how it is implemented and managed.[3] Whether by streamlining methods of communication or information management, technology has demonstrated its ability to transform and even disrupt the way individuals and organizations interact and function across the globe.[4] In the last two decades, a new technology has come to the forefront, presenting unique opportunities to businesses for human rights practices. Blockchain, also known as distributed ledger technology, was originally conceptualized as a use case for a secure database for the transfer, issuance and verified ownership of cryptocurrency, has now been recognized as a "peer-to-peer network that sits on top of the internet."[5] The implementation of blockchain technology has shown potential to revolutionize transparency and accountability in business practice. It has even been described as "the fourth industrial revolution."[6] Organizations and startups globally are promoting the use of this progressive technology called blockchain for social impact and the

[1] Jamie F. Metzl, "Information Technology and Human Rights," in *Human Rights Quarterly*, Volume 18, Number 4, 705-746.
[2] United Nations Human Rights Commission, *The Impact of technology on human rights: global case-studies,* ed. C. G. Weeramantry (Tokyo: United Nations University Press, 1993).
[3] Alison Brysk, *Globalization and Human Rights* (Berkeley: University of California Press, 2002), 1-9.
[4] United Nations Human Rights Commission, *The Impact of technology on human rights: global case studies* (1993).
[5] Karim and Marco Iansiti, "The Truth About Blockchain," *Harvard Business Review,* January-February, 2017, https://hbr.org/2017/01/the-truth-about-blockchain.
[6] Klaus Schwab, *The fourth industrial revolution* (New York: Crown Business, 2016), 1-184.

protection and promotion of human rights. This thesis seeks to understand and evaluate the effectiveness of blockchain technology in business practice for human rights through analysis of literature and case studies of two industries which were early adopters of the technology: Provenance and Everledger. As blockchain technology is a tool for tracking and managing digital transactions, this research looks primarily at supply chains in the fishing industry and the diamond industry and their impact on human rights violations of human trafficking and forced labor. Provenance and Everledger are two early adopters of blockchain leveraging the technology for tracking diamonds and tuna fish in Indonesia from their origin to the consumer. Like others, projects of both Provenance and Everledger have expressed objectives to increase accountability and protect human dignity with data transparency. Blockchain's implementation for social good has resulted in numerous coalitions, conferences and businesses. It is important to highlight that despite the evident hype for technology as a solution to human ills and social problems, there is limited empirical analysis. As a result, preliminary questions arise that I explore in this thesis:

- What does technology provide, or what value does it add to human rights?
- Why would corporate actors want to leverage technology for human rights interests? And why would they have human rights interests at all?
- What unique role, then, does blockchain technology play for corporate supply chain business practice?

Ultimately, **can blockchain be an instrument for improving human rights practices in today's globalized world?** This understanding must then be applied to the practical level, to inform further steps for future research and applications of the technology.

With an analysis of secondary research supplemented with primary research through 10 1-hour key informant interviews and a set of 50 questionnaires, I evaluate the publicly communicated potential of whether blockchain technology is able to help businesses improve human rights practices in supply chains. My gathering of primary research was conducted with a selection of industry leaders I have identified as experts in blockchain technology development, implementation in the social impact, and human rights fields. This data was collected from semi-structured and open-ended retrospective interviews as well as surveys aimed at understanding attitudes and opinion of the selected key informants. Data for my case studies was collected from each companies' public materials including their own case studies, presentations, and articles.

My primary objective was to evaluate third party claims as well as those of Everledger and Provenance to understand whether and how each is positively impacting human rights in supply chain business practices. This, along with a literature review, allowed me to pinpoint the initial core step required for reliable data. The case study on Provenance's tuna fishing industry pilot project illustrated the need to address supply chain data from the very beginning of a product in order to understand who the supply chain is affecting and how. To do this, the initial point of verification is crucial as well as the correct framework in place to address personal data privacy. In the case study on Everledger's diamond tracking and protection initiative, I cross referenced its interest and potential value in the Kimberley Process Certification Scheme (KPCS)[7], and found gaps in how it may seek to confront ethical behavior and human rights violations in the diamond mining industry. My findings suggest that the maturity of blockchain and its potential as a tool for the protection of human rights is dependent on its implementation

[7] "Kimberly Process Certification Scheme," Core Document, accessed June 24, 2017, https://www.kimberleyprocess.com/en/kpcs-core-document.

not as an ultimate solution, but as a tool underlying a greater foundation for ethical business practices.

I. Argument

The two case studies analyzed in this thesis illustrate that blockchain technology is a tool for transparent management of transactions and interactions to fortify and secure communication in a complex information environment. The fundamental significance of verified data comes at the origin of its creation and collection. In recognition on the importance for accurate and timely information as a precondition for human rights, I see blockchain technology as a supplementary tool/instrument for compliance function frameworks to increase accountability and transparency for the prevention of human rights abuses. Moreover, in order for blockchain technology to allow individuals and communities to be a part of revolutionizing systems and industries, proper policy-making and regulatory systems must be in place externally as well as governance systems within the technology itself. The underlying causes of human rights abuses stem from factors that go beyond the accountability and transparency of data. Likewise, blockchain is not a relevant application for every business process. I argue that like the internet, blockchain technology, or any other form of technology for that matter, is not the ultimate solution for stopping or alleviating human rights violations. Rather, it a supplementary tool to business processes for impact assessment and due diligence assessment of business operations. In the cases of fishermen and diamond miners, tracking the origin of the products does not necessarily achieve ethical management of both the data on the product nor the personal data of the individual. I urge for my current four core limitations of blockchain to preemptively be understood and valued as fundamental factors to implementing it in initiatives aimed to protect the dignity of human beings. These are: the understanding of the technology, acceptance and

cooperation that it must be the ultimate source of authority if it is used, understanding its implications within political overhead and long-standing industry systems, and the need for laws and regulations of the technology itself as well as the systems it is being used in. Finally, in order to truly create ethical business practices and for blockchain technology to maximize its potential, a comprehensive approach with multiple stakeholders should be taken.

II. Chapter Breakdown

The breakdown of my chapters is organized in the same way as my preliminary posed questions. As the understanding of blockchain technology itself as well as where it adds value to ethical business practices is limited, I end my first chapter with a brief non-technical explanation of blockchains, their structures, and their current state of development. I conclude with a brief analysis of the importance of identity verification on the network, as it is equally important for tracking, understanding and addressing human rights violations. Chapter 2 analyzes current literature and regulatory instruments that discuss and impact current assumptions and therefore limitations of the maturity of the technology. I seek to understand and explain first how technology is connected to human rights practices and what current international expectations are of businesses for preventing human rights violations. I consider different forms of pressures as critical factors to enforcing multiple stakeholders in supply chains to actively participate. For this, I consider the various forms of pressures businesses face to be transparent and argue that the growing power of corporate social responsibilities should be leveraged in a shared responsibility model. Modernized tools for bringing transparency to large corporations is imperative, considering the status of forced labor and trafficking for the production and transportation of consumer goods. Chapter 3 is divided between my analysis of Provenance in the tuna fishing industry in Indonesia and Everledger in the diamond mining industry, looking specifically at the

tracking of raw conflict, or blood diamonds. The United Nations defines conflict diamonds as "any diamond that is mined in areas controlled by forces opposed to the legitimate, internationally recognized government of a country and that is sold to found military action against that government."[8] In each case study, I discuss the failures of current supply chain systems for each industry and the consequent human rights violations of human trafficking and forced labor. I provide the gaps in data management systems and the avenues blockchain can potentially be implemented in for tangible resolutions in future regulations and a growing wave of responsibilities for businesses. Chapter 3 provides an analysis of primary data collected over my research period to supplement my argument on the implications of blockchain for human rights in corporate supply chains as well as next steps for further research. The conclusion revisits and further explains the four limitations of blockchain as suggestions for further research and a recommendation for incorporating a shared responsibility paradigm.

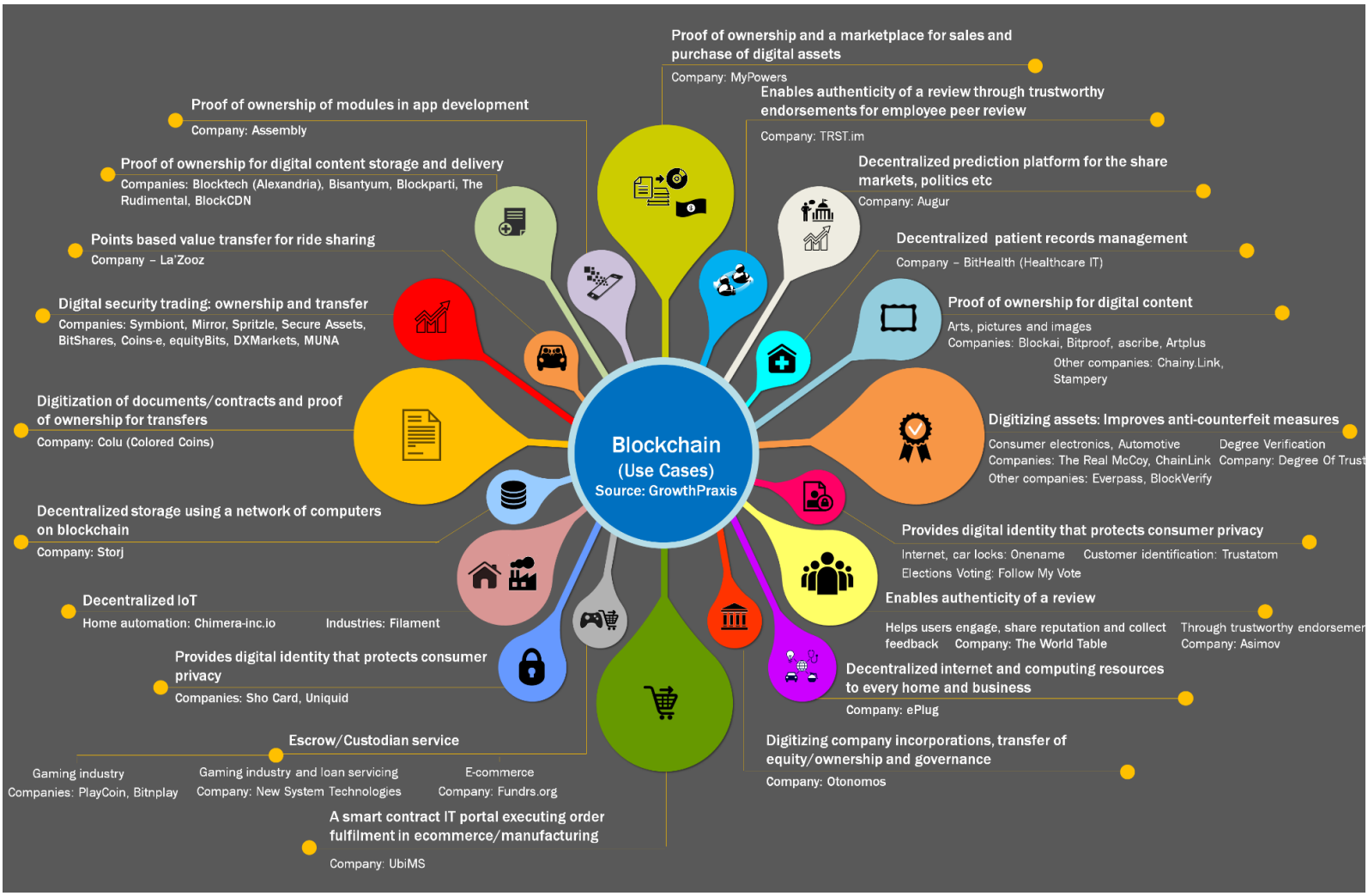
III. Disambiguating Blockchain

Since its initial use case in Bitcoin, implementations of blockchain technology have quickly been replicated across numerous industries, creating considerable hype around the technology. Blockchain is referred to as an umbrella term for distributed peer-to-peer digital ledgers. Peer-to-peer, therefore, means that any information recorded on this blockchain digital ledger is decentralized. Without the need for third-party verification, individuals can transact or transfer information securely to form a digital record. These ledgers, created with algorithms, store data in a series of blocks that are connected by cryptographic technology. Thus, blockchain

[8] "Blood diamond," Encyclopedia Britannica, accessed December 28, 2017, https://www.britannica.com/topic/blood-diamond.

technology has the potential for achieving a high level of data integrity, transparency and security in a multitude of industries.[9]

Figure 1: Blockchain Use Cases: Comprehensive Analysis & Startups Involved as Shown by Let's Talk Payments



Comprehension of the current maturity of blockchain and its appropriate implementations is limited, compared to its expressed potential. This does not come as a surprise when comparing its potential with existing real-world applications as well as the timeline of implementation of other comparable virtual networks such as the internet. The groundwork for the commercial

[9] Daniel Drescher, *Blockchain Basics: A non-Technical Introduction in 25 Steps* (New York: Springer Science+Business Media, 2017), 20.

internet was introduced in 1972 with its single use-case of the e-mail by the U.S. Department of Defense.[10] Organizations began expanding this groundwork in private networks in the 1980s and 1990s, moving to the advent of the World Wide Web by Tim Berners-Lee in the mid 1990s.[11] This 30-odd-year process resulted in a complete restructuring of economies and how information is shared and transacted. Similarly, the first concepts of Artificial Intelligence were designed in the 1940s and 1950s.[12] Over half a century later, the question persists: is business is ready for AI?[13] Questions like these are important as technology is only one part of a foundation for business practice that affects individuals that are involved. With Satoshi Nakamoto's whitepaper on Bitcoin published in 2008, progression of blockchain is dependent on its implementation, development, industry and structural acceptance and time.

Grey literature, such as whitepapers, and working papers on blockchain addresses ongoing use cases as well as the potential of blockchains to provide a unique distributed system for information gathering and sharing between parties.[14] Bitcoin, the original blockchain, and Ethereum and Hyperledger, and examples of blockchains that have been the source of a few functioning and validated use cases of the technology through scaled functioning public transactions. Additionally, there are examples of research done by credible actors such as that of the Monetary Authority of Singapore's *Project Ubin: SDG on Distributed Ledger* report, which shares that its testing of Hyperledger Fabric, Corda and Quorum (three different distributed

[10] Karim and Marco Iansiti, "The Truth About Blockchain," *Harvard Business Review,* January-February, 2017, https://hbr.org/2017/01/the-truth-about-blockchain.
[11] Tim Berners-Lee, "The WorldWideWeb browser," Accessed October 15, 2017, https://www.w3.org/People/Berners-Lee/WorldWideWeb.html.
[12] Bruce G. Buchanan, "A (Very) Brief History of Artificial Intelligence," *AI Magazine,* September 26, 2017, 56. https://web.archive.org/web/20070926023314/http://www.aaai.org/AITopics/assets/PDF/AIMag26-04-016.pdf
[13] Irving Wladawsky-Berger, "Artificial Intelligence Is Ready for Business, Are Businesses Ready for AI?" *Wall Street Journal, September 15, 2017, https://blogs.wsj.com/cio/2017/09/15/artificial-intelligence-is-ready-for-business-are-businesses-ready-for-ai/.*
[14] Daniel Drescher, *Blockchain Basics: A non-Technical Introduction in 25 Steps*, 33.

ledger platforms) proved to fit its criteria.[15] However, the prototype is still not in production. Many other examples, have not been subject to sufficient study to be able to confirm the integrity of their functionality.

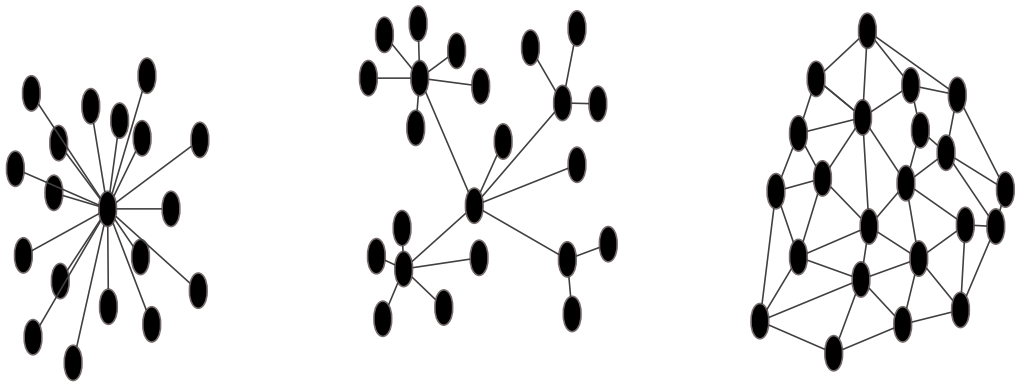
Most definitions of blockchain give an explanation of a system as a whole rather than a single software unit. Differentiating types of blockchains will be described later in this section. In this thesis, I use blockchain under the definition written by Daniel Drescher.

> "The blockchain is a purely distributed peer-to-peer system of ledgers that utilizes a software unit that consists of an algorithm, which negotiates the informational content of ordered and connected blocks of data together with cryptographic and security technologies in order to achieve and maintain its integrity."[16]

A decentralized system means that it operates without the need of a central authority or method to process or validate transactions. A distributed system means there are still proprietary authorities, but no single central one. Each has high scalability potential, meaning a high and growing number of data and transactions can be managed easily. They are more stable than centralized systems due to no single point of failure, and can be created quickly as the framework can be continually replicated and duplicated.

[15] "Project Ubin: SDG on Distributed Ledger," Monetary Authority of Singapore, accessed November 6, 2017. http://www.mas.gov.sg/~/media/ProjectUbin/Project%20Ubin%20%20SGD%20on%20Distributed%20Ledger.pdf
[16] Daniel Drescher, *Blockchain Basics: A non-Technical Introduction in 25 Steps*, 33.

Figure 2: Centralized, Decentralized and Distributed Ledgers as Described by Hyperledger



Centralized Decentralized Distributed

A blockchain is one type of distributed ledger. Its most prominent feature-set is to manage the ownership of information, yet there are many others such as digital goods and cryptographic currencies.[17] For ownership of information to be stored and verified, its validity must be attested to by third parties, rather than through smart contracts. Smart contracts can be understood as digital automated versions of legal contracts, where information can be shared and stored safely without the need for third-parties. They are the rule-making bodies of how data is inputted, stored and shared on the networks. Hyperledger gives an explanation of the unique features blockchain offers that other digital ledger do not.

> "The distributed ledger makes it easy to create cost efficient business networks without requiring a central point of control, in marked contrast to the world of SOR (Systems of Records), where every member in the ecosystem needs to maintain its own ledger system and reconcile transaction updates with one another in inefficient, expensive, and often non-standardized inter-organization operation flows."[18]

[17] Ibid.
[18] "Hyperledger Whitepaper", Hyperledger, accessed April 21, 2017, http://www.the-blockchain.com/docs/Hyperledger%20Whitepaper.pdf.

These values show the computational aspect of digitizing data tracking by businesses in a sustainable compliance function framework. Tracking data through paper trails, centralized systems, or ledgers that do not require verified actors does not create a unique solution. Open sourced blockchains such as IBMs Hyperledger allow for transparency and accountability in business-to-business and business-to-customer transactions through "smart contracts, digital assets, record repositories, a decentralized consensus-based network, and cryptographic security."[19]

The blockchain hype stems from the notion of transforming dominant relationships of power to a decentralized system of truth. This is why the buzz words 'transparency' and 'accountability' are often associated with blockchains. While the foundational aspects of blockchains are decentralized, the problem of governance remains. This will be discussed further in the assumptions and limitations section of this chapter. Here, I want to (briefly) explain the types of blockchain networks. There are different kinds of blockchains operating today and can range from private to public (open source) and permissioned or permissionless.

- **Public and permissionless**: anyone can read the data, but only those with a key can write the data.
- **Public and permissioned**: anyone can read and write the data.
- **Private and permissionless**: only those with keys can read the data, and only those with an additional key can write the data.
- **Private and permissioned**: only those with a key can read the data, but anyone with that key can also write the data.

[19] Hyperledger, "Hyperledger Whitepaper."

Although blockchains can be used in many industries, this thesis focuses on the implementation of blockchain in the Internet of Things (IoT) industry and within it, supply chain management. It is important to also highlight here that blockchain is not a relevant application for everything, however, when it comes to tracking the location and provenance of goods, and validating specified conditions, it has much value to add. On a supply chain network, blockchains provide a unique way of tracking and monitoring relevant individual interactions and data compared to other similar technologies. As a publicly shared data platform, blockchain has the potential to be a system of record for where a product came from, what went into it and who handled it along the way, as a tool to removing the supply chain from its silos.

When it comes to verifying who handled the product within supply chains, blockchains use identity with anonymity to verify users to be able to interact on the ledger. This is significant in both case studies discussed in this paper. This section previously used the term 'ownership' of information. On blockchains, validation of ownership functions through a network of witnesses. As Brian Behlendorf, Executive Director of the Hyperledger Project, would describe blockchain for individuals who have never heard of it, "blockchain is a way to record events and transactions between parties in front of an audience where the audience can witness and confirm those transactions, while maintaining a coherent and consistent history of what was said and done."[20] This system of attestation by multiple parties requires three elements as defined by Daniel Drescher: owner identification, object identification, and owner and object mapping[21]. However, this only accounts for data ownership. More functionalities and points of data are required for identification, authentication, and authorization. This is where smart contracts, cryptographic protocols and different types of blockchains used come in. Verification and

[20] Brian Behlendorf, Amanda Graham interview, phone call, November 6, 2017.
[21] Daniel Drescher, *Blockchain Basics: A non-Technical Introduction in 25 Steps*, 39.

integrity of the identification properties of the initial transaction, therefore, it crucial. Aaron Benningfield, a Blockchain and Supply Chain Strategist at the Tata Consultancy Services says, "that is the data we are operating on essentially, the very entry point of what we are trying to track."[22] In turn, participation of the blockchain platform requires a cryptographic certificate of a verified ID which has been preregistered. It also enables individuals to have control of their data in a time where our data footprint is not through a decentralized personal-data-management system. The concept of identity and data integrity is also where barriers lie in such a technology when not taking into account the industry, governance and social structure it is being implemented in. Limitations for full productions and acceptance of a distributed ledger technology is discussed in the last chapter.

CHAPTER 2: LITERATURE REVIEW

I. Technology and Human Rights: Motivation by Pressure

Globalization and technology have generated new understandings of human rights abuses and new approaches to them.[23] Technology has been the connecting force for actors globally, enabling faster and more efficient processes of sharing information, inducing change, and strengthening networks. It has fundamentally transformed the practices of actors engaged in human rights issues, giving power through a unique platform and a voice to entities that did not have it before. Technology paves a road for unique opportunity. At the same time, however, it presents unique pitfalls that must be addressed with appropriate instruments.

The nexus of technology and human rights is profound as both technology and the understandings and values of human rights continue to evolve and interconnect. Information

[22] Aaron Benningfield, Amanda Graham interview, phone call, October 31, 2017.
[23] Brysk, *Globalization and Human Rights,* 133-148.

technology has spawned an increase in technical capacity and volume of communication, creating new channels and understanding of new and old content. Alison Brysk explores different forms of information technology: cognitive and affective.[24] With concrete cognitive information such as documentation, there presents a potential for improved communication, verified data management, and understanding of the facts. Brysk's analysis of cognitive information in human rights work has a significant impact on the understanding of globalization and effectively, human rights. Brysk explains a strength and the irony of information technology use for human rights organizations:

> "Computers improve the ability to marshal the facts…Information technology can provide increased speed, as time required for gathering, processing, and distributing information is cut. But the speed "arms race" complicated all organizations' efforts to avoid overreacting and making other kinds of errors, while acting fast enough to stay ahead of what rivals are doing."[25]

Globalization has pushed the progression of international institutions and organizations, directly magnifying the impact on and responsibility for human rights.[26] What Brysk describes as the structural 'cosmopolitan dimension', globalization has evolved "multiple, linked, and overlapping centers of power above and below the State."[27] We are experiencing a weakening of the nation-state and a power disparity between developing States and transnational corporations. Corporations tend to hold a dominant influence particularly over "weak governance zones."[28]

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[24] Brysk, *Globalization and Human Right,* 117.
[25] Brysk, *Globalization and Human Right,* 118.
[26] John Gerard Ruggie, *Constructing the World Polity: Essays on International Institutionalism* (New York: Routlidger, 1998)
[27] Brysk, *Globalization and Human Right,* 7.
[28] International Organization of Employers (IOE), International Chamber of Commerce (ICC), and the Business and Industry Advisory Committee (BIAC), "Business and Human Rights: The Role of Business in Weak Governance Zones" (2006).

Even still, countries such as the Netherlands and Estonia are updating their governance structure to be majorly dependent on technology and information technology is becoming the backbone of networks and reliability.[29] Recognition of this expansion of impact and therefore responsibility can be seen in the various forms of pressure faced by private actors such as businesses. When trying to maximize the value of a technology such as blockchain, it is valuable to take into account and build off of the pressures businesses currently face today to further their compliance to ethical practices. I categorize these pressures into three parts: regulatory, social, and internal.

Regulatory, or political pressures are seen in the forms of local and international laws, regulations and standards for both positive and negative human rights. Corporate actors have been recognized as having a major influence on human rights and are not excluded as stakeholders in sustainable development.[30] United Nations Sustainable Development (SDG) goals and current projects utilizing technology in reaching specific targets in the next 12 years are an example.[31] The concepts of 'complicity' and 'sphere of influence' are not enforced by binding legal instruments. However, they have attracted support by States, businesses and NGOs as a guide from which to build international corporate human rights obligations. The Global Compact, OECD Guidelines, and the International Finance Corporation (IFC) are examples of soft-law instruments and corporate social responsibility initiatives.

Regulatory pressures for businesses to respect human rights go further. Since 2003, the United Nations has indicated an awareness of corporate activities impacting human rights through their operations.[32] This notion has evolved into international regulatory actors and

[29] "Building blocks of e-estonia," E-Estonia, Accessed December 28, 2017, https://e-estonia.com/solutions/.
[30] Jena Martin and Karen E. Bravo, *The Business and Human Rights Landscape: Moving Forward, Looking Back* (Cambridge University Press, 2015), Xxi-Xxii.
[31] "Sustainable Development Goals," UNDP, 2015, http://www.undp.org/content/dam/undp/library/corporate/brochure/SDGs_Booklet_Web_En.pdf
[32] Martin and Bravo, *The Business and Human Rights Landscape: Moving Forward, Looking Back,* Xxi-Xxii.

standards such as corporate social responsibility—a two-way process between consumers and businesses.[33] Initiatives calling for more responsible business practices in supply chain management include the proposed "Shared Responsibility Paradigm"[34], the International Organization for Standardization (ISO)[35], the OECD Guidelines for Multinational Enterprises[36], the United Nations Global Compact[37], the United Nations Norms on the Responsibilities of Transnational Corporations[38], and most recently, the United Nations adopted Guiding Principles on Business and Human Rights.[39] Expanding our understanding of human rights by associating actors –other than just states—as having an impact of human rights has led to a set of UN-approved global standards for business activity associated with promoting, identifying and supporting human rights. John Ruggie's UN Guiding Principles on Business and Human Rights and his accompanying Framework have set a soft-law structure from which to advance methods for maintaining a positive role for businesses in human rights.[40] Critics focus on the "opaque framework" of John Ruggie's Guiding Principles that fails to set legal obligations, and instead creates a platform for a due-diligence process.[41] The toughest critics see the implications of CSR as nothing more than a PR scheme. However, community support is growing and can be

[33] Jon Burchell and Joanne Cook, "Confronting the 'corporate citizen': Shaping the discourse of corporate social responsibility," *International Journal of Sociology and Social Policy* Vol. 26, Issue no. 3.4 (2006): 121-137.
[34] "Shared Responsibility: A New Paradigm for Supply Chains," World Economic Forum, Global Agenda Council, November, 2015, http://www3.weforum.org/docs/WEF_GAC_Supply_Chains_%20A_New_Paradigm_2015.pdf.
[35] "About ISO," International Organization of Standardization, accessed November 1, 2017, https://www.iso.org/about-us.html.
[36] "The OECD Guidelines for Multinational Enterprises," OECD, accessed November 1, 2017, http://www.oecd.org/investment/mne/1903291.pdf.
[37] "Who We Are," United Nations Global Compact, accessed September 15, 2017, https://www.unglobalcompact.org/what-is-gc.
[38] "Norms on the Responsibilities of Transnational Corporations and Other Business Enterprises with Regard to Human Rights," University of Minnesota Human Rights Library, accessed November 1, 2017, http://hrlibrary.umn.edu/links/norms-Aug2003.html.
[39] OHCHR, "Guiding Principles on Business and Human Rights."
[40] "Guiding Principles on Business and Human Rights," Office of the High Commissioner for Human Rights (OHCHR), 20011, accessed November 1, 2017, http://www.ohchr.org/Documents/Publications/GuidingPrinciplesBusinessHR_EN.pdf.
[41] David Bilchitz and Surya Deva, *Human rights obligations of business: beyond the corporate responsibility to respect?* (Cambridge: Cambridge University Press, 2013), Summary.

compared to the evolution of customary international law. Additionally, there are various forms of compliance requirement mechanisms within supply chains, one of which is the certification process. Shortcomings of such as process will be discussed in chapter 3 along with the shortcomings of the Kimberley Process Certification Scheme.

Another form of pressure, social pressure, can be seen as potentially the most powerful. It comes from the consumer. The proliferation of conscious consumerism is seen in the explosion of advertisements and marketing campaigns from businesses showing some form of social or environmental consciousness. For the purpose of this thesis, a conscious consumer can be understood as a consumer that buys products or services from moral, ethical or principled organizations.[42] Finally, and most simply, internal pressures develop as a result of the core characteristic of business—money. I have added internal pressure as a third pressure for businesses to respect human rights because it can be directly implicated by the other two pressures.

While there are clear and growing incentive mechanisms for businesses to maintain operations that do not violate human rights, there continues to be a lack of international human rights standards on sources for inputs in information and record keeping. As Jamie Metzl puts it, "Accurate and timely information is an indispensable tool and an essential precondition for effective responsive action and the promotion of human rights, whether by organizations, individuals, government, or international institutions."[43] By providing the right technologies, current business policies and expectations can be enhanced to be able to meet socially responsible global standards in supply chain management. With blockchain technology, actions

[42] Frederick E. Webster, Jr., "Determining the Characteristics of the Socially Conscious Consumer," *Journal of Consumer Research,* Volume 2, Issue 3, (December, 1975), Pages 188-196, https://doi.org/10.1086/208631.
[43] Jamie F. Metzl, "Information Technology and Human Rights,": 705-746.

such as record keeping offer access to the facts and for an informed response to past, ongoing and future issues. The interesting part, then, is what gets done with this information and why it is useful for businesses to operate on the same, secure, and accountable system.

Impact assessment and due-diligence are evidence-based exercises. With this, States as duty bearers are obligated to report on and be monitored for protecting, respecting and fulfilling international human rights. Similar standards of accountability should be implemented for corporate responsibilities. With transparency, accountability and public participation at its core, blockchain technology has the potential to gather the necessary information to account for all of these elements. With this, I introduce two prominent sources that should be taken into account when looking at instrumental benefits of due-diligence and accountability for businesses in supply chains holistically. With the right operational systems and technology, these benefits present a unique opportunity to address the pressures described above.

In 2013, the World Bank conducted research on *Human Rights Impact Assessments: A Review of the Literature, Differences with other forms of Assessments and Relevance for Development (HRIA).*[44] This study defined HRIA as "an instrument for examining policies, legislation, programs and projects to identify and measure effects on human rights" and analyzed existing approaches to human rights impact assessment tools.[45] The study differentiates HRIAs from other forms of impact assessment such as environmental impact assessments (EIA) or social impact assessments (SIA) with the fact that HRIAs are underpinned by the international human rights legal framework and its values as well as comprehensive and detailed analysis of

[44] "Human Rights Impact Assessments: A Review oft he Literature, Differences with other forms of Assessments and Relevance for Development," The World Bank and the Nordic Trust Fund, accessed November 1, 2017, http://siteresources.worldbank.org/PROJECTS/Resources/40940-1331068268558/HRIA_Web.pdf.
[45] The World Bank and the Nordic Trust Fund, "Human Rights Impact Assessments: A review of the Literature, Differences with other forms of Assessments and Relevance for Development."

specific human rights issues at hand. While there is a difference between HRIAs and SIAs with regards to policies in the international human rights legal framework, I argue that social responsibility often parallels the role of human rights accountability due to the fact that a lack of social responsibility can lead to violations of international human rights laws. Therefore, I use the concept of SIA and HRIA interchangeably. Essential elements identified in this analysis of HRIAs are: a normative human rights framework, public participation, equality and non-discrimination, transparency and access to information, accountability and inter-sectoral approach.

Similar to The World Bank's HRIAs, the Office of the High Commissioner for Human Rights has published its *Human Rights Indicators: A Guide to Measurement and Implementation* in 2012.[46] Among the extensive content on how to understand their various human rights indicators, this document also looks at the complexities of various forms of data aggregation and sources of data-gathered. As described in the World Bank research, an essential precondition of data analysis and assessment is the reliability of that data. Instruments such as these can prove helpful when creating data metrics for ethical business practices.

Among lack of political will and expertise, limits for regulatory impact such as treaties include lack of continuity within the recording system.[47] For example, when data on an operation is being inputted in a system by different individuals at different times, it can often be inconsistent and unreliable. Likewise, the recording system itself must be developed enough to handle the magnitude and nature of data collected. In supply chains, data management varies based on the type of data gathered throughout the chain and in different chains, making it

[46] "Human Rights Indicators: A Guide to Measurement and Implementation," OHCHR, accessed November 1, 2017, http://www.ohchr.org/Documents/Publications/Human_rights_indicators_en.pdf.
[47] Christof Heyns and Frans Viljoen, "The Impact of the United Nations Human Rights Treaties on the Domestic Level," *Human Rights Quarterly,* Vol.23, No.3 (August, 2001): 483-535.

increasingly difficult to track and manage. For example, you will not want to record the same type of data when tracking the catch and transport of fish as you will when tracking the source of raw diamonds. Lora Cecere, author of *Supply Chain Metrics That Matter* describes typical supply chains today as "closed and proprietary technologies."[48] This means that any data that is collected and stored in the majority of current supply chain operation systems is not interoperable, and the security and legitimacy of that data is dependent on a single source. In her research, Cecere identifies "dark holes"[49] in current supply chain approaches that drive her description of today's supply chains. These dark holes are found at points in the chain when the ownership of data is being transferred or shared. This often leads to a break in the flow of information, which can lead to major transparency issues regarding the identification of the product and who is handling it. Proposed and mandatory supply chain management solutions range from international and national agreements and standards that call for vendors to fill these dark holes to utilities such as record-keeping technologies. Cecere argues that "It is unrealistic to think that vendors like Infor, Microsoft, Oracle, and SAP will ever work together to erase the dark holes of information in the supply chain."[50] In response, she advocates for open source solutions instead of closed and proprietary ones. With such open source solutions, however, it is imperative that any technology exists on top of a foundation of adequate regulation, understanding of the environment, data management and due-diligence processes. Below, I analyze two case studies to better understand the necessary foundation on which blockchain can bring value optimally.

[48] Lora Cecere, *Supply Chain Metrics That Matter* (Hoboken, New Jersey: John Wiley & Sons, Inc., 2014), 233.
[49] Lora Cecere, "Seven Use Cases for Hyperledger in Supply Chain," January 9, 2017, http://www.supplychainshaman.com/big-data-supply-chains-2/10-use-cases-in-supply-chain-for-hyperledger/.
[50] Cecere, "Seven Use Cases for Hyperledger in Supply Chain."

CHAPTER 3: CASE STUDIES

With its wide range of potential to revolutionize industries such as banking and finance, business, government and other industries such as internet of things, blockchain's existing real-world application has been overinflated by its hype. It is critical to understand the issues we are trying to solve for when using blockchains as most barriers to revolution are not technological. Rather, they are governance, organizational, and even societal.[51] The necessary strategic implications of this foundational technology include not only the understanding of the technology, but often the recreation of decade-old infrastructures and systems. Here, I introduce Provenance and Everledger, their unique implementations of blockchain technology to add transparency in the fishing and diamond supply chains as well as their impact on human trafficking and forced labor. Below, I analyze two case studies of early adopters of blockchain in the supply chain industry that have shown evidence to be able to positively affect the issue of human trafficking and forced labor in supply chains.

Everledger uses blockchain to increase transparency for the ultimate goal of ethical markets.[52] In early 2016, members of the Blockchain Council of the Dubai Prime Minister's office held a series of talks preceding a pilot project to discuss how blockchain can be used in the Kimberley Process.[53] With a collaboration with the United Arab Emirates, The KP Chair announced in his mid-term report that "Blockchain technology can be used to prevent conflict diamonds from entering the market."[54] Although no public information is available on the

[51] Karim and Marco Iansiti, "The Truth About Blockchain," *Harvard Business Review,* January-February 2017, https://hbr.org/2017/01/the-truth-about-blockchain.
[52] "What We Do," Everledger, accessed December 3, 2017, https://www.everledger.io/#do.
[53] Luke Parker, "Kimberley Process pilots a blockchain for tracking the world's diamonds," Brave New Coin, August 28, 2016, https://bravenewcoin.com/news/kimberly-process-pilots-a-blockchain-for-tracking-the-worlds-diamonds/.
[54] KP Chair 2016, "Kimberly Process Mid-term Report," United Arab Emirates, accessed October 1, 2017. https://www.kimberleyprocess.com/en/system/files/documents/kimberley_process_mid-term_report.pdf.

findings, the report and other third parties suggest a pilot project with Everledger with regards to conflict diamonds.

Provenance "exists to empower people to change the way the global economy works. Creating and fostering open and accessible information about products is at our core, inspiring us to be active citizens through the things we choose to buy. We believe companies like us can and should operate both to succeed as a business and in service to local and global communities."[55] Of their six conducted case studies, their first pilot program worked with certified producers in South East Asia to track fish through the supply chain for the United Kingdom, Japanese and US markets to prove sustainable-sourced and slavery-free tuna.[56]

II. Everledger: Raw Diamonds

In 2009, Human Rights Watch interviewed more than one hundred witnesses and victims of human rights abuses within military-controlled diamond fields, operating under President Robert Mugabe's rule.[57] Their documentation on the Zimbabwean military killing, torturing and forcing children to labor provided a stark depiction of a system of abuse and suffering for the diamond-revenue-generating profit of power-hungry actors.[58] Mineral-rich regions, such as sub-Saharan Africa, are often subject to the paradoxical effects of suffering and poverty. This comes as a direct result of impoverished communities due to lack of education, inadequate mining regulations, and an unequal diversification of mining profits to the direct communities and villages from white the diamonds are procured.[59] Records of such abuses prompted

[55] "About," Provenance, accessed December 2, 2017, https://www.provenance.org/about.
[56] "Case Studies," Provenance, accessed December 2, 2017, https://www.provenance.org/case-studies.
[57] "blood diamond," Human Rights Watch, February 1, 2010, accessed June 2, 2017. https://www.hrw.org/news/2010/02/01/blood-diamond.
[58] Ibid.
[59] "Child Miners in Sierra Leone's Diamond Industry," International Human Rights Clinic at Harvard Law School, accessed November 30, 2017. http://hrp.law.harvard.edu/wp-content/uploads/2014/07/Digging_In_The_DirtLR.pdf.

unprecedented global attention from national governments, non-governmental organizations, corporations, and industry associations to prevent the trade and sale of conflict diamonds. The United Nations Security Council defines conflict diamonds as "…diamonds that originate from areas controlled by forced or factions opposed to legitimate and internationally recognized governments, and are used to fund military action in opposition to those governments, or in contravention of the decisions of the Security Council."[60] Wars across Angola, Sierra Leone, the Democratic Republic of the Congo, Liberia, the Ivory Coast and the Central African Republic due to blood diamonds have resulted in over 4 million deaths and a further displacement of millions of people.[61] The highly attractive currency for illegal transactions and actions from the high value of diamonds, their ease in concealment and transportation, remote mining areas, the complex process of trading routes, and little documentation results in a ripe environment for human rights abuse.[62]

The Kimberly Process Certification Scheme (KPSC) was instituted in 2003 as a result of the United Nations Security Council Resolution 1459[63] passed in January 2003. The Kimberley Process Certification Scheme is an international agreement reached by 54 participants, accounting for 81 countries, together making up 99.8% of the diamond industry.[64] Since its adoption by the UN General Assembly, the KPSC has been aiming at monitoring and evaluating the production and international trade of rough diamonds through the Kimberley Process

[60] "Security Council, PRAMUN 2016 Synopsis," PRAMUN, accessed October 23, 2017, http://www.pramun.com/2016-10-Sec-1.pdf.
[61] Ibid.
[62] Annie Wallis, "Data Mining: Lessons from the Kimberley Process for the United Nation's Development of Human Rights Norms for Transnational Corporations," *Northwestern Journal of International Human Rights,* Vol. 4, Issue 2, (Winter 2005): 390. https://scholarlycommons.law.northwestern.edu/cgi/viewcontent.cgi?referer=https://scholar.google.com/scholar?hl=en&as_sdt=0%2C33&q=human+rights+abuses+in+diamond+mining&btnG=&httpsredir=1&article=1039&context=njihr.
[63] S/Res/1459 (2003) http://www.refworld.org/cgi-bin/texis/vtx/rwmain?docid=3f45dbdca.
[64] KP Chair 2016, "Kimberly Process Mid-term Report."

Certificate.[65] Through various requirements on the members, KPCS aims to maintain a reliable certification process for rough diamonds to prevent the shipment in illicit markets of 'conflict' diamonds. To be a member, a state is required to implement legislation and institutions for export, import and internal controls to expose transparency and can prove viable data.[66]

An analysis of the KPSCs triumphs and shortcomings is timely as it has been implemented for long enough that observations in the human rights literature have begun to emerge. Since its early onset, major organizations such as Human Rights Watch and Global Witness have addressed problems with the KPSC. Global Witness, being one of the organizations that worked with the original creation of the KPCS, withdrew form the agreement in 2011 because it has "failed to deliver" on its promises.[67] HRW has identified a major shortcoming of the process to be its narrowly defined terms and applications to batches or rough diamonds rather than individual stones.[68] Without a sustainable tracking system, which blockchain technology provides, the trail ends here.[69] In short, the KPSC was devised to convene a consortium of key global stakeholders to implement state legislation and regulation of the diamond trade. As many other soft law instruments, this system of certifications has been considered as an inadequate monitoring and enforcement mechanism.

Although not explicitly stated in public information by either Everledger or The Kimberley Process documents, a pilot project using blockchain to restrict conflict diamonds from

[65] "Kimberly Process Certification Scheme," Core Document, accessed June 24, 2017, https://www.kimberleyprocess.com/en/kpcs-core-document.
[66] Ibid.
[67] "Global Witness Leaves Kimberly Process, Called for Diamond Trade to Be Held Accountable," Global Witness, December 2, 2011, accessed March 18, 2017, https://www.globalwitness.org/en/archive/global-witness-leaves-kimberley-process-calls-diamond-trade-be-held-accountable/.
[68] "Human Rights Watch Statement on the Kimberley Process," Human Rights Watch, June 6, 2016, accessed March 18, 2017, https://www.hrw.org/news/2016/06/06/human-rights-watch-statement-kimberley-process.
[69] David Rhode, "The Kimberley Process is a 'perfect cover story' for blood diamonds'." *The Guardian*, March 24, 2014, https://www.theguardian.com/sustainable-business/diamonds-blood-kimberley-process-mines-ethical.

markets has been announced.[70] As such, it is beneficial to analyze the business model of Everledger and how it may be seen within the KPCS. In June 22, 2015, Everledger began its process of laser inscription registry, being able to track the characteristics of each diamond through various unique identifiers consisting of 40 metadata points and multi-step verification factors.[71] This is powered by IBM Blockchain on Hyperledger Fabric's open-sourced blockchain. Specifically, it is a supplementary building block to the KPSC with digital certificates on the blockchain. This is created to ensure banks and insurers, law enforcement, and online marketplace stakeholders can participate collectively to verify the legitimacy of each diamond.[72] Leanne Kemp, the CEO of Everledger, in an IBM Edge 2017 speaking event, focused her talk around the word "provenance" and its implications of risk when it cannot be verified, costing insurer $50 billion per year.[73] She shares that without proper tracking mechanisms, a lost or stolen diamond is harder to recover and costly. In a separate interview shared on TechCrunch, she stated,

> "Our play is actually around the police, around insurance companies, and having a line of sight and an eye—whether that's across open portal data with open source intelligence, or whether it's direct Application Program Interface (API) feeds—with really large houses like eBay and Amazon, Rakuten, these kind of portal sites…where people think they're outsmarting the insurance companies by putting their goods online to sell it."[74]

[70] KP Chair 2016, "Kimberly Process Mid-term Report."
[71] Everledger, "EDGE 2016- The Power of the Individual (LONG version)." YouTube, September 25, 2016, https://www.youtube.com/watch?v=GAdjL-nultI.
[72] Carlo Gutierrez, Alex Khizhniak, "A Cloe Look at Everledger—How Blockchain Secures Luxury Goods," April 27, 2017, https://www.altoros.com/blog/a-close-look-at-everledger-how-blockchain-secures-luxury-goods/.
[73] Everledger, "EDGE 2016- The Power of the Individual (LONG version)." https://www.youtube.com/watch?v=GAdjL-nultI.
[74] Natasha Lomas, "Everledger Is Using Blockchain To Combat Fraud, starting With Diamonds," *TechCrunch,* June 29, 2015, https://techcrunch.com/2015/06/29/everledger/.

Unlike other third-party statements, Kemp's statement implies that Everledger is not focusing on raw conflict diamond tracking. This does not correlate with her introductory statement with the word "provenance" as cut diamonds are not at their earliest known form. This would make it impossible to understand and manage conflict diamond mining. She then goes on to say,

> "The perfect use case for the blockchain is most definitely when there is an immutable ID on a device that cannot be changed and it is sitting within an immutable ledger."[75]

These three claims seem to pose the question: What provenance and what ID is Everledger tracking? Where does true provenance lie and what determines it? Also, since the ID tracking has only been shared as that of an already cut diamond, instead of a raw diamond, it is difficult to conclude where exactly this model falls with the KPCS or any other paper certification process of raw diamonds. It is important to reinforce here that there is no public data or study shared by Everledger or IBM on the actual tracking of diamonds from the mine. Additionally, any other processes have been collected through third-party articles and interviews. Such a level of provenance certification for a diamond from its original mine and who mined it is not made public and may not exist, but in the case of fish, Provenance has published more extensive data.

III. Provenance: Tuna in Thailand

In recent years, the topic of human trafficking and forced labor has garnered a major focus in human rights literature. Labor trafficking, the human rights violation focused in this case study analysis, the International Labour Organization (ILO) refers to forced labor as,

> "…situations in which persons are coerced to work through the use of violence or intimidation, or by more subtle means such as accumulated debt, retention of identity papers or threats of denunciation to immigration authorities. Forced labour contemporary

[75] Ibid.

> forms of slavery, debt bondage and human trafficking are closely related terms though not identical in a legal sense. Most situations of slavery or human trafficking are however covered by ILO's definition of forced labour"[76]

In a study conducted by the ILO in 2012, it was found that out of the estimated 20.9 million victims of trafficking, 14.2 million were people trafficked for forced labor primarily in the fields of agriculture, construction, domestic work, manufacturing, mining and utilities.[77] Globalization and a growing consumer society have contributed to complicated and long supply chains, making inventory management increasingly difficult and forced labor harder to identify. In America, for example, a majority of products used daily have a slavery footprint from an item processed through a tainted supply chain. The complexity of the problem can be seen in the often non-linear process of extracting, transporting, warehousing, manufacturing, processing and selling of various materials around the globe to make one product. The trafficking and forced labor of human beings is a grave violation of human rights recognized in the Universal Declaration of Human Rights[78] and many other international documents. While human trafficking is an issue dating far before its recognition, major gaps persist in not only confronting it, but understanding and measuring it. When analyzing literature on gaps in measurement and evaluation tools, I found the vital missing point was proper identification of the victim. Much like products in the supply chain, you must have proper identification mechanisms for individuals to be able to understand where something wrong may have occurred, such as the exploitation of a person.

[76] "The meanings of Forced Labour," The International Labour Organization, March 10, 2014, accessed December 1, 2017, http://www.ilo.org/global/topics/forced-labour/news/WCMS_237569/lang--en/index.htm.
[77] "New ILO Global Estimate of Forced Labour: 20,9 million victims," The International Labour Organization, June 1, 2012, accessed December 1, 2017, http://www.ilo.org/global/about-the-ilo/newsroom/news/WCMS_182109/lang--en/index.htm.
[78] UN General Assembly, "Universal Declaration of Human Rights," 217 (III) A (Paris, 1948).

Frenkel and Scott argue that "brands develop two distinct types of compliance relationships with their suppliers: a hands-on, cooperative relationship with some suppliers and an arm's-length, more distrustful, "compliance" relationship with others."[79] Distant relationships within supply chains result in substantive overlooked areas in business for human rights violations to continue proliferation, and stay unnoticed. The SE Asia and Pacific region accounts for 11.7 million (56% of the global total) documented individual trafficking cases linked to forced labor.[80] An Oceana study found that in the fishing supply chain pipeline, more than 33% of seafood is mislabeled.[81] Furthermore, between 20% and 32% ($1.3-2.1 billion) of "wild-caught" seafood US imports come from pirate fishing.[82]

The aims for Provenance's tuna pilot project holds a second example for the unique potential of blockchain technology. In its study, CEO Jessi Baker and builder Thibaut Schaeffer shares that Provenance uses blockchains to,

> "…track verified claims about the creation of a product as the product changes hands down the supply chain. The main problem we were solving is how to create a system of tracking a set of verified claims about something through a complex chain of custody—to avoid double spending of the claim without an authority needing to broker all the data in the supply chain."[83]

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[79] Stephen J. Frenkel, and Duncan Scott, "Compliance, Collaboration, and Codes of Labor Practice: THE ADIDAS CONNECTION," *California Management Review,* 45, no.1 (Fall 2002): 29-49.

[80] "Global Report on Trafficking in Persons," United Nations Office on Drugs and Crime (UNODC), 2012, accessed July 7, 2017. http://www.unodc.org/documents/data-and-analysis/glotip/Trafficking_in_Persons_2012_web.pdf.

[81] Kimberley Warner, Walker Timme, Beth Lowell, and Michael Hirshfield, "Oceana Study Reveals Seafood Fraud Nationwide," *Oceana*, February 2013, accessed May 3, 2017, http://oceana.org/sites/default/files/National_Seafood_Fraud_Testing_Results_FINAL.pdf.

[82] Ganapathiraju Pramod, Katrina Nakamura, Tony J Pitcher, and Leslie Delagran, "Estimates of illegal and unreported fish in seafood imports to the USA," *Marine Policy*, Vol. 48, (September 2014): 102-113. http://www.sciencedirect.com/science/article/pii/S0308597X14000918

[83] "From shore to plate: Tracking tuna on the blockchain," Provenance, accessed March 4, 2017,

By tracking fish from catch to consumer, the Provenance pilots program in Indonesia with over 12 Pole and Line certified producers of tuna presents a unique use case for bringing transparency and traceability in the supply chain through blockchain. The process began with the formation of a network of eight fishing organizations through interviews, and the respective managers and officers who work directly within Indonesia's pole and line and handline fisheries.[84] Supply chain stakeholders were mapped to participate in the data collection and the data collection from the project was also compared[85] to the previous data managed by three organizations. The team also accounted for the companies' levels of vertical integration, and technological proficiencies. The only company that had used digital forms of accounting used plastic tags on tuna loins to track them before shipping them to a factory. Provenance's project found that while other initiatives had been made to digitize data, a limited amount presented a good enough way to make that data interoperable without a single point of control from a third party.[86] They also found that every fisherman, supplier and factory worker already has a mobile phone with access to wifi.[87]

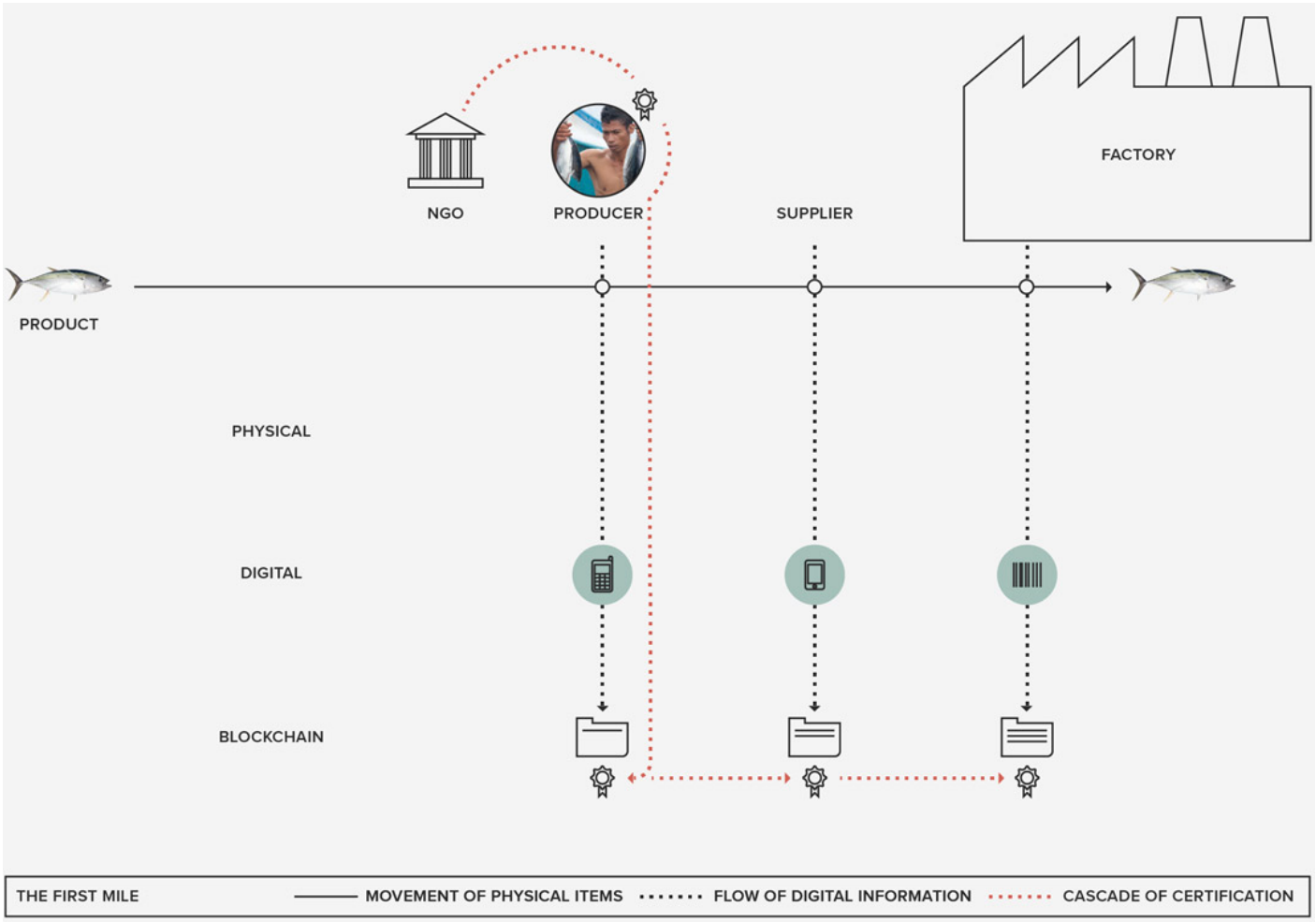
Fishermen in the first phase of the pilot were given the database technology upon registration by an NGO, uses their anonymous IDs for SMS text messaging to register the legal fish catch, which automatically located and tracked the fish, its material attributes, and certification.[88] In turn, this data was accessible by all users of the database including the consumer, making it reliable and accountable. Verification of claims by the fishermen was done

https://www.provenance.org/tracking-tuna-on-the-blockchain.

[84] Ibid.
[85] "The Story Behind the Tuna," Provenance News, March 30, 2016. https://www.provenance.org/news/technology/story-behind-tuna/.
[86] Ibid.
[87] Ibid.
[88] "From shore to plate: Tracking tuna on the blockchain," Provenance.

by third party local NGO's Provenance had worked with, using auditing systems to also account for external compliance measures.

Figure 3: The Certification Process of Fishing as created and shown by Provenance[89]



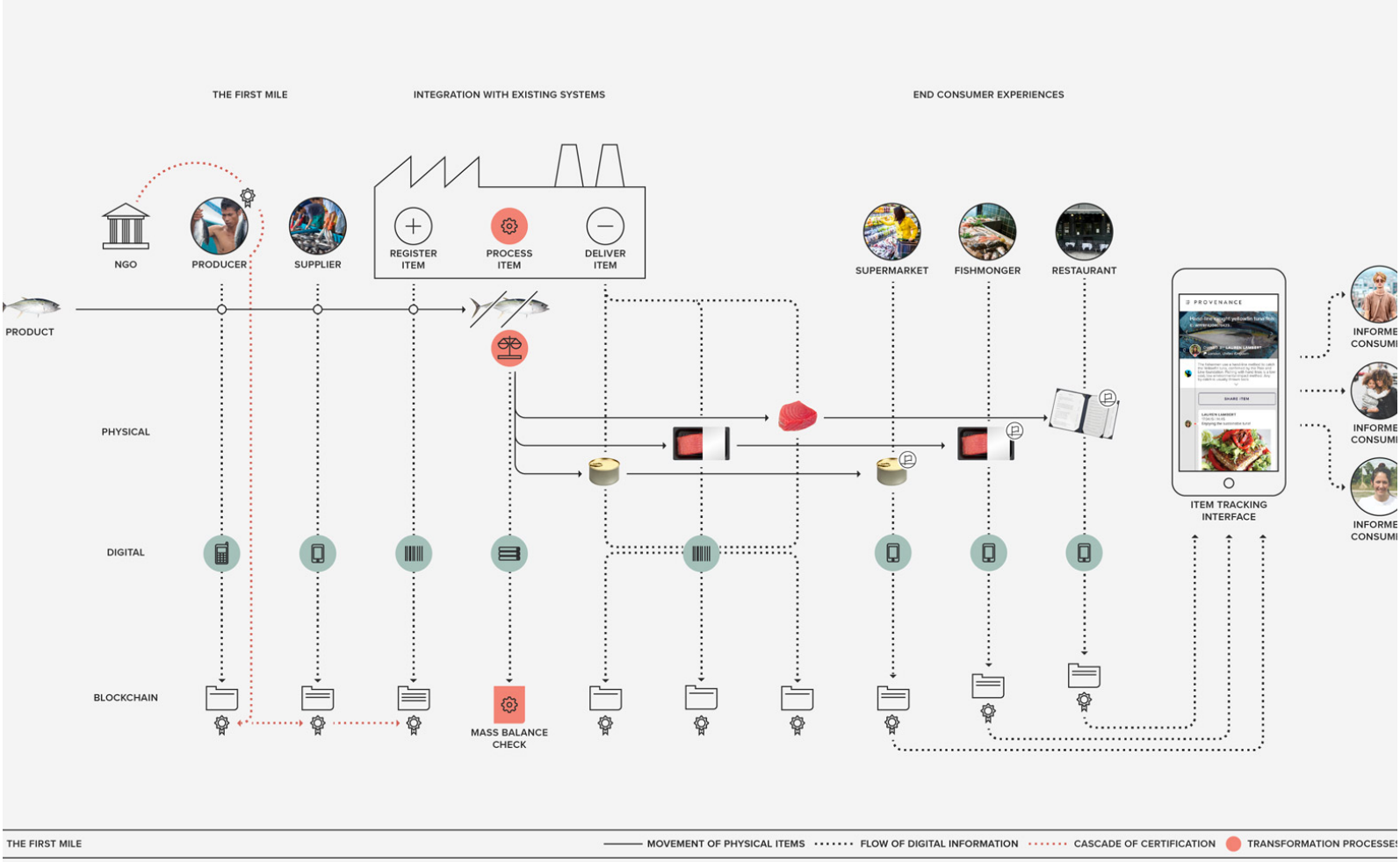
In other words, the system shows the location of the catch, certification and the day it was caught and by whom. Such technology is beneficial not only for individuals as workers by incentivizing good behavior for business to be an open and trusted brand in a society of growing conscious consumers, but also allows for a secure and unique method as a compliance functionality. Phase two of the pilot was focused on the interoperability of data with the various

[89] Ibid.

legacy systems companies managed their data on beforehand. As shared in my second limitation to the maturity of blockchains, Provenance also found the importance of a single source of truth (SSOT) when identifying any point of information. Provenance defines SSOT as, "The practice of having a piece of data stored in exactly one place—any usage of that piece of data refers to this single source instead of storing it somewhere else as a duplicate."[90] Provenance also found a demonstrated need for accompanying materials when validating information on their blockchain to create unique identifiers, such as a quick response code (QR Code) or a radio frequency identification (RFID) tag.[91] This finding also reconfirms the fact that blockchain is only a supplementary tool to an overarching solution that must be addressed with many measurements through multiple aspects depending on the industry, current processes, and tiers of stakeholders. The team's final two findings in the second phase were the need to account for the acceptance and registering of transformed items such as tuna that had been canned in olive oil or one piece of tuna that has been separated into different cans.[92] With the blockchain, the separate tracking of the transformed goods was made possible while still operating under the same accounting system as the first phase. The final part of the pilot is connected to the last pressure businesses face by consumers: "The consumer experience and building an interface for trust."[93] The pilot accounted for a simple and tangible user experience of the food process by adding smart stickers to the final product, which would be scanned with a smartphone to illustrate the story behind the good.

[90] "Key Definitions," Provenance, July 15, 2016, https://www.provenance.org/tracking-tuna-on-the-blockchain#glossary-ssot.
[91] "From shore to plate: Tracking tuna on the blockchain," Provenance.
[92] Ibid.
[93] Ibid.

Figure 4: Blockchain Providing the Base Layer of Truth Across the Supply Chain as created and shared by Provenance[94]



Provenance's pilot project took a thorough approach to understanding and verifying the supply of tuna from its very catch. By registering each fisherman, they had the proper data to be able to verify a slavery-free product through blockchain data tracking.

[94] Ibid.

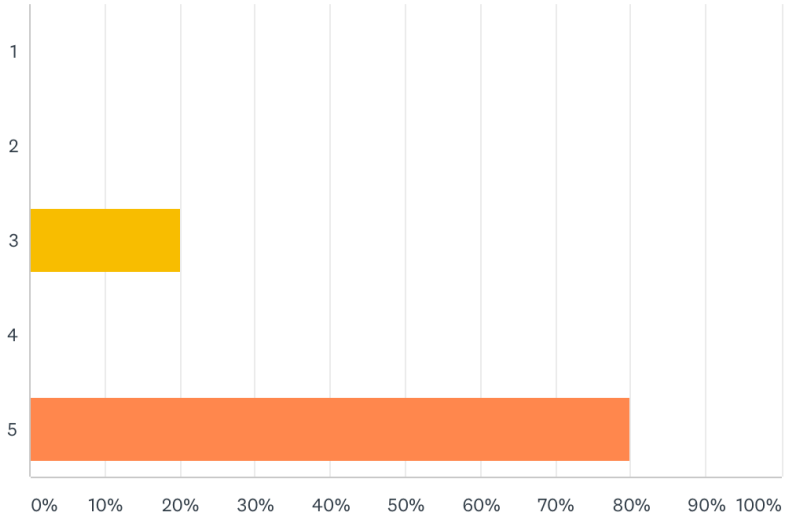
IV. Interpretations from Primary Research

Technology and human rights is an expanding and complex field of study, comprised of numerous aspects of culture, the disruption of powerful centralized actors in capitalist economies, invoking more participation and enforcement by human rights institutions such as the United Nations, the dissolution of state sovereignty, and raising debates about information security.[95] With the potential of blockchain to be the ultimate system of data authority, it correspondingly has the potential to greatly affect the transformation of large and siloed processes such as supply chains. However, it cannot do it alone. With a preliminary description of blockchain and two case studies as well as data collected from key informant industry leaders, this thesis asks whether blockchain can be an instrument for improving human rights practices in today's globalized world. Due to user anonymity, security, and interoperability of data, blockchain shows potential for supply chain transparency and advancing corporate accountability mechanisms in a conscious-consumer society. However, the current nature of the implementation of blockchain technologies is complex and opaque, future focused and often disconnected from actual people.

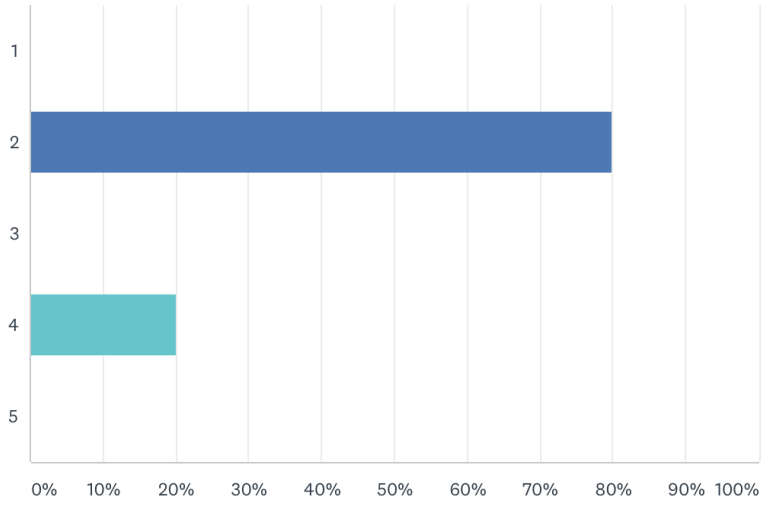
Below are the results of an analysis of selected questions from surveys completed by a consortium of identified industry leaders and key stakeholders ranging in expertise in blockchain technology, human rights, fishing industry supply chains, diamond supply chains, cotton supply chains, coffee supply chains, and business supply chain management. The purpose of this data gathering was to understand the various attitudes and opinions of often contentious concepts in the field of blockchain technology and human rights in supply chains.

[95] Kobina Houghes, "Blockchain, The Greater Good, and Human and Civil Rights," *Metaphilosophy,* 48, no.5 (October 2017): 654-665.

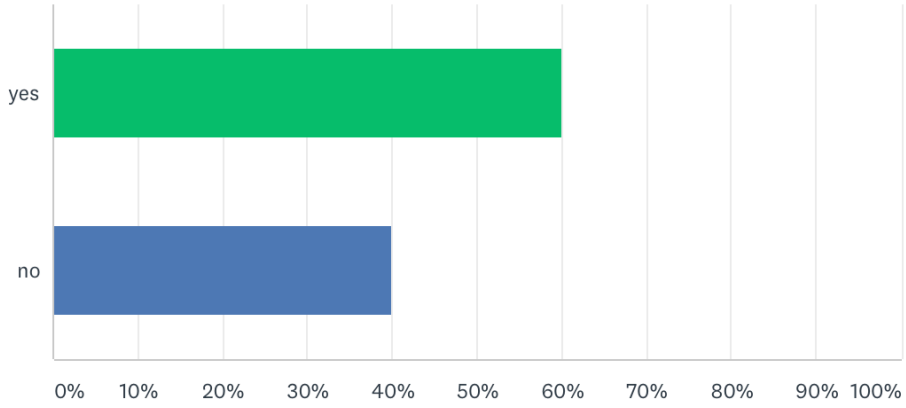
On a scale from 1-5, (1 being extremely low and 5 being extremely high), how likely do you think it is that businesses will be able to improve their human rights practices?



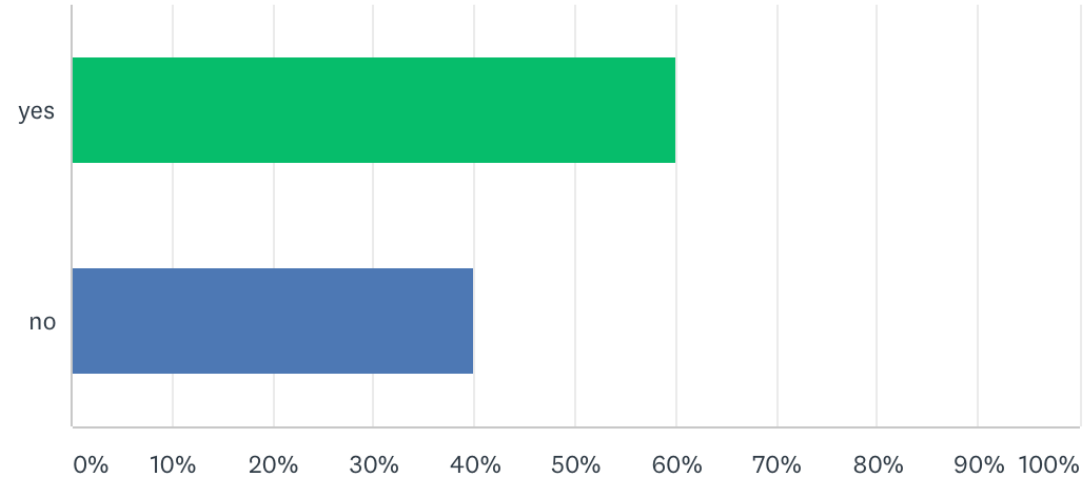
On a scale from 1-5 (1 being extremely low and 5 being extremely high), how likely do you think it is that businesses want to improve their human rights practices?



Is blockchain technology currently scalable to meet global organizational needs and demands?



When looking at data security, does blockchain truly eliminate the need for third party verification?



I did not include graphed answers to the following questions because the results were a 100% yes across the aboard: Are some blockchains more advanced than others? Does blockchain technology have the potential to create transparency corporate supply chains if implemented correctly? Does blockchain technology have the potential to create accountability corporate supply chains if implemented correctly? Is there a potential for blockchain technology in general

to help businesses to improve their human rights practices? Is there a potential for blockchain technology in general to help businesses to improve their human rights practices?

Blockchains can be compared to the internet as they are both powerful and unique data structures that have the ability to be used as a tool for revolutionizing operations of data collection, storage, management, and implementation. They are non-human tools, for both human and technical problems. However, the maturity and value of each in human rights, is seen in how they are used and within functional, societal, and business systems. A technology like blockchain requires a balance of both human and technological governance. This includes regulation, impact assessment, and enforcement. The reason data recorded on the blockchain should be tracked from the very provenance to the consumer would be for the purpose of creating a functional framework to understand and enforce ethical business practices that may impact individuals at any point of the supply chain.

In the case of Everledger, there is no public information available other than that of third-parties on how it may track raw conflict diamonds. However, a study by Annie Wallis on the topic has concluded with a series of recommendations for the KPCS which can also be implemented and considered in blockchain ledgers as that of Everledger as well as other regulatory instruments. First, Wallis mandates random independent inspections of the entire supply chain pipeline by governments in compliance with the Kimberley Process. Second, she calls for self-governance and self-regulation of companies within its internal management processes. Finally, she recommends for legally binding protocols in support of the self-regulation mechanisms called for in the second recommendation.[96] While Everledger is focusing on the tracking and verification of cut diamonds by limiting the resale of lost or stolen diamonds

[96] Annie Wallis, "Data Mining: Lessons from the Kimberley Process for the United Nation's Development of Human Rights Norms for Transnational Corporations,"*406*.

through the involvement of insurance companies, proven and studied use cases of its initiative hold a powerful potential to the transparency of conflict diamond mining.

Information gathered from public data on Provenance's pilot test in Indonesia proved to be a successful data source and, what Provenance calls 'the first mile' of what seems to be a marathon to global successful blockchain implementation. The lessons learned form this case study provide additional validation to both the potential for blockchain as well as its limitations and key areas that need to be addressed preemptive to scaling of the technology. These include an advanced and continually growing of the technology as it itself expands, acceptance and cooperation from all stakeholders for blockchain to be the ultimate source of authority, a restructuring of old monopolized systems where blockchain can be integrated as a supplementary tool rather than a singular solution, and a consensus of regulatory standards both within the blockchains and the industries they are implemented.

CHAPTER 4: CONCLUSION

Blockchain technology has been distinguished for its lucrative operation as a platform for digital currency and democratization of asset exchange through Bitcoin cryptocurrency. It is a decentralized, transparent and accountable digital network and database for empowerment and accountability tools based off digitized metrics and is gradually gaining value for its implications beyond cryptocurrencies. Despite numerous whitepapers, media articles, books and research papers on the topic of blockchain technology as a tool for addressing human rights problems, there remains a lack of empirical analysis. There is however, information on the positive research blockchain technology has brought to data management as well as attitudes on its limitations gives a tangible understanding of where blockchain currently stands and what its potentials may be for businesses when looking at human rights. As discussed in section three of the first chapter,

the timeline for the maturity of blockchain can be compared to that of the internet and artificial intelligence in the sense that such a revolutionary technology takes a lot of variables to be set in place. As a result, literature on blockchain technology is limited due to its nascent and narrow implementation. As a result, there is even less academic literature on the tools blockchain technology provides and the potential they carry in the field of human rights, namely human trafficking and forced labor.

I have used interviews and surveys as accompanying data for my literature review and analysis of blockchain technology to identify four core technical and non-technical limitations of blockchains:

- **Understanding of the technology**: Limited number of developers, and poor management of expectations resulting in 'branding issues' of the technology.
- **Acceptance and cooperation as the ultimate source of authority**: The need for blockchain to be the ultimate source of authority to prevent lack of scalability, oligopolies and scalability.
- **Political overhead and lost-standing industry systems**: the need for functional human systems to be in place before a technology system is built into them.
- **Laws and regulations**: Issues of immutability and privacy.

When analyzing the primitive productions of a nascent technology with global hype attached to it, especially with open-sources systems that can be used by the general public, it is important to manage expectations before understanding the technology. Insufficient understanding of the technology itself, and where it adds value can cause businesses and organizations to do too much too soon with a powerful technology, limiting its positive and

productive potential. Viewpoints of the technology still being seen as esoteric limits its potential and growth. Another type of understanding that is crucial for the maturity of blockchain is the amount of available and credible developers. There is a shortage of developers worldwide that are proficient in the necessary cryptographic languages and other computing skills.[97]

The true value of blockchain technology comes when it is trusted as the ultimate source of authority for data management. Brian Behlendorf shares. "This technology only creates value when it becomes *the* system of record. When companies are dependent upon it as the source of truth and authority rather than simply as another way to document data that's being trusted through a system systems."[98] This is important when there are disputes between the distributed ledger and other legacy systems during the migration of hybridization of the old and new ledger systems. A societal obstacle to overcome when it comes to trust and authority of data is the overarching distrust of big data systems of any kind. This is referenced to the recent Equifax data breach in the summer of 2017 where 209,000 people had their personal data exposed or stolen.[99] With a distributed ledger system, data is no longer held by a third party. Rather, it is distributed, encrypted, and anonymous with the ability to encrypt contracts to govern its management. Wide acceptance of blockchain also addresses the potential for the creation of oligopolies and hidden centrality issues in smaller networks where a small number of individuals can overpower most of the data, resulting in eminent centrality issues distributed systems seek to avoid. In order for acceptance to make a difference, however, the technology itself must be able to scale.

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[97] Michael Scott, "The Blockchain Developer Shortage: emerging Trends and Perspectives," *Bitcoin Magazine,* October 31, 2016, https://bitcoinmagazine.com/articles/the-blockchain-developer-shortage-emerging-trends-and-perspectives-1477930838/.
[98] Brian Behlendorf, Amanda Graham interview, Skype, November 6, 2017.
[99] "The big data breach suffered by Equifax has alarming implications," *The Economist,* September 16, 2017, https://www.economist.com/news/finance-and-economics/21728956-financial-industry-worries-about-who-next-big-data-breach-suffered.

Global scalability in a wide range of uses of blockchain remains to be empirical. IBM, for example, published a document called *Trust in trade" Toward stronger supply chains* in 2016 forecasting the capabilities of blockchain to optimize supply chain operations in huge global companies such as Toyota.[100] Such large scale successful implementations are still in the early phases. Daniel Drescher accounts for the limitation of scalability to high security measures of blockchain.[101] Additionally, Dr. Ammous brings up the irreversibility of data, creating scalabilities issues.[102] Scalability of a database technology can be understood as the ability to expand and grow beyond its current use case in an efficient manner. Concerns of scaling have already been addressed with coded protocols such as IBMs Byzantine Fault Tolerant PBFT algorithm.[103] Questions of the scalability of blockchain technology partially come from the fact that it was originally only thought of as a platform for digital cryptocurrencies. Due to latency (time of transaction) protocols of smart contracts, peer-to-peer consensus can be cumbersome if the blockchain platform is not preprogrammed and built for handling large amounts of data and multiple interactions.[104] To be scalable, the processing power and latency requirements must be robust. This means that the blockchain must be preprogrammed to manage major amounts of data in a timely manner. At the same time, however, the growth of the blockchain increases with interaction, as do the capabilities.[105] There is an obvious importance for long-term data solutions as scalability must be, and has the potential to be, addressed from the onset of the platform

[100] "Trust in trade: Toward stronger supply chains," IBM Institute for Business Value, March 2017, http://www3.weforum.org/docs/WEF_The_future_of_financial_infrastructure.pdf.
[101] Daniel Drescher, *Blockchain Basics: A non-Technical Introduction in 25 Steps*, (California: Apress, 2017) 39.
[102] Saifedean Ammous, "Blockchain Technology: What is it Good for?," *SSRN* (August 8, 2016): 4. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2832751.
[103] Hossein Kakavand, Nicolette Kost De Sevres, and Bart Chilton, "The Blockchain Revolution: An Analysis of Regulation and Technology Related to Distributed Ledger Technologies,": 12-14.
[104] Satoshi Nakamoto, "Bitcoin: A Peer-to-Peer Electronic Cash System."
[105] Hossein Kakavand, Nicolette Kost De Sevres, and Bart Chilton, "The Blockchain Revolution: An Analysis of Regulation and Technology Related to Distributed Ledger Technologies,": 11.

creation. For data on blockchains to remain accessible over centuries, predetermined contracts and protocols must account for the overall vision for the use of the data at hand.

The most important initial step for accurate and accountable information is a trustworthy process of inbound data. Therefore, the validation of not only the data that is imputed must be correct, but in many circumstances the individual conducting this action must be validated as well.[106] This lack of identity documentation and the recognition that digital identity is the most important performance factor of the network in the validation process and determining the performance of the network.[107][108] As described in Chapter 1, blockchain technology has the ability to validate digital identification. This creates transparent communication and management of the origin and tracking of non-linear interactions. One of the most prominent examples of a limitation for blockchain to be able to create global autonomous digital identities on its networks is the European Union's General Data Protection Regulation's (GDPR), "right to be forgotten." This comes as an issue on various levels. First, while digital data can be removed from the public eye, it often remains somewhere, leaving sensitive information at risk to hackers.[109] Second, the rationality behind this rule is privacy. Therefore, the 'right to be known but anonymous' seems more tangible and realistic.[110] This is where anonymity of individuals who transact on blockchain ledgers can play a vital role. However, any information stored on blockchain

[106] Henry M. Kim, and Marek Laskowski, "Towards an Ontology-Driven Blockchain Design for Supply Chain Provenance," arXiv (August 2016): 7.
[107] Hossein Kakavand, Nicolette Kost De Sevres, and Bart Chilton, "The Blockchain Revolution: An Analysis of Regulation and Technology Related to Distributed Ledger Technologies," *SSRN* (January 5, 2017): 19. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2849251.
[108] "The future of financial infrastructure: An ambitious look at how blockchain can reshape financial services," World Economic Forum, August 2016, http://www3.weforum.org/docs/WEF_The_future_of_financial_infrastructure.pdf.
[109] Tribune Wire Reports, "Experts: Deleted online information never actually goes away," *Chicago Tribune,* August 21, 2015. http://www.chicagotribune.com/bluesky/technology/chi-deleted-online-information-never-goes-away-20150821-story.html.
[110] Aram Barnett, Amanda Graham interview, Grand Central Tech, November 6, 2017.

networks is encoded cryptographically and is immutable. This means that if a mistake is made or a piece of information such as a name or a date needs to be deleted, it cannot be. Additionally, new information can become visible and old information can be encrypted and made anonymous. It can then only be re-entered in a new entry with certain permissions. When dealing with personal information such as when registering an individual's identity through the blockchain, the "right to be forgotten", as defined in the European Union's 1995 Data Protection Directive[111], could present difficulties. When looking at human trafficking and forced labor through the identification of victims, another pitfall for the lack of victim cooperation is also attributed to fears such as criminalization, deportation or harm from the trafficker.[112] Privacy and anonymity respond to a major issue in collecting data due to limited victim cooperation. In the *Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression*, David Kaye states that "encryption and anonymity enable individuals to exercise their rights to freedom of opinion and expression in the digital age."[113] Anonymity and security for proof of identification through both case studies provides assurance to individuals distrusting or fearing having their information shared through cryptography.[114]

Through the concept of the future of money being directly linked to the future of identity, David Burch argues that the social aspect of identity is changing alongside the converging of money. As currency is slowly going from cash to digital and cryptocurrency, so are forms of identity. "The 'social graph', the network of our social identities, will be the nexus of

[111] "Right to be Forgotten" ECJ ruling c131/12. (2014).
[112] Savona Ernesto Ugo and Sonia Stefanizzi, *Measuring human trafficking: complexities and pitfalls* (New York; London: Humanities, Social Sciences and Law, 2007), 27-36.
[113] Kaye, David. *Report of the Special Rapporteur on the promotion and protection of the right to freedom of opinion and expression,* Human Rights Council. May 22, 2015.
[114] Tsiakis, Theodosios, "The Role of Information Security and Cryptography in Digital Democracy: (Human) Rights and Freedom," In *Digital Democracy and the Impact of Technology on Governance and Politics,* ed. Christina. Akrivopoulou and Nicolaos Garipidis (USA: Information Science Reference, 2015), 158-174.

commerce, administration and interaction."[115] As recognized in a large portion of literature on human trafficking, major identified problems in literature on the field of combatting human trafficking include: the lack of national and international cooperation for definitions and literature and consequently a diaspora of impractical measurement and evaluation tools, level of victim cooperation and therefore identification, and effective accountability mechanisms for entities and activities associated with the trafficking of human beings.[116] This illustrates a clear need for a technology that can take in various forms of information from different entry points and is then able to coordinate that data between different systems, making it interoperable regardless of the system used.

There always exists a potential for the misuse of any technology. The answer to this potential problem lies in the balance of the platform's governance. Such a technology requires a set of standards set by both technology and human governance. At the same time, the need for functional human systems to be in place must always precede that of technical ones. An example of a current issue behind a lack of formal process for how governance works on the blockchain can be seen in Bitcon's "block size debate" where there is a disagreement between the community on rules within the network as it is now a public system that had been operating for years under limited regulation. R3, another blockchain, has demonstrated an effort to work with old systems like banks who have certain regulatory measures in place for guidance.[117] There is a high importance for a balance of governance and principles both within the blockchain ledger and the system it is trying to manage. While many companies are claiming that blockchain can

[115] David Birch, *Identity is the New Money* (London: London Publishing Partnerships, 2014), 25.
[116] Savona Ernesto Ugo and Sonia Stefanizzi, *Measuring human trafficking: complexities and pitfalls*, (New York; London: Springer, 2017) 27-36.
[117] Vili Lehdonvirta, "The blockchain paradox: Why distributed ledger technologies may do little to transform the economy," *The Policy and Internet Blog*, November 21, 2016. http://blogs.oii.ox.ac.uk/policy/the-blockchain-paradox-why-distributed-ledger-technologies-may-do-little-to-transform-the-economy/

change the very way economies are organized and identity is shared, proper systems must be implemented first. This is where human rights standards and regulations have the potential to play a major role, especially when accounting for the accountability and transparency potentials of the technology.

This leads into a two-sided limitation with regards to laws and regulations. While there are current laws and regulations that exist that limit blockchain, there are also a lack of laws and regulations for it to reach its full potential as a global system of accountability. The World Economic Forum outlined three hurdles for large scale implementation: "An uncertain and unharmonized regulatory environment, nascent collective standardization efforts, and an absence of formal legal frameworks."[118] Organizations that seek to create ethical business practices should operate in an environment of shared responsibility by all stakeholders. This is crucial when implementing legal and regulatory standards throughout the international community and advancing off of the current pressures businesses face to have ethical practices. Although not necessary for all supply chains, the Shared Responsibility Paradigm model calls for a community-based approach when dealing with the most serious human rights risks.[119] It includes both financial and regulatory commitments among stakeholders in order to distribute responsibility and create visibility over the entire supply chain industry. Blockchain, in turn, has the potential of being the underlying technology for secure and verified data gathering and management.

Through the analysis of technical and non-technical limitations and assumptions of blockchain as well as case studies of two early adopters of the technology, it can be concluded

[118] "The future of financial infrastructure: An ambitious look at how blockchain can reshape financial services," World Economic Forum, August, 2016, accessed April 22, 2017, http://www3.weforum.org/docs/WEF_The_future_of_financial_infrastructure.pdf.
[119] Global Agenda Council, "Shared Responsibility: A New Paradigm for Supply Chains."

(at least for now) that blockchain or distributed ledger technologies have a lot of room to mature, but hold great potential to be a tool for data gathering and management. This tool, however, should be implemented along with a greater foundation of understand of the technology itself and the problems it is addressing as well as within an appropriate regulated environment in order to properly access and address ethical compliance. While blockchain technology is often regarded as a unique and preeminent solution to many issues of structure, management and processes, case studies are few. Scaled and long-standing implementations of an industrial level are still to be verified and shared.

ANNEX: Blockchain Explanation and Implementation Diagrams

Figure 1: Blockchain Use Cases: Comprehensive Analysis & Startups Involved as Shown by Let's Talk Payments

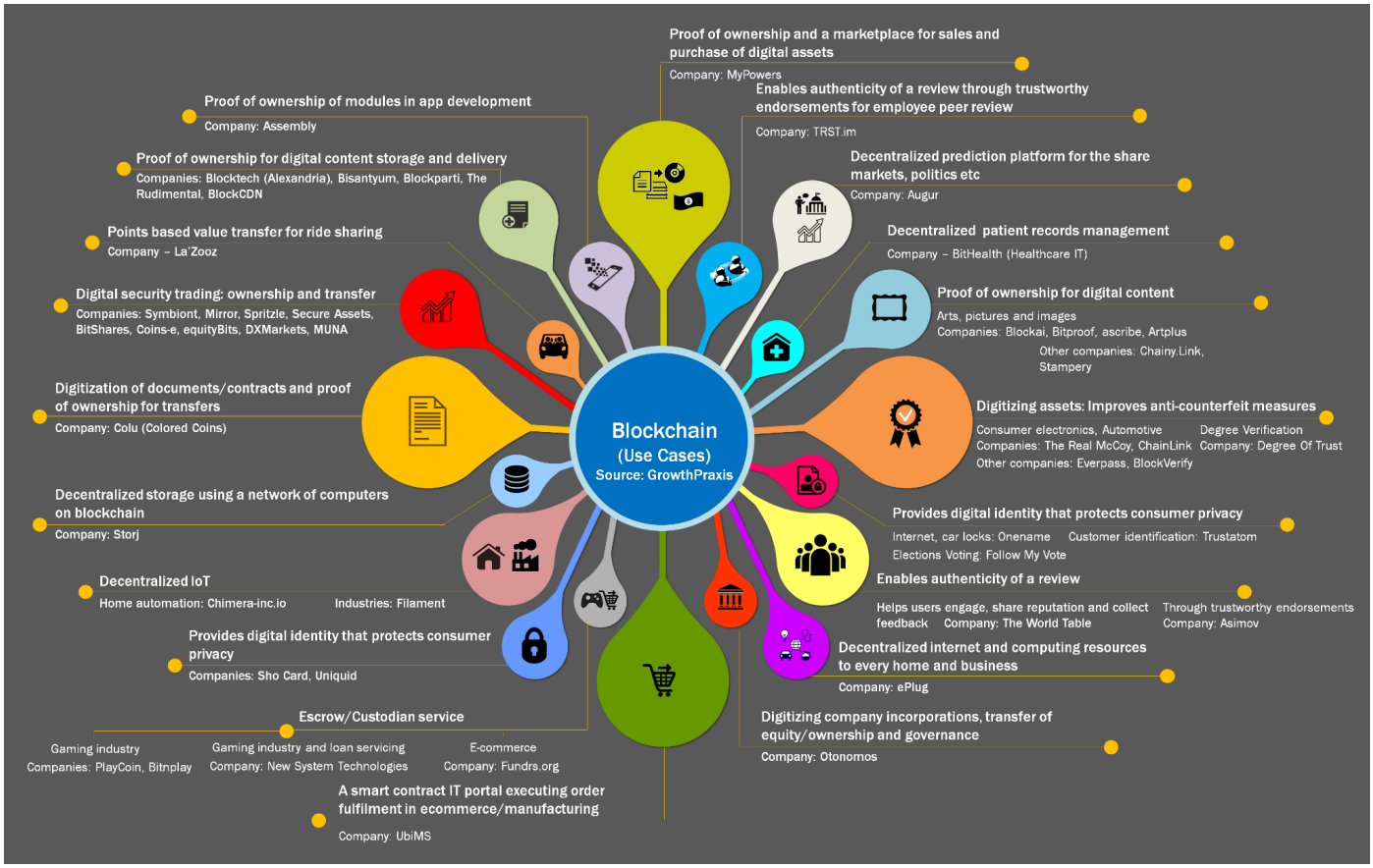
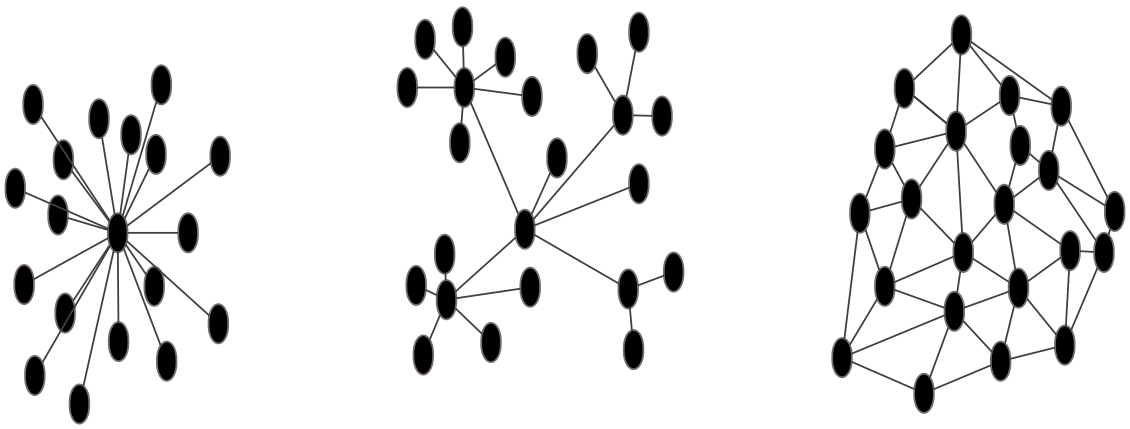


Figure 2: Centralized, Decentralized and Distributed Ledgers as Described by Hyperledger



Centralized Decentralized Distributed

Figure 3: The Certification Process of Fishing as created and shown by Provenance

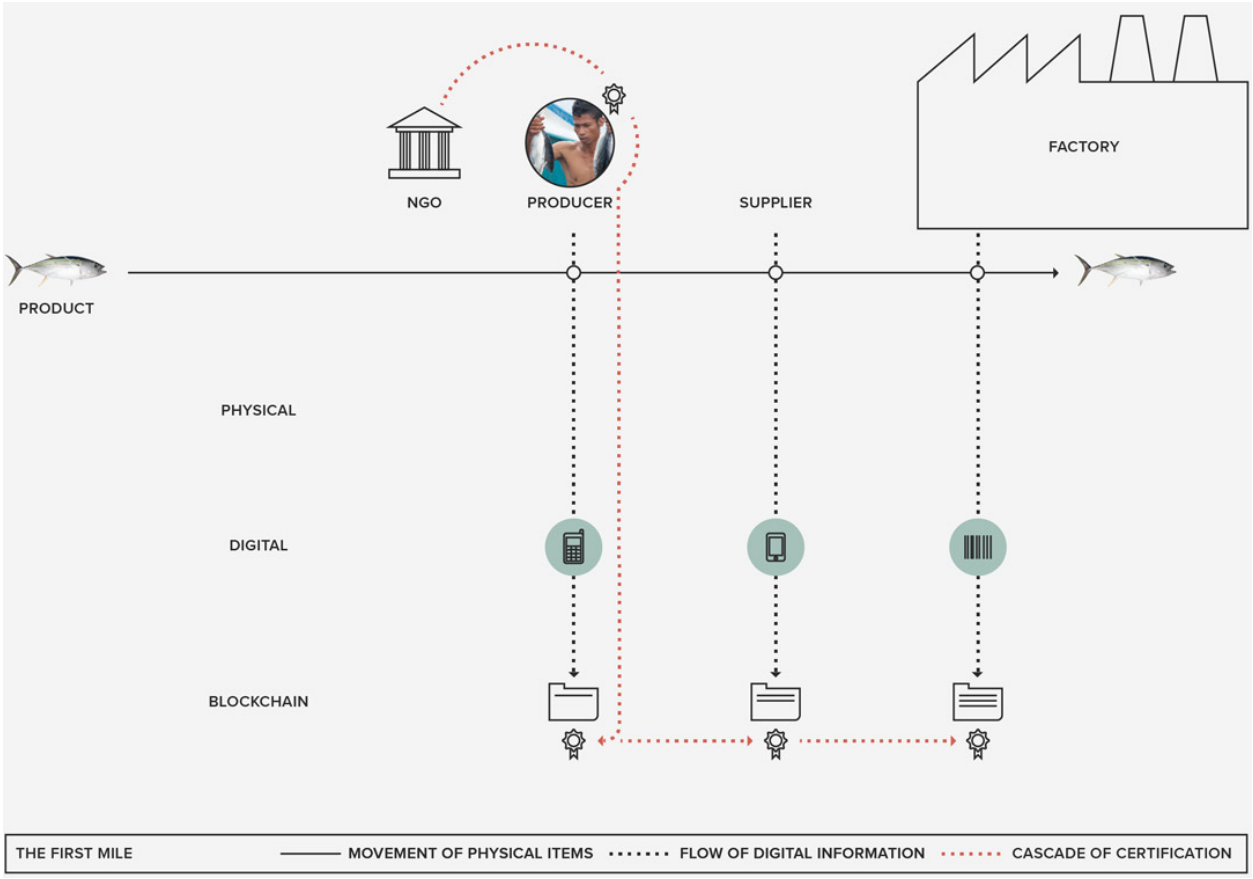
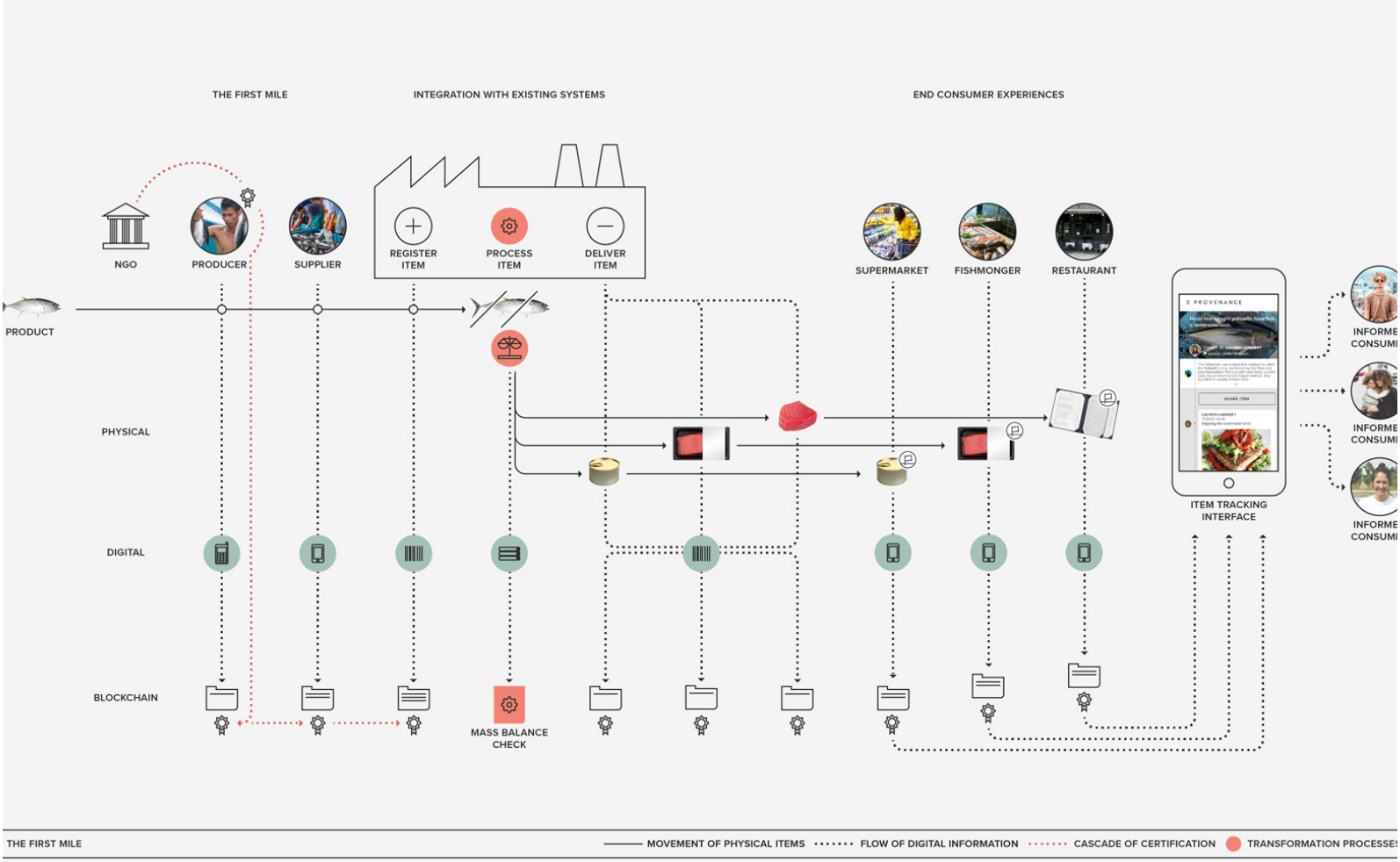


Figure 4: Blockchain Providing the Base Layer of Truth Across the Supply Chain as created and shown by Provenance



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