

The Building Blocks of Higher Education's Future: Blockchain

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Introduction

Blockchain is an immutable, virtual distributed ledger technology that can be programmed to record transactions of any kind. ¹ What does this mean in simplified or layperson's terms? With blockchain, when a transaction occurs, it is grouped with other transactions. All the parties in the network verify the transaction and it is then permanently added to a chain of transactions. If a transaction comes in later or is revised, the original or upstream activities are never changed; rather, additional chains are added, thus making for a more secure transaction with a permanent "ledger" or digital trail. Ultimately, one can track the origin of a transaction, raw materials, and activities along the way.

The technology originated as the support system behind cryptocurrencies such as Bitcoin. Since its birth in 2008, interest in its application to other industries has skyrocketed. Because of the increasing demand for professionals with blockchain knowledge, there will be increased pressures on higher education institutions to prepare their students accordingly.

- Although born into the cryptocurrency industry, blockchain technology is expected to be adopted by organizations across countless industries in both the public and private sectors. The industries include banking, healthcare, politics, real estate, legal services, security, government, rentals and ride sharing, non-profits, education, and supply chain.
- Although the advancements in blockchain technology are expected to create new jobs that include blockchain developer, senior software engineer, blockchain investment analyst, blockchain engineer, and blockchain project manager, the implementation of this technology is expected to eliminate several back-office type jobs such as real estate brokers, loan officers, accountants, billing and invoicing clerks, stock brokers, and entry-level business analysts. Consequently, it is difficult to predict the net effect on job creation that blockchain will have on the market.
- Prospective blockchain employees are expected to have 1-2 years of experience working with blockchain technology in addition to possessing the required job skills of most software developers. Few, if any, job postings list educational requirements for these types of employees since the technology is so new and the talent pool is limited. However, future blockchain employees will be expected to have a minimum of a bachelor's degree in a related field in addition to greater expertise and knowledge of blockchain technology and its application.

¹ https://www.technologyreview.com/s/612974/once-hailed-as-unhackable-blockchains-are-now-getting-hacked/?utm_campaign=the_download.unpaid.engagement&utm_source=hs_email&utm_medium=email&utm_content=70033858&_hsenc=p2ANqtz-jBI7hjXZk030RO7d0KAH5V1sZ2XsdSt_7yfnhrJ35KV3Z8ci--zof_UUD4AlvbyYBrRvpIUAJAZ8NP3fqgHzbHRTaHA&_hsmi=70033858

- Only a handful of educational institutions including Harvard, Princeton, MIT, NYU, Stanford, Cornell, and UC- Berkeley²³ have started to develop programs and course offerings focusing on blockchain. Because these universities are early adopters, they have distinguished themselves as hubs for the blockchain community.

Blockchain is important to higher education because it will span many industries. Higher education has an opportunity to educate the workforce in the technology, customize the delivery of teaching for different industries and also integrate the technology within its own industry, in student records, payments, research and other applications. Educating audiences on the integration to specific industries will offer a number of programming opportunities.

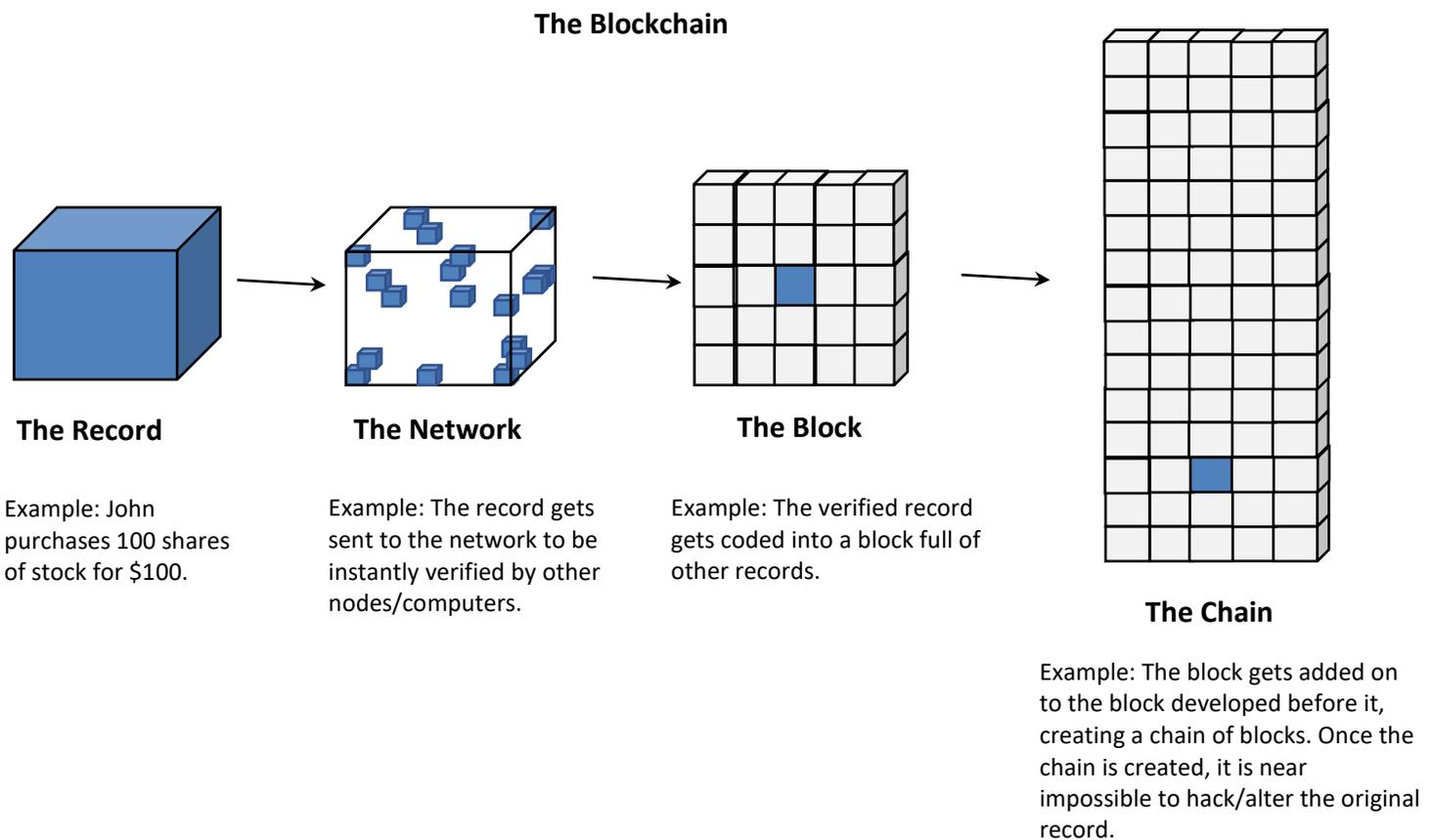
² <https://www.studyinternational.com/news/10-best-universities-to-study-blockchain-degrees/>

³ <https://coincentral.com/blockchains-at-university/>

Overview

What is Blockchain & Why Does it Matter?

As cryptocurrencies like Bitcoin and Ethereum appear in global news report headlines, it is important that higher education providers understand the technology that makes it all happen: blockchain. Blockchain allows digital information to be distributed in a secure, timely, and accurate fashion. For example, blockchain can be imagined as a spreadsheet. This spreadsheet is cloned thousands of times in cyberspace. Each time a change is made to just one of those spreadsheets, it is instantly verified and updated across every single spreadsheet. This process happens on an automatic, continuous basis.⁴



Each record is called a block, and as records are added to the network, each block is added directly onto the block before it, being linked together by computer code. These links form a chain of blocks, and therefore the name, “blockchain.”

⁴ <https://medium.com/the-mission/a-simple-explanation-on-how-blockchain-works-e52f75da6e9a>

Why is blockchain important? Because of its inherent level of security, it is expected to revolutionize daily life. Specifically, blockchain is predicted to act as the kingpin to the concept of a cashless society. Instead of cash, credit and bank cards, you will be using blockchain-backed virtual currency from the convenience of an app on your phone.⁵ Every transaction will be immediately recorded and verified, so the days of waiting on a third party such as your bank or your credit card company to review pending transactions and validate account balances will be over.

The implementation of blockchain technology will not only revolutionize the way people pay for things, but it will fundamentally restructure business processes and functions across numerous industries. The focus of this restructuring will be back-office type roles. For example, there could be significantly less demand for accountants since blockchain is able to instantly record, verify, and ultimately report out all transactions within an organization. Overall, the demand for middleman services will be reduced. Consider the function of a real estate broker: arranging, writing contracts for, and overseeing real estate transactions. Because of blockchain's capacities to securely link buyers and sellers, support contract agreements among several parties, and execute those contracts accordingly, the role of a real estate broker could be eliminated altogether. There is a profusion of examples relating to expected job obsolescence caused by blockchain technology- in all types of existing and emerging industries.

Ultimately, hundreds of organizations across multiple industries are searching for ways to implement blockchain technology and improve their businesses.⁶ In 2018 alone, Google searches involving "blockchain" grew 250% from the year prior.⁷ With so many interested in the application of this technology, what is in store for the future of blockchain?

- The following industries will have the largest, most immediate uses for blockchain: banking, healthcare, politics, real estate, legal services, security, government, rentals and ride sharing, non-profits, education, and supply chain.⁸
- The types of jobs that will be in highest demand include blockchain developer, senior software engineer, blockchain investment analyst, blockchain security consultant, cryptocurrency seminar instructor⁹, blockchain project manager, blockchain quality engineer, blockchain legal consultant, blockchain web designer, and blockchain engineer.¹⁰
- The types of jobs that blockchain will put at risk for obsolescence include many back-office jobs across several industries.¹¹

⁵ <https://www.forbes.com/sites/alastairjohnson/2018/12/24/beyond-plastic-why-a-cashless-society-should-be-a-cardless-one/#3e4a39976cf8>

⁶ <https://www.pluralsight.com/blog/career/tech-in-2025>

⁷ <https://www.forbes.com/sites/forbesagencycouncil/2018/04/05/what-is-blockchain-and-what-can-businesses-benefit-from-it/#1d6773b1675f>

⁸ <https://www.forbes.com/sites/bernardmarr/2018/07/16/here-are-10-industries-blockchain-is-likely-to-disrupt/#14f92535b5a2>

⁹ <https://www.indeed.com/jobs?q=Blockchain&l=>

¹⁰ <https://www.computerworld.com/article/3277617/blockchain/the-top-blockchain-jobs-you-need-to-know-about.html>

¹¹ <https://www.cbinsights.com/research/industries-disrupted-blockchain/>

- Because this industry is still in its infancy and blockchain talent is scarce, the requirements listed on current blockchain job postings are nascent. Very few postings list educational requirements of any kind, but most require at least one to two years of cryptocurrency or blockchain experience.
- As the demand for employees with blockchain technology grows and educational institutions develop programs to meet that demand, stricter requirements regarding experience specifically on job postings will begin to appear.¹²
- In an effort to stay relevant, there are programs and coursework being developed and offered at U.S. universities including Harvard, Princeton, Massachusetts Institute of Technology, New York University, Stanford, Cornell, and the University of California- Berkeley.^{13, 14}
- Overall, blockchain is expected to add a significant number of jobs to the economy because of the greater need for employees who understand the technology; however, the widespread applications for blockchain technology are so great that many traditional jobs are expected to be eliminated because of it. Therefore, it is difficult for any research to predict the net effect in job creation.

As an increasing number of industries investigate the adoption of blockchain technology, a network effect is predicted to occur, only strengthening the growth rate of its implementation. Because the technology is in its infancy, firms typically do not require formal education on blockchain technology; however, as the technology progresses, this is expected to change. Many higher education institutions are lagging behind as they plan to watch the blockchain revolution play out before making any changes to their program offerings. As a result, the few universities that are developing courses and program offerings on blockchain technology will enjoy a large advantage in the market of blockchain education.

Trends in Blockchain

Cryptocurrency

Blockchain was developed as the public transaction ledger of cryptocurrency. The most famous example of cryptocurrency is Bitcoin, an electronic cash system that uses peer-to-peer networks to prevent double-spending.¹⁵ Bitcoin is entirely decentralized with no central authority. As more and more digital, peer-to-peer cash systems were developed, the world of cryptocurrency was created. Despite historic market volatility and the 85% loss in value of the cryptocurrency market in 2018, user adoption nearly

¹² <https://www.entrepreneur.com/article/314921>

¹³ <https://www.studyinternational.com/news/10-best-universities-to-study-blockchain-degrees/>

¹⁴ <https://coincentral.com/blockchains-at-university/>

¹⁵ <https://blockgeeks.com/guides/what-is-cryptocurrency/>

doubled from 18 million users in 2017 to 35 million by the end of 2018.¹⁶ A University of Cambridge study investigated these numbers to show that the increase in users is largely non-business, meaning that cryptocurrency use is rising among individual investors and hobbyists.¹⁷ The spreading use of cryptocurrency among users is a positive sign that in the long-term, cryptocurrency is likely here to stay.¹⁸

Increased Regulation

As with any game-changing, emerging technology, regulation is never far behind. This is particularly important to note because of blockchain's original use, cryptocurrency. Federal regulation is expected to tighten after the federal agencies responsible for regulating cryptocurrencies consolidate and collaborate.¹⁹ The Commodity Futures Trading Commission (CFTC) declares cryptocurrency as a commodity; the Securities and Exchange Commission (SEC) identifies it as a security; the Treasury Department's Financial Crimes Enforcement Network considers it as currency (FinCEN); and the Internal Revenue Service (IRS) treats cryptocurrency as property.²⁰ At the end of 2018, Congress introduced two bills: The Virtual Currency Consumer Protection Act of 2018, and Regulatory Competitiveness Act of 2018.²¹ Both bills were introduced with the intention of reducing the manipulation of crypto markets and developing regulatory agreements across the nation.²² Ultimately, government regulation could have a massive impact on the way that blockchain is used in all U.S industries, especially cryptocurrency

Supply Chain Traceability

Numerous firms are currently evaluating or implementing blockchain technology to track the physical flow of goods throughout the supply chain.²³ The goal for many of these firms is traceability and transparency.²⁴ For example, Provenance, a supply chain start-up, completed a six-month pilot program for tracking responsibly sourced tuna in Indonesia through blockchain technology.²⁵ Even much larger firms such as IBM, Maersk, and Walmart are investigating blockchain as a possible solution to processes that include international shipping and tracing produce back to product recalls.²⁶

Banking

The most prominent application of blockchain technology in the banking industry is the incorruptible, immutable confirmation of transactions.²⁷ It currently takes several hours to several days to process and

¹⁶ <https://www.investinblockchain.com/cryptocurrency-adoption-rising-in-2018/>

¹⁷ https://www.jbs.cam.ac.uk/fileadmin/user_upload/research/centres/alternative-finance/downloads/2017-global-cryptocurrency-benchmarking-study.pdf

¹⁸ <https://www.forbes.com/sites/sarahhansen/2018/09/12/new-report-finance-execs-believe-cryptocurrency-is-here-to-stay/#650a7d4e7c1e>

¹⁹ <https://cointelegraph.com/news/us-federal-government-confusing-regulation-for-crypto-full-clearance-for-blockchain>

²⁰ <https://cointelegraph.com/news/us-federal-government-confusing-regulation-for-crypto-full-clearance-for-blockchain>

²¹ <https://www.congress.gov/bill/115th-congress/house-bill/7224/text?format=txt>

²² <https://www.ethnews.com/congressman-introduces-three-blockchain-bills>

²³ <https://www.coindesk.com/90-companies-join-ibm-and-maersks-blockchain-supply-chain>

²⁴ https://www.supplychain247.com/article/why_blockchain_is_a_game_changer_for_the_supply_chain

²⁵ <https://www2.deloitte.com/us/en/pages/operations/articles/blockchain-supply-chain-innovation.html>

²⁶ <https://www.techrepublic.com/article/5-companies-using-blockchain-to-drive-their-supply-chain/>

²⁷ <https://www.ft.com/content/615b3bd8-97a9-11e7-a652-cde3f882dd7b>

verify a transaction made through a bank, including check payments, loan payments, and wire transfers. Utilizing blockchain technology to increase the speed at which these transactions are verified will significantly reduce the operational costs for banks while at the same time increasing the transparency and security of each transaction.²⁸ Most banks are in the midst of pilot programs and proof-of-concept projects involving the application of blockchain technology, and 9 out of 10 banking executives surveyed said their bank is currently exploring the use of blockchain

Smart Contracts

A smart contract is computer code stored in a blockchain which contains a set of rules under which all parties involved agree to interact with each other.²⁹ When the prescribed rules are met, the agreement is automatically enforced and executed. It helps organizations exchange money, property, etc. in a transparent way in an effort to remove the services of a middleman.³⁰ Smart contracts have a widespread application to any industry or service that requires middleman services. For example, a smart contract can trigger the payment to a carrier once the customer has sent confirmation of delivery rather than going through a complex billing and invoicing process that could take weeks to receive payment.

²⁸ <https://www.cbinsights.com/research/blockchain-disrupting-banking/>

²⁹ <https://blockchainhub.net/smart-contracts/>

³⁰ <https://blockgeeks.com/guides/smart-contracts/>

Occupational Analysis

Current Available Jobs Related to Blockchain

For this research, two occupations, software developers, systems software, and software developers, applications, were selected to illustrate the current marketplace for people with blockchain experience. While this is not an exhaustive list of occupations that can utilize blockchain experience, it provides a sense of the current need for professionals with blockchain knowledge. The job titles sampled from this occupational data include software development engineer, software developer, systems analyst, software engineer, software architect, developer, systems engineer, systems coordinator, senior software engineer, publishing systems analyst, web developer, computer programmer, and information security analyst.

This report presents national occupational and demographic information for jobs that utilize blockchain experience and the employment outlook for emerging jobs that will require blockchain knowledge. All figures and tables are taken directly from Economic Modeling Specialists International (Emsi) and its 2018 datasets.

Region: United States

Table 1 outlines the current and forecasted occupational data for select software developers, systems software, and software developers, applications, in the U.S. Over the next 10 years, all of the select professions are expected to experience growth. Software developers, applications jobs are expected to see the larger growth by percentage by 2028 (27%), while software developers, systems software jobs are expected to grow at a slower, but still significant rate (12%). The median annual salaries for both occupations are similar, around \$100,000 annually.

Table 1: Current and Forecasted Occupational Data for Software Developers, Systems Software, and Software Developers, Applications

Occupation	Total Jobs		2018–2028 Change		Median Annual Salary	Annual Openings	Typical Entry-Level Education
	2018	2028	# Change	% Change			
Software Developers, Systems Software	435,803	489,364	53,561	12%	\$104,000	34,892	Bachelor's Degree
Software Developers, Applications	951,838	1,213,412	261,574	27%	\$100,027	94,826	Bachelor's Degree
Total:	1,387,641	1,702,776	315,135	20%	\$102,013	129,718	-

Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 1 shows the number of jobs, their predicted growth and average hourly earnings for the select occupations in the U.S. There were more than 1.39 million jobs for such occupations, and these are expected to experience strong growth of 22.7% by 2028. The average hourly rate for related professionals is currently \$48.09 or \$100,027 annually.

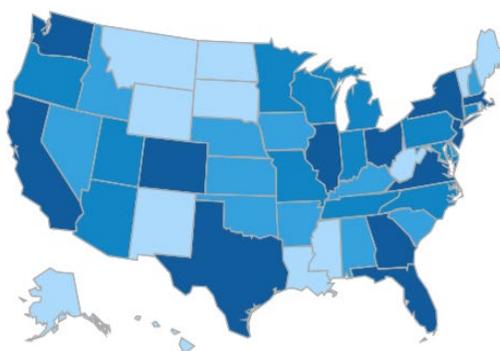
Figure 1: Occupation Overview for Software Developers, Systems Software, and Software Developers, Applications



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Map 1 shows the number of jobs in the U.S. in 2018 related to the defined occupations. The top states include California (306,548 jobs), Texas (139,263), New York (97,776), Washington (89,807), and Virginia (78,182).

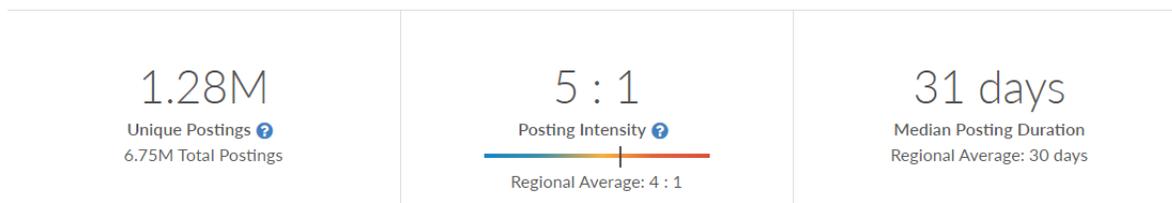
Map 1: Location of Software Developers, Systems Software, and Software Developers, Applications



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 2 shows the job posting intensity for the defined occupations. There were 6.75 million total job postings in 2018, of which 1.28 million were unique, a posting intensity of 5:1, meaning that for every 5 postings, there was 1 unique job posting. This is slightly above the posting intensity for all other occupations nationwide (4:1), indicating that companies in the region are putting above average effort in trying to hire these positions.

Figure 2: Job Posting Intensity for Software Developers, Systems Software, and Software Developers, Applications



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 3 outlines job postings across software developers, systems software, and software developers applications that contain the word, “Blockchain.” Out of 37,158 total postings, 9,839 were unique, a 4:1 posting intensity, comparable to the national average.

Figure 3: Job Postings that Contain “Blockchain” within Software Developers, Systems Software, and Software Developers, Applications



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 4 details the types of degrees professionals in these fields hold. In 2017, computer science was most popular (41,529) with information technology second with half the number (22,645).

Figure 4: Degree Types for Software Developers, Systems Software, and Software Developers, Applications

13 Programs (2017)	109,146 Completions (2017)	112,659 Openings (2017)
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CIP Code	Program	Completions (2017)
11.0701	 Computer Science	41,529
11.0103	 Information Technology	22,645
11.0401	 Information Science/Studies	16,615
14.0901	 Computer Engineering, General	10,962
11.0201	 Computer Programming/Programmer, General	7,372

Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 5 lists the industries in which these professionals are employed. Computer systems design services (234,247) and custom computer programming services (221,189) lead the list.

Figure 5: Industries Hiring for Software Developers, Systems Software, and Software Developers, Applications

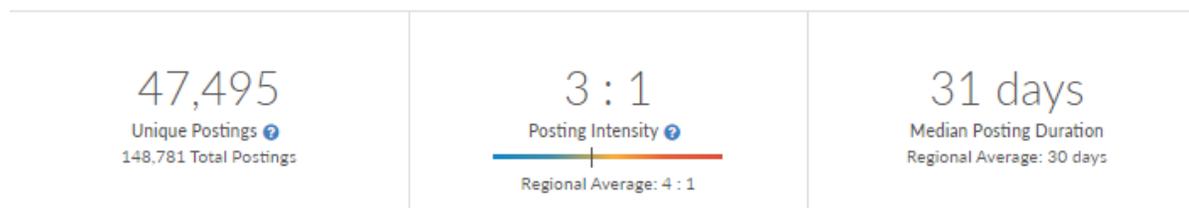
Industry	Occupation Group Jobs in Industry (2018)	% of Occupation Group in Industry (2018)	% of Total Jobs in Industry (2018)
 Computer Systems Design Services	234,247	16.9%	20.1%
 Custom Computer Programming Services	221,189	15.9%	19.8%
 Software Publishers	126,172	9.1%	28.6%
 Corporate, Subsidiary, and Regional Managing Offices	57,482	4.1%	2.3%
 Data Processing, Hosting, and Related Services	45,839	3.3%	11.4%

Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Currently Emerging Jobs Related to Blockchain

Figure 6 highlights the number of job postings across all occupations that include the word, “Blockchain.” Out of 148,781 total postings, 47,495 were unique, a posting intensity of 3:1. This posting intensity is slightly below the national average, indicating that firms may not be trying as hard to hire these positions.

Figure 6: Job Postings that Contain “Blockchain” Across All Occupations



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Various reports and job posting sites were examined to determine the new jobs being created or are soon to be created because of and for the development of blockchain technology. The following job titles were mentioned: blockchain developer, senior software engineer, blockchain investment analyst, cyber threat engineer, cryptocurrency seminar instructor, blockchain project managers, blockchain quality engineer, blockchain legal consultant, blockchain web designer, and blockchain engineer.^{31 32} By 2016, there were 1,838 job vacancies requiring blockchain skills, and through mid-2017, that number grew 115% to 3,958.³³ This trend is only expected to continue as blockchain technology becomes more widespread.³⁴

Salary Expectations

In areas of the U.S. where technology is heavily concentrated such as Silicon Valley, New York, and Boston, the average salary of a blockchain developer is \$158,000.³⁵ In those geographic regions, blockchain development engineers can earn anywhere from \$50-\$100 per hour working freelance.³⁶ Although varying greatly by the type of work, minimum annual salary for professionals working in this field is approximately \$100,000, and the maximum annual salary approximately \$180,000.³⁷

³¹ <https://www.indeed.com/jobs?q=Blockchain&l=>

³² <https://www.computerworld.com/article/3277617/blockchain/the-top-blockchain-jobs-you-need-to-know-about.html>

³³ <https://hackernoon.com/blockchain-jobs-and-salaries-2018-report-45d3e7741c19>

³⁴ <https://www.bitdegree.org/tutorials/blockchain-jobs/>

³⁵ <https://howtotoken.com/career/blockchain-developer-salaries-2018-report/>

³⁶ <https://hackernoon.com/blockchain-jobs-and-salaries-2018-report-45d3e7741c19>

³⁷ <https://blockgeeks.com/blockchain-developer-salary/>

Education & Skill Requirements

The skills required for each job vary greatly by the type of work that is outlined; however, there are overarching trends for certain requirements that are applicable to most jobs in this field. Despite varying skill and experience requirements, nearly all jobs in the field will require a bachelor’s degree in computer science or a related field.³⁸ The following skills will be required³⁹:

- Web application development
- Android/iOS development
- C++, Go, Java, C#, Python
- Proficiency in Bitcoin, blockchain, and Ethereum
- Initial coin offering (ICO) experience
- Smart contract experience
- Cloud application development
- AGILE methodology or other formal project management experience

Since the adoption of blockchain technology is in its nascent phase, job postings are only requiring on average six months to two years of knowledge and/or experience with blockchain.⁴⁰ As time progresses, this experience requirement is expected to continue to increase.⁴¹

Employment Outlook

There are two types of organizations that are hiring blockchain professionals: legacy firms and startups.⁴² The former includes larger, traditional firms that are trying to implement blockchain to improve their business models such as IBM, U.S. Government, Microsoft, Visa, etc.⁴³ Startups that are hiring blockchain professionals were largely created because of the development of blockchain technology such as Atlas City, Blocksmith⁴⁴, and SoluLab, Inc.⁴⁵ Overall, it is the legacy firms that are employing the most blockchain professionals.⁴⁶ Although difficult to forecast how many new jobs will be created because of blockchain technology, there are indications of its recent growth. In 2016, there were only 1,037 job postings related to blockchain on LinkedIn; in 2017 that number quadrupled to 4,541 blockchain-related job.⁴⁷

³⁸ https://study.com/articles/blockchain_developer_salary_job_description.html

³⁹ <https://blockgeeks.com/blockchain-developer-salary/>

⁴⁰ <https://blockgeeks.com/blockchain-developer-salary/>

⁴¹ <https://coincentral.com/blockchain-technology-job-market-and-salary-trends-so-far/>

⁴² <https://www.forbes.com/sites/shermanlee/2018/04/11/the-demand-for-blockchain-engineers-is-skyrocketing-but-blockchain-itself-is-redefining-how-theyre-employed/#7db919bf6715>

⁴³ <https://blockgeeks.com/blockchain-developer-salary/>

⁴⁴ <https://blockgeeks.com/blockchain-developer-salary/>

⁴⁵ <https://www.linkedin.com/company/blocksmithtech>

⁴⁶ <https://blockgeeks.com/blockchain-developer-salary/>

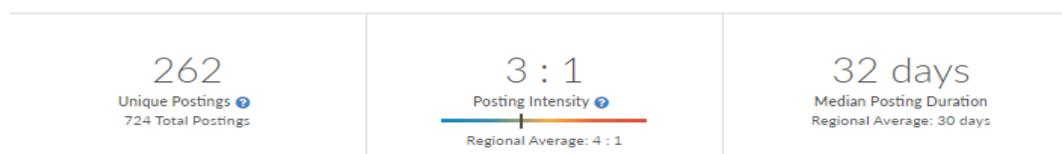
⁴⁷ <https://blockgeeks.com/blockchain-developer-salary/>

Job Posting Analytics of Example Firm: Blockchain, Inc.

Blockchain, Inc. develops software platforms for digital assets. The company offers tools for developers and real-time transaction data for users to analyze the burgeoning digital economy.⁴⁸ Not only does the firm hire many of the emerging jobs previously mentioned, but it hires for ancillary jobs as well that include marketing managers, industrial engineers, and architectural engineers. This firm is highlighted as an example of the potential impact blockchain will have on several job markets because not only are newer jobs created, but more traditionally viewed jobs will be added to help facilitate the growth of this emerging market.

Figure 7 shows that Blockchain had 724 total job postings, of which 262 were unique, resulting in a 3:1 job posting intensity.

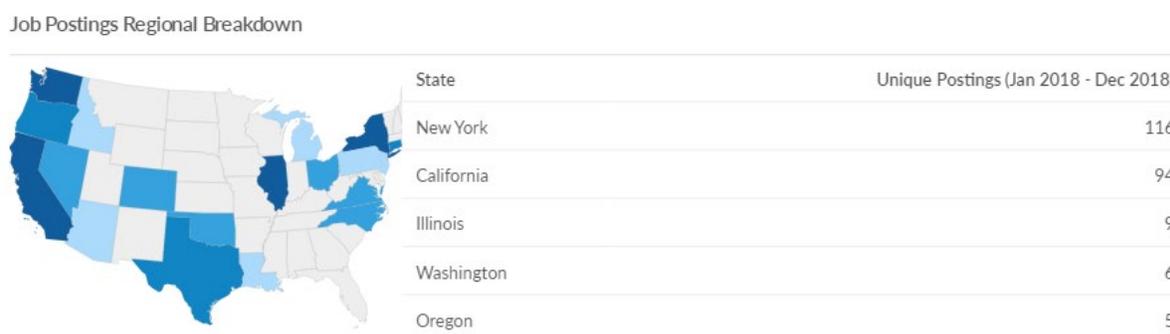
Figure 7: Job Postings Overview for Blockchain, Inc.



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 8 demonstrates the geographic breakdown of these job postings. The highest concentration is found for positions located in New York (116 postings), followed closely by California (94).

Figure 8: Regional Breakdown of Job Postings for Blockchain, Inc.



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

⁴⁸ <https://cryptoslate.com/companies/blockchain-inc/>

Figure 9 outlines the cities in which these jobs are located. Corresponding with Figure 8, the top two cities are New York City and San Francisco.

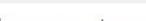
Figure 9: Top Posted Cities for Blockchain, Inc.

Top Cities Posting			
City	Total/Unique (Jan 2018 - Dec 2018)	Posting Intensity	Median Posting Duration
New York City, NY	310 / 114	3 : 1 	54 days
San Francisco, CA	182 / 57	3 : 1 	24 days
Los Angeles, CA	29 / 9	3 : 1 	18 days
Chicago, IL	25 / 8	3 : 1 	34 days
Los Angeles Downtown, CA	11 / 5	2 : 1 	6 days
Palo Alto, CA	4 / 4	1 : 1 	6 days
San Jose, CA	11 / 4	3 : 1 	7 days
Seattle, WA	12 / 4	3 : 1 	60 days
San Mateo, CA	8 / 3	3 : 1 	6 days
Sparks, NV	5 / 3	2 : 1 	2 days

Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 10 displays the top occupations posted by Blockchain, Inc. in 2018. Software developers, applications was first in the total number of job postings.

Figure 10: Top Posted Occupations for Blockchain, Inc.

Top Posted Occupations			
Occupation (SOC)	Total/Unique (Jan 2018 - Dec 2018)	Posting Intensity	Median Posting Duration
 Software Developers, Applications	165 / 60	3 : 1 	26 days
 Computer Occupations, All Other	71 / 25	3 : 1 	35 days
 Web Developers	57 / 16	4 : 1 	31 days
 Marketing Managers	26 / 14	2 : 1 	31 days
 Software Developers, Systems Software	27 / 14	2 : 1 	21 days
 Human Resources Specialists	38 / 10	4 : 1 	20 days
 Architectural and Engineering Managers	67 / 8	8 : 1 	25 days
 Industrial Engineers	17 / 8	2 : 1 	25 days
 Market Research Analysts and Marketing Specialists	10 / 7	1 : 1 	37 days
 Network and Computer Systems Administrators	35 / 7	5 : 1 	56 days

Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 11 shows which job titles Blockchain, Inc. posted most frequently. Software engineers had the highest number of unique job postings at 31, over triple the amount of any other job title in the firm.

Figure 11: Top Posted Job Titles for Blockchain, Inc.

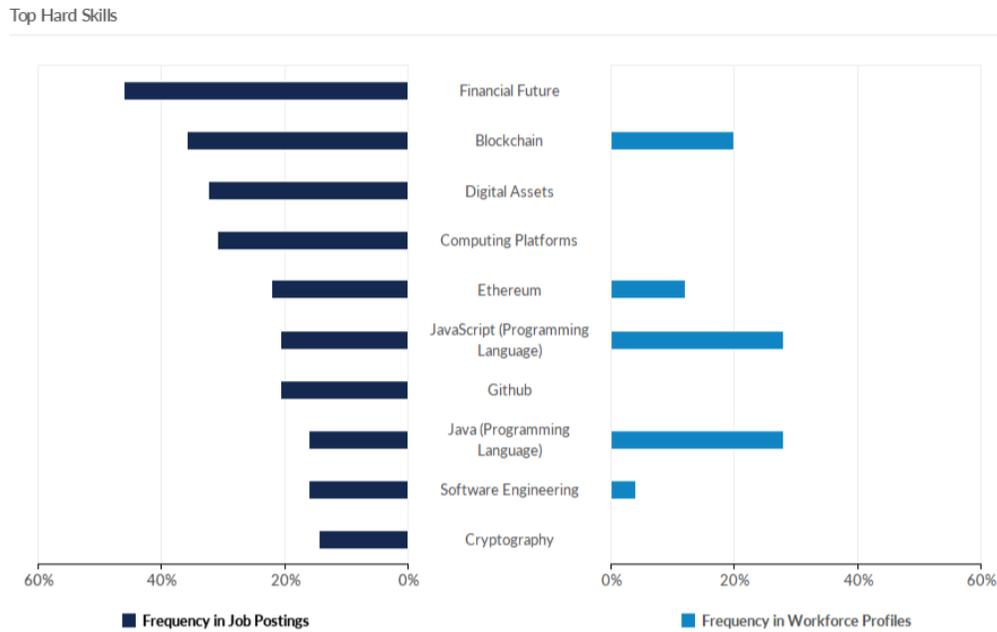
Top Posted Job Titles

Job Title	Total/Unique (Jan 2018 - Dec 2018)	Posting Intensity	Median Posting Duration
Software Engineers	67 / 31	2 : 1 	29 days
Front-End Developers	21 / 8	3 : 1 	45 days
Traders (Sales and Related)	20 / 8	3 : 1 	23 days
Java Developers	42 / 7	6 : 1 	38 days
Systems Engineers (Computer and Mathematical)	17 / 7	2 : 1 	18 days
Head Coaches	18 / 7	3 : 1 	54 days
Product Managers (Management)	14 / 6	2 : 1 	31 days
Technical Leads	12 / 6	2 : 1 	6 days
IOS Developers	8 / 6	1 : 1 	32 days
Business Development Directors	8 / 5	2 : 1 	17 days

Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 12 charts the most frequently posted hard skills listed in each job posting by Blockchain, Inc. The most frequent were knowledge of financial future (46%), blockchain (36%), digital assets (32%), and computer platforms (31%).

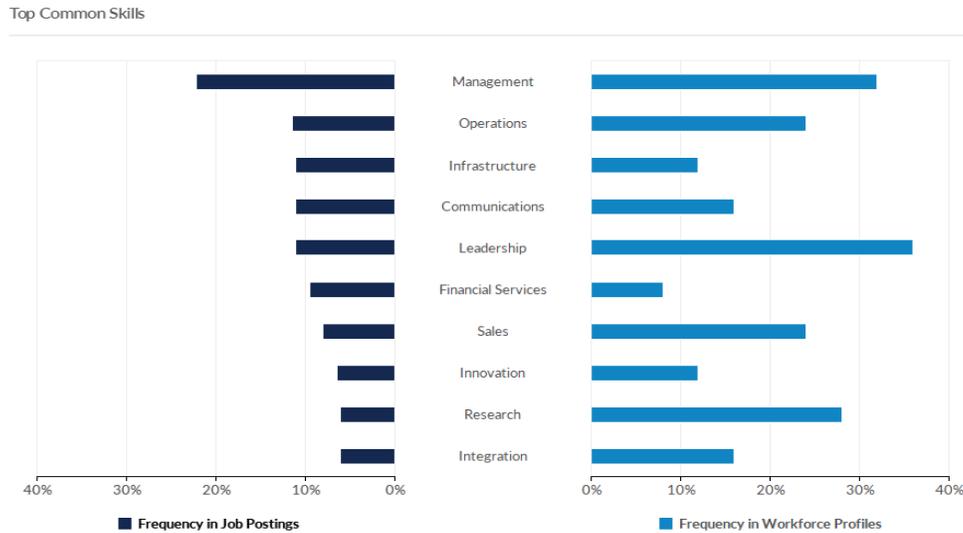
Figure 12: Top Posted Hard Skills for Blockchain, Inc.



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 13 shows a breakdown of the most frequently posted common skills listed in each job posting by Blockchain, Inc. in 2018. Management skill is the most popular common skill listed, appearing in 22%. Leadership appears in 36% of workforce profiles, management in 32%, and research in 28%.

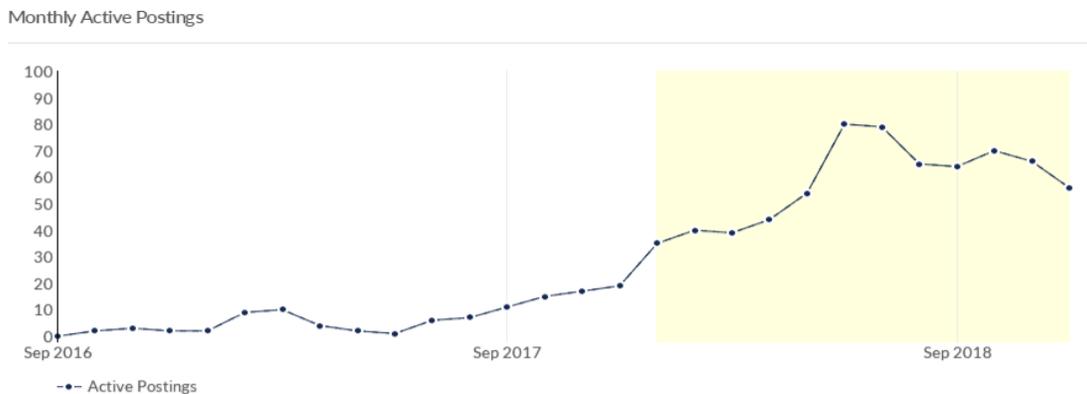
Figure 13: Top Posted Common Skills for Blockchain, Inc.



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Figure 14 displays the monthly active postings for Blockchain, Inc. from September 2016 to December 2018. There is a clear growth trend in job postings, with a peak in mid-2018.

Figure 14: Monthly Active Postings for Blockchain, Inc.



Source: Emsi Data, 2018.4 (www.economicmodeling.com)

Impact on Higher Education

Higher education institutions will have opportunities to integrate blockchain theories and concepts into their curricula and given the complexity and breadth of the technology, could potentially build out entire degrees centered on the discipline. Blockchain applications for different industries and technologies would clearly be part of the degree. While blockchain is fairly new and largely misunderstood, it may be too early to build out an entire degree around the concept. However, there are certificate and workshop opportunities that could be developed by colleges and universities for an evolving user base. There are also many institutions currently offering programs around blockchain technologies and applications that will almost certainly evolve and create new refresher opportunities for future instruction.

Courses and certificates could be designed around blockchain technologies and how digital assets are created, managed, stored and protected. As mentioned in the body of the paper, these blockchains could be created and managed for specific industries and for those managing and working within these industries, knowledge transfer and education will be essential, thus creating potential programs, enrollments and revenue.

Jobs will be created where blockchain technologists and managers will need a deep understanding. Jobs will also be impacted as those that interface with blockchains will need greater understanding. As a result, educational opportunities will be created and will need constant updating as the technology evolves. Given that the technology is both highly technical and highly operational, educational programs for specific audiences could be created. These educational offerings could focus on the basics of blockchain or its applications, such as bitcoin or its applications to the supply chain, manufacturing process or personal records.

While there are many individual leaders in the blockchain movement, at some point, increased adoption and integration may be fueled by the likes of IBM, Microsoft, Coinbase, J.P. Morgan Chase or many of the start-ups centered around the technology. Blockchain is not going away and early adopters in the educational space that are uniquely positioned to help bring clarity on the topic should thrive.

Courses, workshops and credentials are flowing out of higher education institutions such as MIT, Harvard and Cornell, as well as many of the Massive Online Open Course (MOOC) providers, but looking ahead, institutions should still plan to offer significant programmatic opportunities as the concept, along with its applications, are in its early stages. As higher education institutions and private training companies train the early market on initial blockchain concepts and topics, the market will evolve and society will ultimately embrace it. Given the complexity of the interfacing technologies and applications, it is reasonable to believe that, in time, blockchain could become a full undergraduate minor, major or degree and that graduate certificates and credentials could also evolve. Picking the time and place for the right blockchain credential will require precision, as the market needs to be ready to receive it. Some may take a trailblazing or leader approach by taking rewards and risks along the way, while others may wait, respond and react, yielding the market leader position but still providing a valued source of knowledge to the community. Regardless, blockchain will have staying power.

Frequently Asked Questions (FAQ)

What is blockchain and why does it matter to me?

Why is it important for higher education or continuing education?

What jobs or industries will it impact and why?

What jobs will be lost or created?

Why should my institution be worried about it or should it be a leader in education in this field?

What credentials or education programs could flow out of advances in the field?