

State of Diversity and Inclusion in Blockchain December 23, 2019

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DIVERSITY
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The State of Diversity and Inclusion in Blockchain

Diversity in Blockchain, Inc.

Diversity in Blockchain (“DIB”) is a not-for-profit organization with 501(c)(3) status that is committed to creating equal, open, and inclusive opportunities in the blockchain industry. Our co-founders include Susan Joseph, Anna Ashurov, Michelle Gitlitz, Shawna Hoffman and Joshua Ashley Klayman. DiB’s mission is to empower everyone from all walks of life to engage with blockchain technology to ensure equal participation and distribution. True innovation includes everyone.

This report was written by Susan Joseph, Executive Director of Diversity in Blockchain, Inc. and Principal of Susan Joseph LLC¹ for Diversity in Blockchain’s use and to aid the Blockchain Industry. If you can measure things, you can change them. We hope that this report creates a benchmark with regard to Diversity and Inclusion in Blockchain and supports a Call to Action and Task Force to develop Best Practices for this sector.

Susan Joseph Biography

Susan is a JD/MBA, former General Counsel and Principal at SusanJosephLLC, a consulting firm, and owner of the Law Firm of Susan Joseph. She advises and consults on law, blockchain, and fintech, including cryptocurrencies, enterprise digital ledgers, digital assets and wallets, insurance/insurtech, smart contracts, consortia, regulatory issues, policies and compliance, decentralized identity and privacy, open source strategies, and other issues as they occur across financial services, real estate, supply chain, and insurance.

She currently is the Civics Representative for RiskStream and was formerly the B3i North America Representative (Insurance Consortia). She was the first Executive Director of ID2020 and is a co-founder and Executive Director of Diversity in Blockchain, Inc.

Susan is a Core Leader for the World Economic Forum Blockchain Projects on both Supply Chain and Consortia and is a member of their Expert Network. She is an Advisor to BlockRe (digital asset insurance) and OneWorldIdentity (identity). Susan publishes (TABB, PLI, Insurtech360) and speaks regularly on blockchain to industry and legal groups, including Cornell, Stanford, MIT, CKGSB, Cleveland Marshall Law School, PLI, ABA, ACC, MercyCorps, Consensus, Blockland, UN, the US Treasury, and other regulators. Additionally, Susan founded and runs the womeninfintech group on LinkedIn which has 2400-plus members in over 47 countries.

Executive Summary

Why Blockchain Technology Matters

Blockchain technology provides a “digital ledger” that enables peer-to-peer interactions with minimal trust required between parties. Its focus on minimized trust is exciting because business and civil society need trusted interactions to function well. The technology has broad potential,

¹ Susan would like to thank Norton Rose Fulbright US LLP for its significant assistance in compiling and analyzing many of the sources listed below. Specifically, Susan would like to recognize the efforts of Christian Nisttahuz, Kyra Latham and Ronald Smith.

ranging from fundamentally ordering transactions to running shared business and market processes with peers within and across verticals. While the technology is still nascent and emerging, Gartner predicts that this technology will generate \$3.1 trillion in new business value by 2030 and believes that businesses can expect more mainstream adoption through 2023.² It is quite possible that this technology will provide a new foundation for digital interactions that will affect our communications, identification, and financial transactions.

This report analyzes diversity and inclusion in the blockchain sector today and recommends some actions and Best Practice standards that can be developed and adopted to enable access and voice to a truly diverse cross-section of our economy. People of all backgrounds must have “seats at the table” and feel comfortable enough to participate in this fast-developing industry, and we must work to value our different backgrounds and viewpoints for true inclusion to occur. This report will not delve into the technical aspects of how blockchain works. However, for a glossary of terms relating to blockchain technology, please refer to the Appendix.

Diversity and Inclusion: Importance in Potentially Foundational Technologies

Technology powers how we live our lives and conduct business. We need to radically think about the role of digital public communication and transaction rails in open civil societies, and build accordingly, to create a world that balances innovation, risk, rights, access, and action. Far-reaching applications ranging from decentralized identity systems to messaging to financial services can be built and deployed in groundbreaking ways that can re-imagine and re-order how society manages itself. We all have an interest in ensuring the best design and implementation of digital infrastructure. The broader the input and the more knowledge about who is served, the better the end product.

Further, if we fail to act inclusively at the outset of the blockchain era, we simply maintain the status quo, or worse, even further narrow who participates. This imbalance can create a cultural divide that is characterized by lack of access to technology, services, loss of income, and a non-inclusive workforce. We will then need to face the much more difficult task of remediating an entrenched and imbalanced environment in the future.

Finally, diversity and inclusion are good for business. Entities that incorporate inclusive practices experience better financial performance and more innovation.³ The World Economic Forum Report tackled the subject recently and concluded: “There is substantial research to show that diversity brings many advantages to an organization: increased profitability and creativity, stronger governance and better problem-solving abilities. Employees with diverse backgrounds bring to bear their own perspectives, ideas and experiences, helping to create organizations that are resilient and effective, and which outperform organizations that do not invest in diversity.”⁴

Diversity and Inclusion: The Opportunity in the Blockchain Sector

Disparities exist in the blockchain sector. Some inclusive efforts have started, but more are needed. Female participation in the crypto community is low. One stark statistic shows that, of the 378 venture-backed crypto and Blockchain companies founded around the world between 2012

² <https://www.gartner.com/smarterwithgartner/the-cio-s-guide-to-blockchain/>

³ <https://www.bcg.com/en-us/publications/2018/how-diverse-leadership-teams-boost-innovation.aspx>

⁴ <https://www.weforum.org/agenda/2019/04/business-case-for-diversity-in-the-workplace/>

and 2018, only one had an all-female founding team, and only 31 (8.2%) had a combination of male and female founders.⁵ During the same time period, only 17.7% of all technology companies had at least one female founder, a small percentage that still more than doubles the percentage of companies with female founders in the blockchain space.⁶

There is a similar lack of diversity in academia. A recent CoinDesk study that surveyed top university programs in blockchain in the USA shows that at the top ten universities listed, twenty percent of the professors/faculty are women. As other academic institutions such as Historically Black Colleges, State-Supported Schools and Community Colleges start to offer blockchain in their curricula, the lack of diversity and inclusion may subside, and the pipeline of diverse candidates to be employed in the sector may increase.

Conferences are vitally important venues and channels for communication and information in the young and growing blockchain space. Those who are participating are largely self-taught (other than coders and architects), and conferences are a useful and necessary resource to learn about the latest developments from other participants. The diversity of keynote speakers and attendees at these events is lacking and is similar to the diversity level of participation found in academia.

Finally, government participation should also be evaluated with respect to diversity and inclusion. A congressional blockchain caucus exists that is bipartisan and largely male. In fact, a recent article listing nine legislators who are involved with the crypto space named only one female.

All is not lost! We are early enough in the industry that we can pay attention to and create inclusion in the education, development and distribution of blockchain technology. Because the technology is not fully developed, we have the opportunity at the outset to all participate in its design and deployment as technologists, lawyers, regulators, institutional and retail investors, representatives of enterprises, academics, and consumers.

Introduction

Blockchain Technology Importance

Blockchain technology is an emerging peer-to-peer technology that is foundational in nature and creates digital infrastructure that touches all. As such, it is everyone's business. Blockchain-based digital structure employs minimized trust. This is especially important in today's age, because trust is necessary to support the digital interactions of today's civil society, financial systems and relationships. As the technology grows in maturity, complexity and adoption, the internet as we know it today will be changed, and with it, our lives will change as well.

Some Basics of Blockchain Technology

Public and private blockchains are both parts of this business sector. In general, the computing model of a blockchain is as follows. Computing underlying these data structures is supported by cryptography. The architecture is decentralized, and multiple parties validate transactions through a consensus mechanism that can be designed to allow anyone to participate or only members of

⁵ <https://qz.com/1262167/the-first-rule-of-being-a-woman-in-crypto-is-you-do-not-talk-about-being-a-woman-in-crypto/>

⁶ 6 *Id.*

a group to engage. Resulting interactions on the chain, be they messaging or financial transactions, are viewed as certain. It is hoped these computing solutions may set the stage for a better way to digitally interact.

1. Public Blockchains: These chains generate cryptocurrencies as incentives to support network integrity. Transactions may not be altered or deleted, though they can be overwritten by additional entries appended to the ledger. Public chains are being tested as a foundation upon which to create the framework for open financial, law, and other products, and to sustain messaging incorruptibility.

2. Private Blockchains: These chains do not generate cryptocurrencies in the same way as public chains, but tokens representing assets can be created, and back office processes including communications can be built on these systems that can potentially create efficiencies and improvements as well as sustain a level of messaging integrity. These types of chains also use consensus mechanism performed by “validators.” Since the technology can be applied to many business sectors, it potentially offers many types of applications ranging from identity, law, finance, insurance and supply chain solutions which today are works in progress.

3. Timestamp: Chains record interactions that are chronologically planted in time or “timestamped” that are truths that cannot be erased. This data certainty is very powerful. For instance, a blockchain ledger could store the source of the data used to develop Artificial Intelligence applications and maintain user permissions for that data in a transparent and tamper-resistant manner allowing one to trace and understand any biases in the data sets used.

4. Smart Contract: The ledger can host embedded automated protocols called “smart contracts” that can potentially create digital assets as well as help improve and streamline business processes and digital interactions. This has vast implications for the way we provenance, manage, audit, and treat data, and the manner in which we implement compliance and accountability. However, smart contracts must be carefully coded and tested, or far-reaching and damaging unintended consequences can occur. For example, a smart contract that miscalculates and creates an endless loop of financial transactions can have profound negative results.

There are tradeoffs. Some of the characteristics of these tools such as data persistence and automation may be simultaneously empowering and limiting. Garbage in is still garbage out, and automated protocols and/or nearly tamperproof data records that can only be changed through an append can have disastrous consequences. That does not mean we should not use the technology, but blockchain systems using smart contracts should be carefully thought out, prudently designed, and managed.

The Importance of Inclusion in a Global Environment Powered by Technology

It is well-documented that neither the technology nor the financial industry consists of broadly diverse populations.⁷ This lack of diversity affects the development of the digital products, which may be biased, inferior and downright dangerous to certain swaths of the population who do not have a seat at the table as those products are being designed. As emerging technologies pave the way of our future, skewed results, imbalances and outright discrimination can and should be

⁷ <https://iveybusinessjournal.com/enhancing-fintech-with-diversity/>

avoided. There are costs to society of not including diverse groups. Perceptions of “unfairness” and a “rigged system” by those who are excluded can create long-term systemic issues that may even lead to destabilization of civil societies.

This technology has a global audience and broad applications. Virtual currencies can seamlessly transact across borders. Enterprise is developing applications on private chains that will streamline and change the way certain industries operate. While its full disruptive potential is not yet appreciated due to its immaturity, its global impact is heating up. In recent months, China has announced its claim for blockchain leadership.⁸ Global regulators are avidly discussing potential digital currency creation and standards⁹ as well as stablecoins¹⁰ such as Libra and digital wallets. The reach of the technology is so broad that failure to incorporate diversity and inclusion affects all.

The Benefits of an Inclusive Workforce

Diversity and inclusion initiatives are good for business. It follows that the blockchain field would benefit from ensuring a diverse and inclusive workforce. Research shows that companies in the top quartile for gender or racial and ethnic diversity are more likely to have financial returns above their national industry means.¹¹ Although this does not equal causation, the correlation does indicate that when companies commit themselves to diverse leadership, they are more successful.¹² More diverse companies can win top talent, improve customer happiness, employee satisfaction, decision-making, and gain better reviews - all benefits from employing a variety of viewpoints.¹³

More specifically, in 2015 data sets for 366 public companies across Canada, Latin America, United Kingdom, and the United States, companies in the top quartile for racial and ethnic diversity are 35% more likely to have financial returns above their respective national industry medians.¹⁴ Further, the data sets show that companies in the top quartile for gender diversity are 15% more likely to have financial returns above their respective national industry means.¹⁵ Looking at the United States, there is a linear relationship between racial and ethnic diversity and better financial performance, demonstrated by the statistic that for every 10% increase in racial and ethnic diversity on the senior-executive team, earnings before interest and taxes rise 0.8%.¹⁶ Any way you slice it, diversity and inclusion are good for business.

Current Diversity and Inclusion Efforts

Many global companies are attempting to create a more inclusive culture. However, much work needs to be done. PwC’s 2016 cross-industry study that addressed diversity and inclusion efforts shows that, while efforts are being made, obstacles remain.¹⁶ Within the technology industry,

⁸ <https://www.cnn.com/2019/11/15/china-technology-trends-from-blockchain-to-ai-and-fintech.html>

⁹ <https://www.bis.org/publ/bppdf/bispap101.pdf>

¹⁰ <https://www.bis.org/cpmi/publ/d187.pdf>

¹¹ <https://www.mckinsey.com/business-functions/organization/our-insights/why-diversity-matters>

¹² *Id.*

¹³ *Id.*

¹⁴ *Id.*

¹⁵ *Id.*

¹⁶ *Id.*

¹⁶ <https://www.pwc.com/gx/en/services/people-organisation/global-diversity-and-inclusion-survey.html>

companies viewed diversity and inclusion as legal and compliance factors as well as a talent recruitment resource.

How Big of a Problem Do We Have?

At a high level, while many global companies are attempting to create a more inclusive culture for their employees, Diversity & Inclusion program leaders still see diversity as a great barrier to progression for employees. PwC conducted a cross-industry survey in 2016 of those closely involved with HR or diversity and inclusion efforts in organizations. Eighty-two percent of respondents whose organizations have a global footprint agree or strongly agree that employees demonstrate a commitment to inclusion.¹⁷ In a PwC survey on diversity and inclusion, 87% of those polled said diversity was a stated value or priority area for their organization.¹⁸ Meanwhile, 42% agreed that diversity is a barrier to progression at their organization.²⁰ Accordingly, the PwC survey shows that, while efforts are being made, real obstacles continue to exist.

Findings from the Technology Industry

Studies have also looked specifically at the technology field and found that diversity efforts have a long way to go. One PwC survey asked 224 corporate respondents in 15 different countries to respond to a series of questions on diversity and inclusion in their technology organization.¹⁹ For instance, only approximately 31% of technology organizations have adopted training on how to embed inclusive behaviors into everyday job responsibilities, a leading practice to create an inclusive and diverse workforce.²⁰ If the respondents did have a training program in place, the respondents were then asked a question in which they could select all answers that apply. The question asked what their training programs focus on, and the potential answers included: nondiscrimination and compliance, embracing difference, overcoming unconscious bias, managing diverse populations, and embedding inclusive behaviors in jobs.²¹ Training programs in the technology field focus on embracing difference the most (with 43% of respondents with a training program in place saying that this was a focus), with a focus on nondiscrimination and compliance coming in second at 39%, and focus on overcoming unconscious bias coming in third at 38%.²² A majority of technology organizations surveyed view their Diversity & Inclusion programs as mechanisms for legal compliance or talent attraction.²³ A minority of those surveyed view their programs as a way to achieve business results and improved financial performance.²⁶

The need for diverse representation and hiring is apparent in the technology industry where men hold 76% of technical jobs, and where 95% of the workforce is white.²⁴ Some think that the lack

¹⁷ *Id.*

¹⁸ *Id.*

²⁰ *Id.*

¹⁹ <https://www.pwc.com/gx/en/services/people-organisation/global-diversity-and-inclusionsurvey/technology-report.pdf>

²⁰ *Id.*

²¹ *Id.*

²² *Id.*

²³ *Id.*

²⁶ *Id.*

²⁴ <https://www.forbes.com/sites/lisawinning/2018/03/13/its-time-to-prioritize-diversity-acrosstech/#350f00216f8a>

of diversity in technology is because fewer women, people of color, or people from other underrepresented groups apply to these positions; however, we must closely dissect this argument. In a study that looked at why people voluntarily left their jobs in technology, it was discovered that workplace culture “drives turnover, significantly affecting the retention of underrepresented groups, and costing the industry more than \$16 billion each year.”²⁵ In the same study surveying a representative sample of more than 2,000 U.S. adults who have left a job in a technology-related industry or function within the last three years, underrepresented men and women of color were found to have experienced stereotyping at twice the rate of White and Asian men and women.²⁶ Further, 30% of underrepresented women of color were passed over for promotion.²⁷ Accordingly, culture, stereotyping, and lack of career growth are adversely affecting diverse participation in the industry.

As for women, the top two reasons why women overall left technology occupations were to seek a better opportunity (33%) and to leave unfair environments (32%).²⁸ Meanwhile, unfairness was the top reason for leaving for women of color (36%), and White/Asian women were less likely to leave for this reason (28%).²⁹ Further, women reported having others take credit for their work (27%), being passed over for promotion (25%), and unrealistic assumptions about their ability (16%) at rates higher than men.³⁰

As for underrepresented people of color in technology, men of color were more likely than any other group to leave their prior company due to unfairness (40%).³¹ Unfairness was more likely to be a significant factor in the decision to leave for underrepresented women of color (36%) than White and Asian women (28%).³² Lastly, women of color experienced stereotyping twice as often as White and Asian women.³³

One of the few silver linings about the results and data from such studies is that there are some things that technology companies could do to take proactive steps to improve workplace culture and retain talent. For instance, nearly two-thirds of those who left their jobs in technology indicate that they would have stayed if their employer fixed its culture.³⁴ Also, having a diversity and inclusion strategy was associated with fewer reports of unfairness, significantly lower sexual harassment, bullying and stereotyping, and a lower rate of leaving due to unfairness.³⁸ So it is not too late for employers to take action to remedy problems with lack of diversity. It is unfortunate that technology companies have put themselves in a position that requires such remedies. As regards any emerging technologies, the right time to pay attention to imbalances that might occur as an industry develops is at its outset. It is much easier to design a new and fair way of doing business as compared to implementing remedial programs and new culture.

²⁵ <https://www.kaporcenter.org/tech-leavers/>

²⁶ *Id.*

²⁷ *Id.*

²⁸ *Id.*

²⁹ *Id.*

³⁰ *Id.*

³¹ *Id.*

³² *Id.*

³³ *Id.*

³⁴ *Id.*

³⁸ *Id.*

Findings from the Crypto/Blockchain Space

Not surprisingly, diversity issues extend into the crypto/blockchain space. Female participation in the crypto community is low. The percentage of women employees in the sector, including developers, investors, and casually interested individuals, hovers usually between 4% and 6%,³⁵ although 2019 has seen Bitcoin Community Engagement by Gender hit 90% male and 10% female.³⁶ Of the 378 venture-backed crypto and Blockchain companies founded around the world between 2012 and 2018, only one had an all-female founding team, and only 31 (8.2%) had a combination of male and female founders.³⁷ As a matter of comparison, only 17.7% of all technology companies during that time period had at least one female founder.³⁸ Finally, a report from Forbes detailing the richest people in crypto included 19 people and all of them were white or East Asian men.³⁹

Findings from Academia

In academia, there is an increasing number of university programs for the study of blockchain technology in the United States, as well as around the world. Funding for such programs comes from a variety of sources. These universities have clubs, social activities, research projects, and classes on the emerging subject. We have reviewed many of these programs, and they reveal intriguing information concerning diversity in academia.

Multiple businesses are helping to fund academic offerings. In 2018, Ripple announced its launch of the University Blockchain Research Initiative (“UBRI or Initiative”).⁴⁰ The Initiative is a program “comprised of collaborative partnerships with leading universities globally to support academic research, technical development and innovation in blockchain, cryptocurrency and digital payments.”⁴¹ Ripple announced that its Initiative would donate \$50 million to 17 university partners for Blockchain-related research of the institutions’ choosing.⁴² The 17 institutional partners were chosen because they represent a broad cross-section of geographies, markets, and academic disciplines.⁴³ Further, Ripple announced that it is committed to working with campus initiatives to increase diversity in Blockchain, cryptocurrency, and related fields.⁴⁸ Columbia University has launched a research center in collaboration with IBM called the Columbia-IBM Center for Blockchain and Data Transparency. IBM is contributing an undisclosed sum to support the center, but the company’s interests go beyond funding research that will lead to new business applications.⁴⁴

³⁵ <https://qz.com/1262167/the-first-rule-of-being-a-woman-in-crypto-is-you-do-not-talk-about-being-a-woman-in-crypto/>

³⁶ <https://coin.dance/stats/gender>

³⁷ <https://qz.com/1262167/the-first-rule-of-being-a-woman-in-crypto-is-you-do-not-talk-about-being-a-woman-in-crypto/>

³⁸ *Id.*

³⁹ <https://breakermag.com/black-blockchain-meet-up-addresses-lack-of-diversity-in-crypto/>

⁴⁰ <https://www.businesswire.com/news/home/20180604005364/en/Ripple-Announces-50M-UniversityBlockchain-Research-Initiative>

⁴¹ *Id.*

⁴² *Id.*

⁴³ *Id.*

⁴⁸ *Id.*

⁴⁴ <https://www.insidehighered.com/news/2018/08/13/rising-profile-blockchain-academe>

U.S. student experience with cryptocurrency

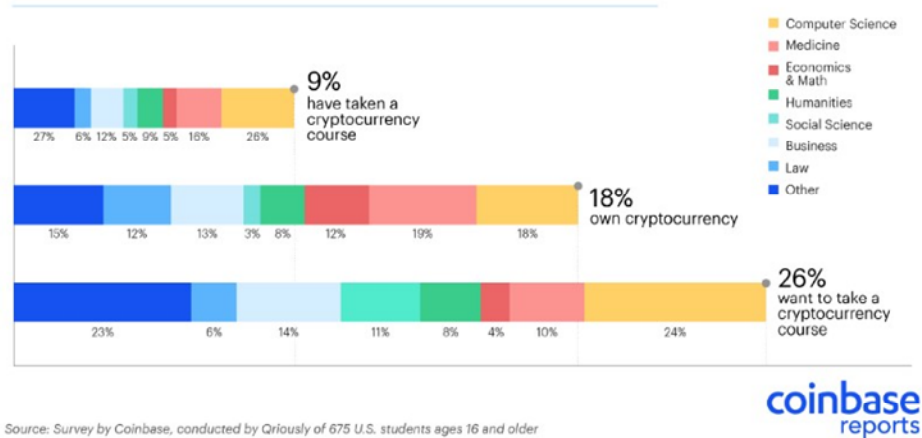


Figure 1: <https://blog.coinbase.com/the-rise-of-crypto-in-higher-education-81b648c2466f>

Classes on Blockchain and cryptocurrency are just gaining traction. A new study shows that 42% of the world's top 50 universities now offer at least one course on cryptocurrency or Blockchain.⁴⁵ Classes on Blockchain and cryptocurrency are just gaining traction. As of now, in the United States, few students have taken a cryptocurrency or Blockchain course, (9%), few students own cryptocurrency (18%), and a small but increasing number want to take a cryptocurrency course (26%), according to a Coinbase study.

CoinDesk has created a ranking system to rank the top Blockchain schools in the United States based on three quantitative factors: the number of Blockchain-related courses, the number of Blockchain organizations on campus, and each school's access to the Blockchain technology industry.⁵¹ These factors are weighted 70%, 25%, and 5% respectively. The rankings, from 1-10, are: Stanford University, UC Berkeley, NYU, MIT, Cornell University, Georgetown University, Harvard University, Duke University, Carnegie Mellon University, and University of Pennsylvania.^{46,47} It is notable that Historically Black Colleges, State Supported Schools, and Community Colleges are not included in this report as those schools would provide access to a more diverse population to be educated.

⁴⁵ <https://blog.coinbase.com/the-rise-of-crypto-in-higher-education-81b648c2466f>

⁵¹ <https://www.coindesk.com/blockchain-university-rankings>

⁴⁶ *Id.*

⁴⁷ <https://cbr.stanford.edu/>

UNIVERSITY	CLASSES/ACTIVITIES	SCHOOLS/DEPARTMENTS	FACULTY DIVERSITY
Stanford	<p>Digital Currency and Cybercrime</p> <p>Bitcoin Engineering (about how to produce Bitcoin-enabled applications)</p> <p>Cryptocurrencies and Blockchain Technologies</p> <p>5-year project: Center for Blockchain Research⁵³ (supported by blockchain organizations such as the Ethereum Foundation, Protocol Labs, the Interchain Foundation, OmiseGO, DFINITY Stiftung, and PolyChain Capital⁴⁸)</p>	<p>The classes are in the Law School, Engineering School, and Computer Science Department.</p> <p>Faculty from the Center for Blockchain Research come from different departments: five from computer science, one from law and business, one from business, and one from electrical engineering.</p>	<p>Professors of classes: two white males</p> <p>Course assistants: four males</p> <p>Center for Blockchain Research faculty: Only one of eight members of the faculty is a woman.</p>
University of California at Berkeley ⁴⁹	<p>Blockchain, Cryptoeconomics, and the Future of Technology, Business and Law</p>	<p>The class is in the Department of Electrical Engineering and Computer Sciences.</p> <p>The professors come from Business School, Law, and Electrical Engineering and Computer Sciences.</p>	<p>Three main professors: two men and one Asian woman</p>
NYU ⁵⁰	<p>Blockchain lab</p> <p>Digital Currency, Blockchains, and the Future of Financial Services</p> <p>Past class: The Law and Business of Bitcoin and Other Cryptocurrencies</p> <p>Past class: Digital Currency: Revolution in Money and Payments</p>	<p>"Law and Business of Bitcoin and Cryptocurrencies" was offered jointly by the law school and the business school.</p>	<p>Two men</p>

⁴⁸ <https://www.insidehighered.com/news/2018/08/13/rising-profile-blockchain-academe>

⁴⁹ <https://coinify.com/news/10-universities-blockchain-courses/?q=10-universities-blockchain-courses/>

⁵⁰ *Id.*

UNIVERSITY	CLASSES/ACTIVITIES	SCHOOLS/DEPARTMENTS	FACULTY DIVERSITY
MIT	Cryptocurrency Engineering and Design Shared public ledgers, cryptocurrencies	Media Arts and Sciences Department Computer Science Department	Taught by Tadge Dryja, Neha Narula, and Silvio Micali (two men and one woman)
Cornell ⁵¹	Blockchains, Cryptocurrencies, and Smart Contracts Distributed Consensus and Blockchains (taught by E. Shi) Cornell Blockchain Club	All within Computer Science Department.	“Blockchains, Cryptocurrencies, and Smart Contracts” is taught by two men E. Shi is an Asian woman
Georgetown	Cryptocurrencies, Initial Coin Offerings and the Law Seminar Blockchain Technology and Ecosystem Design (B-TED) that conducts research Doctoral Seminar: Blockchain Theory	The classes are in the Law School and the Computer Science Department.	Perianne Boring: prominent female in the space The law school class is taught by a man B-TED Research faculty consists of seven professors (four men and three women), two senior fellows (both men), and five students (four men and one woman) ⁵² A white male teaches the Doctoral Seminar ⁵³
Harvard	Introduction to Blockchain and Bitcoin Entrepreneurship and Innovation Blockchain Club ⁵⁴	The classes take place in the Computer Science Department and the Management Department, respectively.	Both classes are taught by men, Julian Avila and James C. Fitchett ⁵⁵

⁵¹ <https://www.coindesk.com/blockchain-university-rankings>

⁵² <https://coinify.com/news/10-universities-blockchain-courses/?q=10-universities-blockchain-courses/>

⁵³ *Id.*

⁵⁴ <https://www.coindesk.com/blockchain-university-rankings>

⁵⁵ *Id.*

UNIVERSITY	CLASSES/ACTIVITIES	SCHOOLS/DEPARTMENTS	FACULTY DIVERSITY
Duke	Past class: Innovation, Disruption, and Cryptoventures ⁵⁶ Duke Blockchain Lab, whose mission is to empower “students and professors with the tools to understand and utilize blockchain technology in their respective fields” ⁶³	Business School Student Leadership of the Duke Blockchain Lab comes from different areas: Computer Science, Mechanical Engineering, business school, law school, Economics, Computer Science and Statistics, and Computer Engineering. ⁵⁷	Campbell R. Harvey is the main professor (white male) Founder of lab is a woman who studied computer science and economics All faculty advisors and student leadership team in the Lab are men ⁶⁵
Carnegie Mellon	Cryptocurrencies, Blockchains, and Applications CMU Blockchain Club ⁵⁸	Software Engineering and Computer Science	Nicolas Christin (white male)
University of Pennsylvania	Cryptocurrencies, Blockchains, and Applications Penn Blockchain Club	Professor studies legal studies and business ethics.	Kevin Werbach (white male)

Out of the professors at the top 10 universities for blockchain listed above, only 8 of the 40 listed faculty/professors are women. This is a startling 20% of the professors that are women, which matches the statistic of speakers in the Information Technology industry, 20% of whom are female and 80% of whom are male.⁵⁹ Another observation is that most of the classes/faculty come from the Computer Science department at their respective universities.

Some other universities not ranked in CoinDesk’s system are also introducing new courses and clubs on cryptocurrency technology and Blockchain. The number of universities with dedicated Blockchain research centers is small but growing.⁶⁰ Miami University students started one of the largest student-led clubs on campus, and started asking faculty for more detail on how the technology works.⁶¹ Arizona State University also has its own Blockchain Research Lab intent on research “to see this technology positively impact the world.”⁶² Blockchain University in the United States is in California and is a robust academic institution led by influential minds.⁷¹ However, only

⁵⁶ <https://coinify.com/news/10-universities-blockchain-courses/?q=10-universities-blockchain-courses/>

⁶³ <http://www.dukeblockchainlab.com/>

⁵⁷ *Id.*

⁶⁵ *Id.*

⁵⁸ <https://www.coindesk.com/blockchain-university-rankings>

⁵⁹ <https://www.forbes.com/sites/rachelwolfson/2019/02/04/nearly-eighty-percent-of-attendees-at-cryptofocused-events-are-male/#7a46a448336e>

⁶⁰ <https://www.insidehighered.com/news/2018/08/13/rising-profile-blockchain-academe>

⁶¹ *Id.*

⁶² <https://www.montclair.edu/continuing-and-professional-education/blockchains-impact-across-industries/>

⁷¹ <https://coinify.com/news/10-universities-blockchain-courses/?q=10-universities-blockchain-courses/>

two of the eleven professors are women. The instructors are: Dr. Jeff Flowers, Ryan X. Charles, Dr. Atif Nazir, Christopher Allen, Nathalie Salami, Dr. Gavin Wood, Sujata Menon, Matthieu Riou, Ethan Buckmann, Greg Slepak, and Juan Batiz-Benet.⁶³

Some universities are actively supporting diversity in Blockchain and technology. For instance, Blockchain at University of California at Irvine is an ecosystem for blockchain education, networking, and development. The group recently hosted the Women in Blockchain Summit at UCI to emphasize the need for female and minority voices in Blockchain.⁶⁴

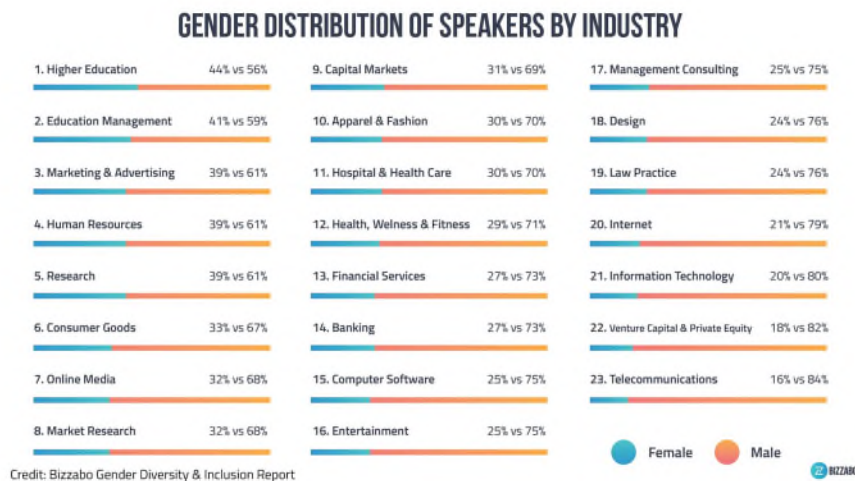
Princeton University has an online course on the subject. The course is called “Bitcoin and Cryptocurrency Technologies.”⁶⁵ The course is taught by Professor Arvind Narayanan, who is an associate professor of computer science. The online course addresses questions such as: How does Bitcoin work? What makes Bitcoin different? How secure are your Bitcoins? How anonymous are Bitcoin users? What determines the price of Bitcoins? Can cryptocurrencies be regulated? What might the future hold?⁶⁶

Findings from Conferences

There is a large number of conferences that take place annually in the United States, as well as globally, regarding blockchain, cryptocurrency and technology in general. Similar to academia though, the diversity of keynote speakers and attendees at these events is low.

Speakers

The diversity of speakers at conferences overall is low, but the diversity of speakers in technology in particular is lower.



⁶³ *Id.*

⁶⁴ <https://www.montclair.edu/continuing-and-professional-education/professionaldevelopment/blockchain/diversity-in-blockchain/>

⁶⁵ <https://coinify.com/news/10-universities-blockchain-courses/?q=/10-universities-blockchain-courses/>

⁶⁶ *Id.*

According to a Forbes study, the gender distribution of speakers in the Information Technology industry was 20% female and 80% male.⁶⁷ Further, at major conferences around the world in 2019 about Cryptocurrency and Blockchain, only 20 of 113 of the main keynote speakers were women. Out of the 113 advertised keynote speakers, 37 were minorities. Below is a chart with the name of the conference, the location of the conference, and the notable keynote speakers.

CONFERENCE	LOCATION	KEYNOTE SPEAKERS
Blockchain Connect Conference: Academic 2019	San Francisco	Vitalik Buterin, David Chaum, Jun Li, Dawn Song, Mic Bowman
The North American Bitcoin Conference	Miami	Shiv Madan, Ben Swann, Nebil Ben Aissa
Crypto Finance Conference	St. Moritz, Switzerland	Charles Hoskinson, Eva Kaili, Helen Hai, Andy Bromberg
EmTechAsia	Singapore	Kimberly Powell, Poppy Crum, Henk Rogers, Mike North
The Blockchain Event	Fort Lauderdale	Andey Zanolovskiy, Pramod Achanta, Gary Davis, Chong Li
Blockchain Economy Istanbul Summit	Istanbul	Tom Lee, Tim Draper, Serguei Popov
NFT.NYC – Exploring the Non-Fungible Blockchain Ecosystem	NYC	Richard Titus, Michael J Casey, Benny Giang, Virgil Griffith
World Blockchain Summit	Singapore	Kohei Kurihara, Alvin Chua, Mastura Ishak, Samson Lee
DC Blockchain Summit 2019 https://dcblockchainsummit.com/speakers/	DC	Brad Garlinghouse, Tom Jessop, Anoop Nannra

⁶⁷ <https://www.forbes.com/sites/rachelwolfson/2019/02/04/nearly-eighty-percent-of-attendees-at-cryptofocused-events-are-male/#7a46a448336e>

CONFERENCE	LOCATION	KEYNOTE SPEAKERS
Token 2049	Hong Kong	Charlie Lee, Justin Sun, Max Kordek, Yanislav Malahov
Block Hedge Conference Bangkok	Thailand	Jason Hsu, Giang Le Ngoc, Reuben Yap, Dennis Trawnitschek, J.L Velde
Anon Blockchain Summit Austria	Vienna, Austria	Mariya Gabriel, Helen Hai, Dr. Thomas Endress, Jolanda Ter Maten
Security Token Summit—LA	Los Angeles	Ami Ben David, Jor Law, Amy Wan, Tal Elyashiv
Crypto Invest Summit 2019	Los Angeles	Andrew Dix, David Weild IV, Amy Wan, P. Bart Stephens
Paris Blockchain World Summit	Paris	Bruno Le Maire, Eva Kaili, Arthur Breitman, Wei Zhou, Dominik Schiener
Tokenized Assets New York	New York	Ryan Hanley, Biser Dimitrov
Consensus 2019	New York	See website https://www.coindesk.com/events/consensus-2019
Digital Asset Summit https://blockworksgroup.io/das2019	New York	Tom Jessop, John Tornatore, Ken Seiff, Erik Torenberg, Michael Moro, Travis Kling
Malta AI & Blockchain Summit	Malta	Roger Ver, Tone Vays, Tim Draper, Joseph Muscat, Patrick Chang, David Orban, Dr. Alexandra Mik
EventHorizon Summit 2019	Berlin	Mate Rimac, David Martin, Maria McKavanagh, Jo-Jo Hubbard, Ana Trbovich, Ed Hesse, Marzia Zafar, Christoph Frei

CONFERENCE	LOCATION	KEYNOTE SPEAKERS
Romania Blockchain Summit	Bucharest, Romania	Tim Draper, Fabio Canesin, Bobby Lee, Mihai Alisie, Dave Pulis, Pascal B. van Knijff
World Blockchain Forum – Singapore & World Blockchain Award	Singapore	Samson Mow, Paul Brody, Du Jun, Tom Menner, Franklyn Richards, Kevin Xu
Blockchain Summit	London	Bob Crozier, Amit Varma, May Winifield, Marjan Delatinne
Bloconomic Expo	Malaysia	Amarjit Singh, Stefano Virgilli, Kenneth Hu, Rafael Schult, Harpreet Singh Maan, KC Seow, Xanne Leo
CoinAlts Fund Symposium 2019	Chicago	Tim Draper, Olaf Carlson-Wee, Mark Yusko
DAS: Markets 2019	New York	Marcos Veremis, Jim Robinson, Amber Baldet, Rob Palatnik

Attendees

The diversity of attendees at crypto and Blockchain conferences is similar to that of the speakers at the same events. A report by Bizzabo analyzed over 100 crypto events across 15 countries and found that 79% of attendees were male, while only 21% were female.⁶⁸

Findings from Government

In government, there is a Congressional Blockchain Caucus, which was only founded in 2016 by (now former) Congressman Jared Polis (CO-02) and Mick Mulvaney. In 2018, Congressman Polis, who takes pride in the Blockchain Caucus being bipartisan, stated that “a lot has developed since [he] founded the Blockchain Caucus in 2016. The Blockchain Caucus continues to evolve [as blockchain technology can] be used in so many new ways. It has the potential to reshape everything from cryptocurrencies to supply chains to banking to property titling – decentralizing cybersecurity and revolutionizing many industries.”⁶⁹ The Blockchain Caucus is a bipartisan group

⁶⁸ 77 *Id.*

⁶⁹ <https://emmer.house.gov/media-center/press-releases/rep-emmer-foster-announced-co-chairscongressional-blockchain-caucus>

that promotes the future of Blockchain technology and shapes the role that Congress plays in its development.⁷⁰

The four co-chairs of the Congressional Blockchain Caucus are: Congressman Darren Soto (FL-09), Rep. Tom Emmer (MN-06), Rep. Bill Foster (IL-11), and Rep. David Schweikert (AZ-06). Although two of the co-chairs are Republican, and two are Democratic, all four leaders are men. As for the members of the Caucus, there are 17 members with near-even representation from both parties in this session of Congress.

A recent article has listed nine legislators that are involved in the crypto space.⁷¹ Of them, only one is a woman.⁷² Carolyn Maloney, a Democratic Representative from New York, has expressed concerns about the repercussions of speculative cryptocurrency trading.⁷³ She calls for a tighter oversight on behalf of the SEC, and she is on the Financial Services Committee and the Oversight and Government Reform Committee in the House of Representatives.⁸³

More Diversity and Inclusion Efforts Are Needed

The lack of diversity in the blockchain/crypto field has implications that go far beyond fairness.⁷⁴ If the emerging Blockchain industry succeeds in redefining the global financial system, commentators have opined that the lack of diversity and inclusion may result in biased and inferior products.⁷⁵

By way of analogy, the US credit system prior to 1974 barred women from applying for a credit card, which is now considered one of the most basic forms of financial inclusion.⁷⁶ While no one expects that women or other population groups will be barred entirely from participating in blockchain, there are more subtle and current examples we can learn from in other industries such as Artificial Intelligence.

For instance, predominantly white men have developed artificial intelligence, and there have been resulting examples of algorithmic bias.⁸⁷ Patterns matter. Machine learning uses patterns to predict behavior. How are these patterns developed and what data sets were used to train the machines? Machines are not neutral, and they often have gender and racial bias in these AI systems when given the task of guessing a face.⁷⁷ One government dataset of faces collected for testing contained 75% men and 80% lighter-skinned individuals and less than 5% women of color – echoing the pale male data problem that excludes so much of society in the data that fuels AI.⁷⁸ Failure to incorporate inclusion from the start can exacerbate the imbalances that already exist

⁷⁰ <https://soto.house.gov/media/press-releases/rep-darren-soto-named-co-chair-congressionalblockchain-caucus>

⁷¹ <https://cointelegraph.com/news/running-up-that-hill-here-are-all-members-of-congress-involved-incrypto>

⁷² *Id.*

⁷³ *Id.*

⁸³ *Id.*

⁷⁴ <https://qz.com/1262167/the-first-rule-of-being-a-woman-in-crypto-is-you-do-not-talk-about-being-a-woman-in-crypto/>

⁷⁵ *Id.*

⁷⁶ *Id.*

⁸⁷ *Id.*

⁷⁷ <https://time.com/5520558/artificial-intelligence-racial-gender-bias/>

⁷⁸ ⁸⁹ *Id.*

within the technology industry and similar imbalances in finance and insurance where blockchain technology is currently being applied.

The Path Forward for Diversity and Inclusion

Luckily, we are early enough in the blockchain industry that we can create and adhere to Best Practices that enable inclusion in the education, development and distribution of blockchain technology. Broader participation at the table will benefit the development and deployment of more robust technology infrastructure as it emerges and becomes mainstream.

While many global companies are attempting to create a more inclusive culture, much work needs to be done. PwC's 2016 cross-industry study that addressed diversity and inclusion efforts shows that while efforts are being made, not enough is being done and real obstacles still exist. Within the technology industry, companies viewed diversity and inclusion as legal and compliance factors as well as a talent recruitment resource. Training is needed to mainstream diversity and inclusion practices and embed them into the corporate culture and business practices. Issues such as nondiscrimination, compliance and unconscious bias are slowly being addressed. Corporate culture has not yet adopted the stance overall that diversity and inclusion will bring better business results and financial performance.

There are things that we can do to begin to create inclusive environments and raise performance. Companies that have an inclusive culture from top down and bottom up and who implement strong diversity and inclusion strategies are likely to retain an inclusive workforce and perform better. Companies are well thought of when they are promoting fairness and will have less workforce retention issues, less bullying, harassment and other negative issues, and are less likely to need to remediate.

Recommendations: Call to Action

1. Set up an Advisory Group/Task Force to:
 - a. Draft and institute a Pledge that addresses building an inclusive workforce that reflects all, actively seek out those who are underrepresented, and engage with the Blockchain Sector to actively support and sign the Pledge.
 - b. Set up Best Practices for the Blockchain sector
 - c. Set up accountability measures, reporting, review results each year and adjust to continue to strive for and reach inclusion goals
 - d. Use this paradigm to encourage inclusion from the outset in other emerging technologies and industries that interact with blockchain so remedial action and litigation as well as costly and harmful mistakes do not occur, and better financial and other impacts occur
2. Governments, corporates, not-for-profits, finance, media, academia, and others are moving to study and deploy blockchain technologies to support society infrastructure and should be mindful of and incorporate inclusive practices as they adopt these systems. Cross-training and interdisciplinary training should be given to technologists and business people alike to insure a broader approach, as the technologies that create networks impact relationships, economics and the law. Care should be taken to encourage disparate voices as a rule, and training should be implemented so that all voices feel comfortable being included and heard.

3. Diversity and Inclusion Best Practices should be implemented to maintain an inclusive environment as the technologies become mainstream. Exclusionary cultures can lead to exclusionary infrastructure. Practical measures that support a culture of inclusion should be taken to support inclusion from the bottom up as well as the top down to avoid seriously impacting and exploiting the populations who currently do not have a seat at the table.

Practical examples of Best Practices may include:

- a. Unconscious bias training, sponsorship and mentorship programs;
 - b. Pipeline recruitment programs including retraining existing workers;
 - c. Written commitment from entities' senior management and the boards of directors or (or equivalent) to support diversity and inclusion and staffing that reflects that set of values;
 - d. Measure and report diversity and inclusion efforts on an annual basis;
 - e. Foster both team level and individual progress;
 - f. Engage in active listening and follow-up action;
 - g. Update policies and communicate progress and failures with an eye to Improvement;
 - h. Become comfortable with the discomfort of change;
 - i. Create dedicated and meaningful spend and programs to support an inclusive environment;
 - j. Become recognized for positive contributions to improve diversity and inclusion; and
 - k. Create policies of openness and trust, and achieve an ongoing critical mass of employees and participants with different perspectives.
4. Since this is such a wide-ranging global technology, inclusion incentives that support innovation in the form of financial programs and sandboxes (investment incentives, tax aid, research, education, etc.) that encourage more diverse and inclusive technologically oriented workforces should be developed to help speed research and development and support ongoing training.
5. Technologies emerge under differing circumstances. In the case of blockchain technologies, there are few formal training programs, and almost none existed at the outset of the technology. Information in new industries is transferred through more informal settings such as conferences, summits, meetups, online training and classes, startup accelerators and the like. These venues as a rule have not been overwhelmingly diverse or inclusive. Efforts should be made to ensure diverse and inclusive participation through techniques as suggested in #3 above as the foundations of the new technologies are being communicated and sometimes built through or associated with these venues.
6. Auditability and governance should be addressed in an inclusive manner. For example, if the integrity of your blockchain is supported by a consensus mechanism that allows anyone to join

(i.e. Proof of Work), then ideally anyone can participate. As other types of consensus mechanisms are developed to support blockchains that only allow a subset to engage (i.e. Proof of Stake), it is important to ask who is staking, as the stakers are the ones who control. External advisory boards or ethics foundations might be used to maintain inclusiveness.

Conclusion

Blockchain technology is an immature technology that holds much promise as the foundation for the next wave of digital infrastructure. This computing architecture design of a trust minimized, distributed and decentralized ledger can create the backbone for digital interactions, transactions, and communications. The technology has embedded attributes, determinative protocols called smart contracts that run the automated business logic of the network.

This technology is at once powerful and empowering, and by stark contrast, in some cases, simultaneously limiting. While it can be used to help create access to financial products and in fact create new financial products, provide decentralized identity systems, anchor the truthfulness of whether an interaction occurred or enable streamlined business processes that may eliminate record reconciliation, the ledger entries themselves cannot be edited; only overwritten. This can lead to potentially damaging outcomes that may be exponentially deployed through automated protocols. To prevent havoc, careful vision, strategy, and planning should be employed when contemplating, designing and deploying a blockchain system.

The Blockchain sector suffers from a lack of diversity and inclusion across verticals, academia, conferences and government/regulators. This is an all-too-familiar story when looking at the track record of inclusion in existing technology and financial services. This lack of voices at the table to participate in the infrastructure design and build has far-reaching implications. Infrastructure concerns all. The more variety of input, the better designed and more robust the architecture, and the better financial and other results for business and society. Lack of inclusion today can lead to exponential disparities, lower incomes, poorly designed products that might even be downright dangerous, and hard-to-remediate environments.

The good news is we are early on in the development of this technology sector. Radical action can be taken to embed and support diversity and inclusion practices and culture at the outset of the industry so that rules are not overlaid with implicit cultural biases that exclude. We can develop, recommend and create accountability mechanisms for Best Practices to create an inclusive environment as a matter of course. Change is hard, but creating an inclusive industry today will allow us to reap the rewards of better products, systems and ultimately better civil societies.

Appendix

Distributed ledger technology: A digital record of data that differs from traditional database technology in that there is no central administrator or central data ledger; instead, the ledger is replicated and shared among many different systems in a distributed network that arrive at consensus before storing the data.

Blockchain: A type of distributed ledger database that maintains a continuously growing list of transaction records ordered into blocks with various protections against tampering and revision, with a cryptographic key.

Consensus mechanism: A method of authenticating and validating a value or transaction on a Blockchain or a distributed ledger without the need to trust or rely on a central authority. Consensus mechanisms are central to the functioning of any blockchain or distributed ledger.

Smart contract: A piece of written code that auto-executes subject to the satisfaction of pre-agreed conditions, thus adding additional functionality to a Blockchain and providing the ability to automate certain processes.

Nodes: Members or systems of a distributed ledger or Blockchain network that hold a replicated copy of the ledger and can have varying roles: to issue, verify, receive, inform, etc.

Cryptocurrency: A digital currency that uses cryptographic techniques for governance and security and operates independent of any central bank. Cryptocurrencies are a popular use case for the application of Blockchain technology. Digital Tokens issued as cryptocurrency are native digital assets related to and stemming from information/blockchain networks and are often referred to and classified as a new asset class.

Bitcoin: A type of cryptocurrency and one of the most popular applications of Blockchain technology.

ICO: An initial coin offering (ICO) is a fundraising tool that trades digital tokens (also referred to as coins) of future value in exchange for cryptocurrencies of immediate, liquid value (such as Bitcoin or Ether). Generally, tokens are sold to raise money to cover operating costs and fuel technical development before the product/service is officially launched. These fundraising tools are subject to varying regulations.

Stablecoin: A Virtual Currency that is backed by and pegged to a reserve asset or basket of assets such as fiat currencies, other types of assets, cryptocurrencies, or some combination of these assets. Stablecoins are used to minimize volatility as compared to cryptocurrencies like Bitcoin and Ether, which can be viewed as speculative. Currently regulators are globally evaluating how to engage with this asset class.

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