Blockchain in Boston: Beyond Cryptocurrencies
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Disclaimer: this document was written and updated in March 2018. Due to the fast developments in the blockchain field and the rapidly evolving nature of blockchain technology, this document and the Boston landscape described below may not be as accurate and representative at your moment of reading.

1. Introduction

This document provides an overview of the blockchain landscape in Boston as of March 2018, with a focus on non-cryptocurrency blockchain initiatives. It aims to map out the current actors operating in the blockchain space in the Boston area. This document is structured as follows: section 2 and 3 introduce the concept of blockchain and outline how blockchain can be used for a wide array of applications in a broad range of industries. Section 4 describes Boston's blockchain landscape and outlines Boston-based blockchain companies and organizations (4.2), universities (4.3) investors (4.4), and events and meetups (4.5). Section 5 provides a summary of the paper and presents a conclusion.

2. What is Blockchain?

Blockchain, the technology that powers Bitcoin and other digital currencies, has received widespread attention over the last years. Blockchain is an audit trail for a database which is managed by a network of computers. In this network, no single computer is responsible for storing or maintaining the database. In contrast to traditional databases, where a central authority maintains a single copy of the ledger, blockchain technology makes use of a network of nodes which each store a copy of the database. Also, blockchain technology requires the maintenance of an audit trail of all changes to the database and public availability of information on the blockchain. All information on transactions are thus instantly available to everyone.[i] Because of these key characteristics of blockchain technology, blockchain-based solutions are extremely secure and can improve transparency, auditing, encryption, and resilience.[ii]

3. Implementing Blockchain Technology in Different Industries

Blockchain was popularised by Bitcoin. Since Bitcoin was the first application of Blockchain, this currency is the most known application of blockchain. However, blockchain technology can be used for a wide array of applications in a broad range of fields, among which but not limited to healthcare, financial industries, agriculture, real estate, data- and energy storage, government, machine-to-machine communication, and logistics.

One of the most promising applications of blockchain is the smart contract. Smart contracts are completely automatically fulfilled contracts that help people to exchange money, shares, property or anything of value. These exchanges take place in a transparent way and without the added expense of a middleman.[iii] Smart contracts save money and time, and eliminate conflicts as well because of the automatic enforcement of the obligations of the parties that are involved. Therefore, they have the potential to play a fundamental role in the financial world, logistics, automobile industries, real estate and government services. For example, blockchain experts consider blockchain to be an alternative to traditional banking. Since blockchain technology can be used to verify and transfer money, banks are no longer a necessary component in financial transactions.[iv] Other examples of the usage of blockchain include improvement of online identity management, cloud storage, government efficiency, cybersecurity, and music streaming, securely storage of personal healthcare records, and prevention of fraud during online elections.

Because of the technology's potential, blockchain is considered to be one of the most disruptive and transformative technologies in the world. Experts predict blockchain to have a significant economic and social impact on current and future society and to generate unprecedented opportunities.[v]

4. Boston's Blockchain Landscape

4.1 Overview
Boston's blockchain landscape is highly fragmented: there are no central or coordinating blockchain institutions or organizations operating in the area. Mainly because blockchain technology is still in its infancy stage, there are no companies or organizations that are able to hold a central position in the blockchain space or can be clearly identified as the key market leaders. Another factor adding to the lack of cohesion in the blockchain landscape is the lack of accurate documentation on blockchain initiatives in Boston, as well as reports providing an overview of the region's landscape.

As in many other cities and countries, many people in Boston's blockchain community are interested in cryptocurrencies rather than the technology behind it. However, the number of companies, organizations and people focusing on the application of blockchain to non-cryptocurrency sectors is rapidly growing, especially since the autumn of 2017. This trend is

reflected by the sharply increasing number of blockchain start-ups, companies, investors, and blockchain meetups which exclusively focus on non-cryptocurrency initiatives.

4.2 Companies and Start-ups

Globally, the number of corporate companies investing in blockchain rose to 91 enterprises last year.[vi] Equity investment deals by corporates totalled over 325 million dollar in 2017. Companies such as Google, Intel, IBM, Bank of America, and Microsoft - all of which have large (R&D) offices in the Boston and the Massachusetts area - have invested in blockchain-backed initiatives. However, so far, these large corporate companies and their investments are not very visible in the Boston blockchain space, partially because of their reluctance to publicly share details of their blockchain projects. Also, their investments in blockchain are in general lower than those in other technologies such as artificial intelligence.

Boston is famous for its high concentration of start-ups. In Boston, a fairly large and growing number of start-ups is focusing on blockchain. Appendix A provides a comprehensive list of non-cryptocurrency start-ups that use blockchain technology. Examples of highly successful and rapidly growing start-ups are Cambridge Blockchain and Voatz, which focus on identity management and electronic voting via a smartphone respectively. Both start-ups raised more than 2 million dollar last year.[vii] The growing attention for blockchain and start-ups in Boston is also reflected by the establishment of Genesis Block, one of the world′s first blockchain co-working spaces. This co-working space opened on March 1st 2018 and aims to become the nation′s East Coast hub for innovative blockchain companies.[viii]

4.3 Universities

Several universities in Boston, including MIT, Boston University and Northeastern University, conduct research on blockchain. In particular, two research initiatives at MIT, which was one of the first universities to enter the blockchain space, are quite active in the blockchain field. Firstly, the Trust Data Consortium[ix] is a MIT initiative on open-source software that enables better data security. This consortium focuses on the usage of blockchain for securing data privacy and digital identity. Secondly, the Digital Currency Initiative[x], part of the MIT Media Lab, conducts research on blockchain technology and cryptocurrencies. It focuses on how blockchain can be applied to healthcare and medical records, decentralized publishing, user-controlled credit identities, securitized financing for solar microgrids, and digital currency at central banks. Several universities in Boston, such as Northeastern University, also offer graduate degrees or courses in blockchain to students.[xi]

Nonetheless, the total number of university staff members in the Boston area conducting research on blockchain technology is low in comparison to the number of researchers studying other new technologies such as machine learning, robotics, and artificial intelligence. At most universities in the area the assigned resources and staff members focusing on blockchain are

relatively limited. This should be seen in the light of the broader observation that many blockchain developments and improvements in the US, as well as in the rest of the world, are occurring outside the gates of universities.

4.4 Investors

Boston ranks third worldwide when it comes to venture capital investments. Last year, venture capital investments in Boston amounted to more than 3.1 billion dollar, which accounts for 7.5 percent of the global total of venture capital investments.[xii] Regarding blockchain, the number of venture capitalists investing in blockchain has continuously grown over the last years. Examples of Boston-based investors that put money into blockchain based companies are Underscore VC[xiii], Pillar[xiv], Founder Collective[xv], Cosmino Ventures[xvi], and Flipside Crypto[xvii]. Furthermore, a clear trend is observable in which total investments in non-cryptocurrency blockchain companies are sharply increasing. However, it should be noted that blockchain venture capitalists in Boston manage relatively small amount of funds. The largest and most active venture capital firms investing in blockchain still operate in Silicon Valley and New York[xviii].

4.5 Events and Meetups

Boston is characterised by a very lively and active blockchain meetup- and event scene. Blockchain events, workshops, lectures, and meetups are organized on a daily basis. Larger meetups are Cambridge Blockchain[xix], Blockchain Reserve Boston[xx], and Boston Blockchain Meetup[xxi]. The latter meetup, which exclusively focuses on non-cryptocurrency blockchain initiatives, has close to 2,500 members and usually attracts a crowd of 100-200 people. Boston also hosts a number of blockchain conferences on a yearly basis. For a comprehensive list of the upcoming conferences, events, and meetups, please see appendix B.

5. Summary and Conclusion

The novel nature of blockchain technology is reflected in the development of Boston′s blockchain landscape. Until now (March 2018), larger Boston-based companies and universities are not very visible in the blockchain space. Nonetheless, Boston′s blockchain ecosystem is very quickly expanding and has various strengths compared to other cities and regions. Boston is home to many blockchain start-ups, has a very active blockchain event- and meetup scene, and a large amount of students with excellent technical and computing skills graduating from the 135 higher education institutions in the area, which include universities such as MIT, Harvard, and Northeastern University. Also, the interest in blockchain from Boston-based entrepreneurs, companies and investors has tremendously increased, especially since late 2017 and the beginning of 2018. Furthermore, Boston has a leading position in cybersecurity, distributed computing, IoT and economics, all of which are essential to blockchain technology. These factors make Boston well-positioned to become the next global blockchain hub.

Appendix A: Non-cryptocurrency blockchain start-ups and companies in Boston

Adjoint	Develops smart contracts and distributed ledger technology for the financial industry.
AirFox	Ethereum-based ERC-20 digital utility token that facilitates the transfer of mobile airtime, data and currency, as well as payments for goods and services, with minimal friction and fees.
Algorand	A scalable, secure and decentralized digital currency and transactions platform. Algorand has raised more than 4 million dollar in February 2018. The blockchain software was founded by a Professor at MIT.
Cambridge Blockchain	Gives users control over their personal identity through blockchain.
Circle	Uses blockchain to send money like a text. Circle is backed by $140 million in venture capital.
Cognate	Creates a permanent, time-stamped record of your trademark use.
Eximchain	Uses blockchain to enable businesses to connect, transact and share information more efficiently and securely.
FirstBlood	The world′s first blockchain powered eSports platform where players can challenge each other and win rewards for their skill.
Level K	Smart contract development, smart contract auditing, whitepaper technical architecture.
LBRY	Open, free and community-run digital marketplace.
Sia	Decentralized storage platform that is secured by blockchain technology.
Soldified	Platform for crowd-sourced review of smart contracts, where developers can bring their contract for a quality review.
Talla	Blockchain platform for universal registration, identity validation, audit, and coordination of A.I. agents and autonomous software.
Token Labs	Developing tools for digital currency payment services for web and mobile, as well as tools for consumers and merchants to join and participate in the new digital economy.
Voatz	Blockchain-based initiative which enables citizens to vote in all kinds of elections or voting events via a smartphone.

Overview adapted from https://medium.com/@erickpinos/boston-blockchain-guide-89056a6f0bb3

Appendix B: Blockchain events and meetups in Boston

Blockchain Meetups in Boston
- Boston Blockchain Meetup: Largest blockchain meetup group in Boston, consisting of close to 2,500 members. This meetup group focuses exclusively on non-cryptocurrency initiatives and is designed for those interested in learning about the potential of this technology and its social impact. The group's monthly meetup usually attracts a crowd of 100-200 people.
- Cambridge Blockchain: This meetup focuses on the latest blockchain research happening in the Boston area, with primarily a focus on cryptocurrencies and ICOs. Several of the group's monthly meetups attracted more than 150 visitors.
- Blockchain Reserve Boston: Hosts two meetups a month. Primarily focuses on ICOs and cryptocurrencies.
- Women in Blockchain Boston Meetup: Meetup group founded in January 2018, hosting one or two events every month. Covers a wide range of topics related to blockchain. The meetup focuses on (the role of) women in blockchain, but is open to all genders.
- Blockchain Lunch and Learn: Meetup group founded in February 2018, which organizes a lunch-meetup every 2 weeks. The meetups focus on the world of blockchain and the wave of change it is bringing to businesses and the financial, governmental, and educational system in Boston. The meetups are hosted at Genesis Block, Boston's blockchain co-working space which opened on March 1st 2018.

Upcoming Blockchain Conferences and Events in Boston
- Agile Global Events (March 21, 2018): This conference aims to improve our understanding of Blockchain technology by focusing on how to address challenges related to the implementation of blockchain and how to make best use of the opportunities and benefits from the innovation and disruption that this technology brings along.
- The Business of Blockchain (April 23, 2018): 1-day conference hosted by MIT Technology Review in collaboration with MIT Media Lab Digital. The conference aims to examine the technology, ethics, and impact of blockchains.
- Unchained Summit (April 26, 2018): Aims to bring together founders, developers, academics, and students for a conference on the future of blockchain.
- Boston Blockchain Week (April 23-27, 2018): Boston Blockchain Week aims to bring together the Blockchain community from Boston and beyond to explore the evolution of blockchain and cryptocurrency. During this week, 14 Blockchain events are organized in the Boston area.
- Identiverse 2018 (June 24-27, 2018): World's largest identity industry conference with 500+ enterprises and 150+ sessions. During the 4-day conference, topics such as digital identity, customer identity, devices & things, privacy and governance are covered.
- Token Fest Boston (September 13-14, 2018): Two-day networking event focusing on the business and technology of tokenization.

[i] https://lifehacker.com/what-is-blockchain-1822094625

[ii] https://www.csoonline.com/article/3252213/security/6-use-cases-for-blockchain-in-security.html

[iii] https://blockgeeks.com/guides/smart-contracts/

[iv] https://lifehacker.com/what-is-blockchain-1822094625

[v] https://www.weforum.org/whitepapers/realizing-the-potential-of-blockchain

[vi] https://www.cbinsights.com/research/report/blockchain-trends-opportunities
https://www.cnbc.com/2017/10/18/google-goldman-sachs-investors-blockchain.html/

[vii] https://www.builtinboston.com/2017/03/08/cambridge-blockchain-using-blockchain-technology-secure-identity ;
http://www.govtech.com/biz/Blockchain-Voting-Startup-Raises-
22M.html?utm_source=Cambridge+Innovation+Center+Updates&utm_campaign=7c1f2a499a-
EMAIL_CAMPAIGN_2018_01_12&utm_medium=email&utm_term=0_3536f04e8b-7c1f2a499a-303463581

[viii] https://www.bizjournals.com/boston/businesswire/press_releases/Massachusetts/2018/03/01/201803010
05157

[ix] https://www.trust.mit.edu/about/

[x] http://dci.mit.edu/index.html

[xi] For example: The Master of Science in Information Systems with a specialization in Blockchain
Technology at Northeastern University.

[xii] https://www.theatlantic.com/technology/archive/2016/01/global-startup-cities-venture-capital/429255/

[xiii] https://underscore.vc/

[xiv] https://pillar.vc/,

[xv] http://www.foundercollective.com

[xvi] http://cosimoventurepartners.com/?lipi=urn%3Ali%3Apage%3Ad_flagship3_company%3BQ96bLN2N
SS2C738PmaisKw%3D%3D

[xvii] https://flipsidecrypto.com/

[xviii] https://www.cbinsights.com/research/report/blockchain-trends-opportunities/

[xix] https://www.meetup.com/nl-NL/Cambridge-Blockchain/

[xx] https://www.meetup.com/nl-NL/Blockchain-Reserve-Boston/

[xxi] https://www.meetup.com/nl-NL/Boston-Blockchain-Meetup/