



# Artificial Intelligence and Blockchain

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*The future of accounts receivable and credit management*

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## INTRODUCTION

Since the dawn of time and the first appearance of mans' innovations, technology has been ever present. Civilization formed new ways to communicate that advanced from hieroglyphics, written scrolls, the printing press and the telephone. Societies also brought forward new forms of commerce, developing from common forms of exchange (still the underlying model for all business today) from fur trading to the Barter System, ultimately to the creation of standardized currency, a financial banking system and a formalized accounting system. The gradual but forward moving development of all of these events was underpinned by new and progressive technologies driving them forward.

The beginning of the 21st century saw the introduction of a new communication technology concept called the "World Wide Web" or "Internet" as it is known today. Its usage and application seemed quite foreign to many, a seemingly futuristic idea. Yet, today the use of the internet is commonplace, most everything we do, information we seek, communication we transmit have been influenced by the internet. This form of technology has brought about other innovations and applications (i.e. smart devices), increasing speed and efficiencies and shortening distances. Yet, can you imagine the inherent delays and stall of today's global business enterprise operating without the development of the internet?

Technology and automation in B2B accounts receivable and credit management has been growing over the past 5 to 10 years, as is evident with the technological growth and proliferation of new automation solutions providers in this space. These things have helped drive greater efficiencies that transcend into companies realizing reductions in

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*"We are at a point where all major financial institutions have some form of innovation".... "now we are moving from an industrial economy to an innovation economy".*

*Luis Noriega, Wells Fargo & Co.*

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DSO, past due receivables, and bad debt reserves, along with other cost reductions. However, even with this technology and automation, most A/R and credit management professionals still manage many manual, time-intensive and repetitive tasks in the order-to-cash processes, while being challenged to do more with less.

This paper will address two new and developing technologies:

- Artificial Intelligence (including robotic process automation), and
- Blockchain technology and its possible impact to the Procure-to-Pay process.
- Finally, we will explore the impact these technologies may have on accounts receivable and the credit profession at large.

## ARTIFICIAL INTELLIGENCE

### What is Artificial Intelligence?

The term ‘artificial intelligence’ was first coined by Stanford researcher John McCarthy, one of the organizers of a conference held at Dartmouth College in 1956.<sup>1</sup> McCarthy has since come to be known as one of the founding fathers of AI. The proposal for the conference included the following claim: every aspect of learning or any other feature of intelligence can be so precisely described that a machine can be made to simulate it.<sup>2</sup>



Artificial intelligence (AI) describes the work process of machines that would require intelligence if performed by humans. AI thus means ‘investigating intelligent problem-solving behavior and creating intelligent computer systems.’<sup>3</sup>

There are two kinds of artificial intelligence:

- Weak artificial intelligence (A.K.A. *Narrow AI*): AI that has no power of perception that is focused on narrow tasks. All currently existing systems considered artificial intelligence of any sort are week AI. Siri and Alexa are good examples of narrow intelligence.<sup>4</sup>
- Strong artificial intelligence: The processes in the computer are intellectual, self-learning processes. Computers can ‘understand’ by means of the right software/programming and are able to optimize their own behavior on the basis of their former behavior and their experience.<sup>5</sup> Strong AI’s goal is to develop artificial intelligence to the point where the systems intellectual capability is

<sup>1</sup> Advisory Board. (2017, April). *Artificial Intelligence and Robotics and Their Impact on the Workplace*. IBA Global Employment Institute, pp. 9-10

<sup>2</sup> ReceivableSavvy (2016) *Artificial Intelligence and Robotic Process Automation in Accounts Receivable Are Here to Stay* [Online]. Available: <https://www.receivablesavvy.com/blog/ai-and-rpa-in-ar-here-to-stay/>

<sup>3</sup> See Reference #1 above.

<sup>4</sup> Karau, B. (2017). *Artificial Intelligence in the Credit Department* [Online]. Available: <https://nacm.org/pdfs/webinars/5-24-17-artificial%20IntelligenceNACM.pdf>

<sup>5</sup> See Reference #1 above.

functionally equal to humans. Currently, no computers on the market exhibit full AI.<sup>6</sup>

AI is mostly being developed to perform tasks that usually require human intelligence, such as visual perception, speech recognition, translation between languages and decision-making. AI is a set of very powerful business tools that can be used to solve business problems. In today's business world and the future, AI will assume increasing responsibility as work forces change and managers are forced to do more with less. The emergence of mobile phones, tablets, social networks and wearable electronic devices has made (weak) AI applications more practical and easy to access. The reality is that artificial intelligence is now very much a part of our everyday lives.

The advancement of intelligent technologies in recent years means that individuals and organizations no longer must rely solely on manual intervention to accomplish learnable tasks. Some examples of how AI has made its way into our everyday lives include:<sup>7</sup>

- The introduction of virtual personal assistants such as Amazon's Alexa, Siri on iOS phones and tablets, and many other applications. Why take the time to look things up on your browser or dial that best friend when you can simply have Siri do it via voice command.
- Fraud reduction through AI tools that can learn a user's habits by following their behavioral patterns and warning of any inconsistencies.
- Recommendations for movies and music from providers like Netflix and Spotify. Watch enough movies and listen to enough music and these providers will leverage technology that can now make recommendations based on your habits.

Smart appliances and devices that can anticipate your needs in your home, lights that come on and burn at certain brightness or thermostats that adjust the temperature based on your home activity are just some of the mundane but repetitive tasks AI-enabled appliances and devices can manage.<sup>8</sup> As more AI systems appear, new names are being used in collaboration, which includes machine learning, reasoning, robotic process automation (RPA), to name a few.

### **Components of Artificial Intelligence:**

What qualifies as intelligence? Research in AI has focused on five key components of intelligence. While some of these elements may seem self-evident as a single item, they must work in conjunction with each other to qualify as Artificial Intelligence.

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<sup>6</sup> See Reference #4 above.

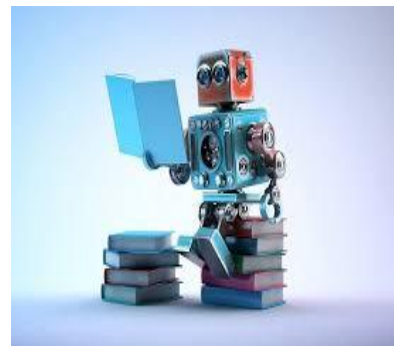
<sup>7</sup> ReceivableSavvy (2016) *Artificial Intelligence and Robotic Process Automation in Accounts Receivable Are Here to Stay* [Online]. Available: <https://www.receivablesavvy.com/blog/ai-and-rpa-in-ar-here-to-stay/>

<sup>8</sup> See Reference #7 above.



[www.tutorialspoint.com/artificial\\_intelligence/artificial\\_intelligent\\_systems.htm](http://www.tutorialspoint.com/artificial_intelligence/artificial_intelligent_systems.htm)

1. **Reasoning:** Implies the computer representation of logic. Reasoning employs complex deductive reasoning to draw inferences from available data.<sup>9</sup> Reasoning systems come in two modes: interactive and batch processing. Interactive systems interface with the user to allow the user to guide the reasoning process.<sup>10</sup> Batch systems take in all the available information at once and generate the best answer possible without user feedback or guidance. Reasoning systems have a wide field of applications that includes business rule processing, problem solving, predictive analytics, robotics, natural language process, along with other applications.<sup>11</sup>
2. **Learning (Machine Learning / Robots):** The ability of a computer system to improve its performance on previous results without being explicitly programmed.<sup>12</sup> Machine learning is used to devise complex models and algorithms that lend themselves to predictive analytics<sup>13</sup> – which produce reliable & repeatable decisions and results. Machine learning is the concept that a computer program can learn, adapt and react to new data without human interference. Within machine learning is a broader method call *deep learning* (also known as deep structured learning or hierarchical learning) based on learning data elements, as opposed to task-specific algorithms.<sup>14</sup> Deep learning models learn, in a very real sense, to recognize patterns in digital representations



<sup>9</sup> Reasoning Systems: Use of Logic [Online] Available:

[https://en.wikipedia.org/wiki/Reasoning\\_system](https://en.wikipedia.org/wiki/Reasoning_system)

<sup>10</sup> See Reference #9 above.

<sup>11</sup> See Reference #9 above.

<sup>12</sup> Machine Learning [Online] Available: [https://en.wikipedia.org/wiki/Machine\\_learning](https://en.wikipedia.org/wiki/Machine_learning)

<sup>13</sup> See Reference #12 above.

<sup>14</sup> Deep Learning [Online]. Available: [https://en.wikipedia.org/wiki/Deep\\_learning](https://en.wikipedia.org/wiki/Deep_learning)

of sounds, images, and other data. In short, AI systems with deep learning can now teach themselves, to a degree. The state-of-the-art deep learning is already well known and used in various disciplines like automatic speech recognition and computer vision of figures and objects. The IBM Watson system (that beat a human on the television game show *Jeopardy*) is now using deep learning techniques and is being trained to help doctors make better decisions.<sup>15</sup> Deep learning has also helped improve the voice search function in smart phones. It has become more popular in AI to the degree that one tech company used the term “deep learning” 81 times during its 83-minute earnings call with investors.<sup>16</sup> Deep learning could transform almost any industry and has already started impacting accounts receivable with automated cash application that recognizes patterns of customer remittance and deduction processing.

3. **Perception**: To put the data together and to make sense of them is the job of the perception component of AI. Perception is the process of acquiring, interpreting, selecting and organizing sensory information.<sup>17</sup> In AI, perception is mostly focused on speech and visual signals. Voice or speech recognition is the ability of a machine or program to receive and interpret dictation, or to understand and carry out spoken commands.
4. **Problem Solving**: Problem solving encompasses a number of techniques known as algorithms, root cause analysis, etc. A variety of problem solving is addressed in AI, including planning a series of movements that enable a robot to carry out a given task. In AR & Credit this could include addressing customer deductions based on reason codes or other data that can lead to root cause analysis.
5. **Linguistic Intelligence (or Language Understanding)**: The ability of a machine or program to receive and interpret dictation, or to understand and carry out written and spoken commands. Language understanding is devoted to developing algorithms and software for intelligently processing language data. Some research in this field aims to create working speech or text processing systems while others aim to create a system allowing machine interaction.<sup>18</sup> Early work in this component has included Optical Character Recognition (OCR) and document retrieval, which are able to be used in AR & Credit automation today.

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<sup>15</sup> Hoff, D. (2013) Deep Learning: With Massive Amounts of Computational Power, Machines can Now Recognize Objects and Translate Speech in Real Time. Artificial Intelligence is Finally Getting Smart. MIT Technology Review [Online]. Available:

<https://www.technologyreview.com/s/513696/deep-learning/>

<sup>16</sup> See Reference #15 above.

<sup>17</sup> Temple University. 3202. Introduction to Artificial Intelligence [Online]. Available:

<https://cis.temple.edu/~wangp/3203-AI/Lecture/IO-2.htm>

<sup>18</sup> Computational Linguistics [Online]. Available:

[https://en.wikipedia.org/Computational\\_Linguistics](https://en.wikipedia.org/Computational_Linguistics)



## **Potential Benefits of Artificial Intelligence:**

**Cost Savings:** Robotic process automation can create a 50-70% cost savings.<sup>19</sup> Process automation enables 24/7 execution at a fraction of the cost of human equivalents.

Prior to automation, one Business Process Outsourcing (BPO) service provider that handled the application for processing insurance benefits employed a full-time human employee who could complete the process in an average of 12 minutes. Automation software completed the process in one-third the time, tripling the transaction volume for one-tenth of the Full-Time Employees (FTE) cost.<sup>20</sup>

**Operational Efficiency & Reduced Downtime:** AI offers an improved workflow and services delivery model by increasing production and accuracy, reducing errors and cycle times, and decreasing the need for ongoing training. Unlike humans, robots can work 24 hours a day, seven days a week. Typically, one robot can do the work of multiple FTEs.

**Advanced Analytics:** Process automation makes gathering and organizing data easier so a company can predict future outcomes and optimize their processes. The analysis determines areas of improvement, and the improved processes, in turn, produce more specific data that allows for further improvement of operations and higher levels of efficiency. Advanced analytics is an essential element in achieving regulatory compliance, cost effective growth and optimized operations. The analytics can help manage credit risk by predicting potential slow pay and potential bad debts, while providing management with insight into possible industry economic trends and consideration for possible changes to policy.

**Enhanced Performance and Quality:** Out of every 100 steps, a human is likely to make 10 errors, even when carrying out somewhat redundant work.<sup>21</sup> Robots are trustworthy, consistent and tireless. They can perform the same task the same way every time without error or fraudulence. AI optimizes capabilities that grow organizational capacity. After deploying automation software to support a number of processes, one company was able to increase organizational productivity and capacity without extra recruiting or training. They achieved payback in approximately 15 months with a calculated return on investment of 141 percent and concluded that they could expect

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<sup>19</sup> Ernst & Young Accountants, LLP. (2016). Robotic Process Automation in the Finance Function of the Future [Online]. Available: [http://www.ey.com/Publication/vwLUAssets/EY\\_-\\_Robotic\\_process\\_automation\\_in\\_the\\_Finance\\_function\\_of\\_the\\_future/\\$FILE/EY-robotic-process-automation-in-the-finance-function-of-the-future-2016.pdf](http://www.ey.com/Publication/vwLUAssets/EY_-_Robotic_process_automation_in_the_Finance_function_of_the_future/$FILE/EY-robotic-process-automation-in-the-finance-function-of-the-future-2016.pdf)

<sup>20</sup> Institute for Robotic Process Automation & Artificial Intelligence [Online]. Available: <https://irpaai.com/definition-and-benefits/>

<sup>21</sup> See Reference #20 above.



greater returns as they continued to automate more workflows.<sup>22</sup> Many large companies have recognized significant ROI within one-to-two years of implementing some aspect of AI in their accounts receivable department. Most have implemented robotics to automate the majority of the cash application workflow processes during off-business hours, including retrieving remittance advice and other source data from vendor portals to apply cash within seconds and have virtually a zero-error rate. This has resulted in savings through FTE reductions in their accounts receivable department. Some companies have shifted a portion of their FTEs to focus on other important tasks that were previously not receiving the level of attention needed, like deduction management.

### **Potential Challenges with Artificial Intelligence:**

**High Cost to Fully Implement:** The purchase, maintenance and repair costs require large capital investment as they are very complex machines. In the case of severe breakdowns, the procedure to recover lost codes and reinstating the system may take time and have high costs.

**Loss of Data:** As with many highly utilized systems powered by big data, there is always the risk of systems being corrupted that could result in the loss of data. Once lost, it is very difficult (if not impossible) to retrieve the data. This can cause serious trouble to a business.

**No Original Creativity:** Creativity or imagination is not the forte of artificial intelligence. Human beings are highly sensitive and emotional intellectuals, which AI will not be able to achieve. However, human creativity may develop further in areas that AI has less influence, like credit managers being more involved in the high level/major account decisions most companies may not leave solely to AI processes alone.

**Job Security:** Artificial Intelligence can and has led to unemployment in certain sectors. Most of these jobs have been associated with positions that handle repetitive workflow. AI enables 24/7/365 execution, which human capital cannot achieve. However, AI will not be able to do strategic planning, make high level/exception decisions, negotiate with customers, etc. Within accounts receivable and credit, FTE reductions may occur with positions that handle repetitive and redundant tasks that are easy to automate with robotics like cash application, along with on-boarding new accounts through electronic credit applications and risk model analytics.

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<sup>22</sup> Institute for Robotic Process Automation & Artificial Intelligence [Online]. Available: <https://irpaai.com/definition-and-benefits/>

## **Big Data and Artificial Intelligence:**

The volume of stored data has been increasing exponentially since the advent of the internet. According to estimates, by 2020 the worldwide data volume is expected to be more than (*100 zettabytes or one sextillion bytes*) ten times the volume in 2006.<sup>23</sup> Big data and the “internet of things” (to be covered later in this paper) create new disruptive purposes of AI.

Stored data can be obtained from different sourcing that includes, but are not limited to, the internet, electronic payment transactions, credit card data, credit bureaus and many other sources. With big data AI will be able to analyze and predict – which will help improve risk management. Another great advantage of big data is that it creates a clear basis for decisions, enabling the decision-maker to make rational decisions without spending a lot of time on research. Even with weak AI, systems can sift out relevant data from the noise because they have so much to work with.<sup>24</sup> Big data is thus an important part of artificial intelligence and will be more important than ever in the future, with the rapid rise in the amount of collected data.

There are three ways in which big data is now empowering AI:<sup>25</sup>

1. **Big Data Technology**: We have the ability to process huge quantities of data that previously required extremely expensive hardware and software.
2. **Availability of large data sets**: Intelligent Character Recognition (ICR), transcriptions, payment history and other data are now available in ways that were never possible in the past; even old “paper sourced” data is becoming available online.
3. **Machine learning at scale**: Scaled up algorithms such as deep learning is powering the breakthrough of AI.

While the first wave of big data was about speed and flexibility, it appears the next wave of will be all about leveraging the power of AI and machine learning to deliver better business value.

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<sup>23</sup> Advisory Board (2017, April). Artificial Intelligence and Robotics and Their Impact on the Workplace. IBA Global Employment Institute, Pg. 99.

<sup>24</sup> Hammond, K. (2015). *Practical Artificial Intelligence for Dummies*. Hoboken, NJ: John Wiley & Sons.

<sup>25</sup> Bean, R. (2017, May 8). How Big Data is Empowering AI and Machine Learning at Scale [Online]. Available: <https://sloanreview.mit.edu/article/how-big-data-is-empowering-ai-and-machine-learning-at-scale/>

For the first time, large corporations are reporting that they have direct access to meaningful volumes and sources of data that can feed AI algorithms to detect patterns and understand behaviors. In a 2018 survey by NewVantage Partners the main finding is that an overwhelming 97.2% of executives report that their companies are investing in building or launching big data and AI initiatives.<sup>26</sup> In particular, executives report notable successes in initiatives to improve decision-making through advanced analytics – with a 69% success rate – and through expense reduction, with a 61% success rate.<sup>27</sup>

### **Robotic Process Automation (RPA) - Dependent on AI?**

Many people think of robots as physical machines in places like car manufacturing plants. Or they think of science fiction legends such as Optimus Prime, C-3PO or “The Terminator”. The easiest way to describe RPA is as software (“robot” or “soft-robot”) that mimics human behavior. Typically, this is “rule-based”, so that it can be captured in procedures and work instructions and requires digital inputs for the RPA software to be

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*“So, the question is (1) how much of those tasks can be automated so that we are tasking our team members on the most important FTE events and then (2) can you as the management team dictate the sequence of those tasks that add the most value for the company to improve the capacity of your FTE events.”*

*Chris Caparon – CEO & Founder, cforia*

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effective. RPA is designed to reduce the burden of repetitive, simple tasks while providing better compliance and accuracy. Process automation has been around for a long while (even SAP can be described as process automation software), but the difference with RPA is the focus on the human tasks. Does RPA have a continuum or dependency on AI? Well, think of the key differences between RPA and AI this way - - robots of RPA are ‘dumb’ while AI is ‘self-learning’.<sup>28</sup> The robots will do exactly what you tell them to do based on digitized and structured data, which is perfect for rules-based process where accuracy is critical, like accounts receivable cash application.

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<sup>26</sup> Bean, R. (2018, February 5). How Big Data and AI Are Driving Business Innovation in 2018 [Online]. Available: <https://sloanreview.mit.edu/article/how-big-data-and-ai-are-driving-business-innovation-in-2018/>

<sup>27</sup> Same as Reference above.

<sup>28</sup> Burgess, A. (2015, December 9) RPA and AI – The Same but Different [Online]. Available: <https://www.symphonyhq.com/rpa-and-ai-the-same-but-different/>

However, AI is better suited where there is ambiguity, unstructured and changing inputs to a process, or where there are very large amounts of data, because AI can manage the variability and get better at the process over time through its own reasoning, learning and perception of the data. So, RPA is not dependent on AI or AI dependent upon RPA, but the two technologies do complement each other very well - - AI to manage unstructured data at the beginning of the process, then using the robots to process the transactions. However, today most companies implement RPA without any need for AI. The simplicity and relatively low cost to implement can make RPA a more attractive solution for many companies (particularly with legacy systems) that provides significant advantages in the areas of consistency, compliance, flexibility, scalability, speed and 24/7 operations. RPA works like a digital assistant for workers by clearing the onerous, simple and repetitive tasks that consume part of every workers day. Finally, RPA software captures a wealth of data that can be used for process improvements, reporting and analytics.

According to Chris Caparon, CEO and Founder of cforia “Converting key stroking to a robot allows that FTE to do other tasks. Let’s take into account tasks that an associate does throughout the course of a day - - invoice reprint, collection call, working a dispute, etc. So, the question is (1) how much of those tasks can be automated so that we are tasking our team members on the most important FTE events and then (2) can you as the management team dictate the sequence of those tasks that add the most value for the company to improve the capacity of your FTE events.”<sup>29</sup>

Receivables solution providers are leveraging AI more each year as they incorporate technology such as Robotic Process Automation (RPA). Incorporating RPA allows non-technical personnel to ‘train’ software robots in a way that allows them to learn specific steps in a process. Where traditional software programming will use code-based instructions to execute tasks, RPA software can be configurable for non-technical users so that it makes better choices based on how it has been trained, very much like staff members.<sup>30</sup>

RPA can improve and streamline a number of key areas for credit and accounts receivable departments, including:<sup>31</sup>

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<sup>29</sup> Caparon, Chris (2018, January 12) CEO & Founder, cforia, 10:00 am ET, Conference Call

<sup>30</sup> ReceivableSavvy (2016) *Artificial Intelligence and Robotic Process Automation in Accounts Receivable Are Here to Stay* [Online]. Available: <https://www.receivablesavvy.com/blog/ai-and-rpa-in-ar-here-to-stay/>

<sup>31</sup> See Reference #25 above.

- ✓ Refining data capture and cash application through Optical Character Recognition (OCR), without template or rules management, while resulting in a higher rate of accuracy.
- ✓ Automate the cash application process, where remittance data is gathered through various sources, matched with invoice data and is reconciled with the corresponding customer account under the electronic payment process.
- ✓ Enhance workflows related to the collections process, allowing for greater efficiency of staff and other dedicated resources, while improving invoice collections.
- ✓ Establish workflow, tracking and reason codes of customer deductions to reduce Days Deductions Outstanding (DDO) and complete root-cause analysis to better manage and minimize future deductions.

Industry research predicts the RPA market will expand at a compound annual growth rate (CAGR) of 60% over the next seven years, reaching \$8.75 billion by 2024.<sup>32</sup>

### **Existing and Future Artificial Intelligence Applications in Finance:**

Where organizations are concerned, AI provides many benefits through the automation of manual processes. Automation greatly reduces the risk of human error while speeding up processes. Not only does this save time, it reduces costs and eliminates long hours of unnecessary manual labor.

As AI expands into different facets of life, it will affect the way we work. Credit departments will change as a result of AI. Exactly how AI is implemented and how soon will vary, but it's possible to get some insight into how it will be used by examining recent research, along with other industries and job functions. "AI will change the role of the credit professional because you are going to be engaged in far less work that is currently an exception, but should not be an exception, and the credit professional will become far more efficient and harvest the benefits of that based on the financial impact across the financial supply chain." Mr. Caparon goes on to say "We are going to see a transformation of roles, responsibilities and staffing and what is required in the order-to-cash space in the AR world related to new technology... and I think you are starting to see it today."<sup>33</sup>

According to the recent white paper commissioned by Salesforce, 2018 will be a landmark year for AI adoption. More than 40 percent of companies said they will adopt

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<sup>32</sup> Grandview Research (October 2016). RPA Market Size Project to Reach \$8.75 Billion by 2024. Available at: <https://www.yaypay.com/pdf/re-imagining-human-work.pdf>

<sup>33</sup> Caparon, Chris (2018, January 12) CEO & Founder, cforia, 10:00 am ET, Conference Call

AI within the next two years. In fact, by 2018, International Data Corporation (IDC) forecasts that 75 percent of enterprise and independent software vendor development will include AI or machine-learning functionality in at least one application. The types of AI that companies are planning to use, or exploring, range from machine learning (25 percent) and voice/speech recognition (30 percent), to text analysis (27 percent) and advanced numerical analysis (31 percent).<sup>34</sup>

Some areas of accounts receivable and credit where AI is available today, or will be, include:

**Cash Application:**

Cash application is a part of the credit department that can benefit greatly from RPA. It is starting to be used by some companies developing robots that apply payments to the company's ERP system with no human intervention. This is accomplished through machine learning and only improves and perfects over time. Yes, initially there will have to be some matching and human intervention, but as time goes by the AI in place learns and works more effectively. This system can work for all forms of payment including checks, ACH and wires. AI allows for easy handling of large data volumes with complex and changing patterns.

**Collections Management:**

Collection management can take advantage of the uses of "rule-based" algorithms in many different forms as well. This could include the use of collection management software with automated dunning letters, workflow management, escalation rules and more. Also, electronic invoice presentment and payment (EIPP) can be another good use, allowing the customer to receive and pay invoices electronically without the need for human intervention. Automation could also be incorporated to include payment tracking and trend analysis for better predictive cash flow planning.

**Credit Decisioning and Management:**

Credit decisioning and management could use AI through many applications. First, the credit application could be submitted electronically online or via language understanding. Then, it could be decisional though credit scoring software integrated into you ERP system using applications such as DNB, Equifax and others. If needed, workflow approvals could be routed to individuals for approval based on authority levels. For more difficult or complex credit decision the use of automated financial statement analysis could be incorporated into the necessary software. Ed Bell, PhD (ICCE), National Credit

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<sup>34</sup> NACM North Central (2017, July 17) Artificial Intelligence and B2B Credit [Online]. Available: <https://www.nacmnc.org/news/356927/Artificial-Intelligence-and-B2B-Credit.htm>



Manager with W.W. Grainger comments “I don’t think we will ever get to a point with technology where a credit professional is absolutely not needed. We will always have a need where credit professionals who understand how business works and are on the cutting edge of how the credit profession is evolving, can help their company remain efficient at the credit & collection process.”<sup>35</sup>

In the future, a credit management professional can and will see greater influence and control of AI automation, specifically in the areas of on-boarding new business, accounts receivable and others areas of credit management at large. However, what additional influence could Blockchain Technology bring forth?

## **BLOCKCHAIN**



### **What is Blockchain?**

Blockchain Technology, while still on the development horizon, is considered to have the potential to revolutionize business and finance transactions much like the internet's impact to change the speed and access of information. Blockchain technology is premised on the theory of an open or distributed ledger technology (DLT) or database. Meaning that either everyone (public/anonymous) has access to digital information (i.e. Bitcoin). Or, restricted access (private/known) to an authorized, shared community.



The Blockchain is an incorruptible digital ledger of economic transactions that can be programmed to record not just financial transactions but virtually everything of value.<sup>36</sup> What this really means is tracking the ownership of assets. “An asset can be tangible – a house, a car, cash, land – or intangible like intellectual property, such as patents, copyrights, or branding.”<sup>37</sup> A Blockchain is a technology that allows people who do not

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<sup>35</sup> Bell, Edwin (2018, January 18) Sr. Manager, Credit Administration, W.W. Grainger, Inc., 12:00 pm ET, Conference Call

<sup>36</sup> Tapscott, Don & Alex. (2016). *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business and the World*. New York, NY: Penguin Random House, LLC.

<sup>37</sup> Gupta, Manav. (2017). *Blockchain for Dummies – IBM Limited Edition*. Hoboken, NJ: John Wiley & Sons.



know each other to trust a shared record of events. This shared record, or ledger, is distributed to all participants in a network who use their computers to validate transactions and thus remove the need for a third party to intermediate.

When most people think of Blockchain they think of bitcoin, one of many cryptocurrencies. However, the cryptographic technology that underlies bitcoin, called the “Blockchain”, has applications well beyond cash and currency. Before attempting to understand Blockchain, let’s review the aspects of a traditional transaction today.

When any sales transactions are recorded, businesses, banks and governments have used databases to record these account transactions. There is usually a central authority – the creditor and/or bank – which manages changes to the record of the transactions so they can identify where the transaction is in the process, when transfer of title takes place and when & how payment will be processed.

Historically, the modification of documents involves the author to issue the document and then forwarding it on to another for modification and then on to another or back to its author for verification and processing. In today's environment these same actions may be

transacted utilizing software programs, the most common being Microsoft Word and Excel. As users of this software know, only one party can make modifications to a document

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*"Blockchain is about the digitization of the order-to-cash process".*

*Bradley Palmer - cforia*

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while momentarily preventing any other user from making simultaneous modifications. "That's how databases work today. Two owners can't be messing around with the same record at once."<sup>38</sup>

Each party involved in a transaction maintains a record of their own ledger, this function remains duplicative, costly, time consuming and subject to dated/lagging information and error. Today's traditional methods for accounting and tracking recorded transactions can be costly due to external fees and services, along with inefficiencies due to time lags in finalizing contractual agreements. Transactions that are centralized could also be subject to fraud, cyber theft or human error, causing interruption to transaction processes.<sup>39</sup>

These transactions take time, have possible risks and rely on third parties or intermediaries like a bank, company or government to record the transaction from order-

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<sup>38</sup> Mougayar, W. (2016). *The Business Blockchain: Promise, Practice and Application of the Next Internet Technology*. Hoboken, NJ: John Wiley & Sons.

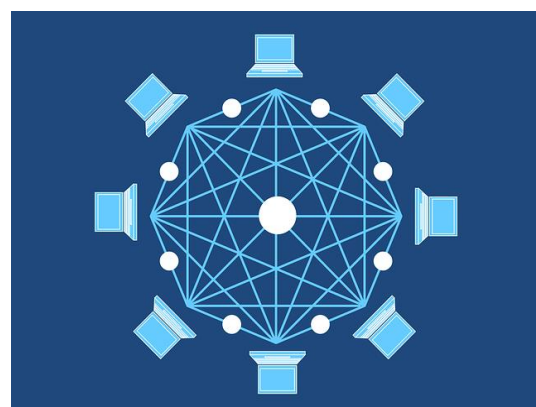
<sup>39</sup> Gupta, Manav. (2017). *Blockchain for Dummies – IBM Limited Edition*. Hoboken, NJ: John Wiley & Sons.

to-cash. The information for these transactions is maintained by each party in their own (centralized) systems, which sometimes creates a lack of trust by other parties involved in the transaction. Just think of the debt crisis in Greece during 2015 - - banks froze all bank account deposits and limited withdraws. Some creditors did not trust doing business with Greece or any business in the country due to its risks and limited trust with intermediaries. If banks can collapse and governments can freeze bank withdrawals in Europe, how can people trust less developed and regulated countries? The simple answer is they cannot. There are many factors that complicate financial transactions: need for collateral, time required for settlement, differences in currency denominations, country risks, third party mediations and more. This is where Blockchain technology may have an impact as it removes the need for any intermediaries, allowing parties to transact directly between each other in an environment, which helps to foster trust, accountability, and transparency in business transactions.

*The Economist* described one implementation of Blockchain as “a programming language that allows users to write **Smart Contracts**, thus creating invoices that pay themselves when a shipment arrives or share certificates which automatically send their owners dividends if profits reach a certain level.”<sup>40</sup> Various regulatory bodies in the music industry have started testing models that use Blockchain technology for royalty collections and management of copy rights around the world. According to Accenture, in 2016 Blockchains attained a 13.5% adoption rate within financial services, being an early adopter of Blockchain technology. Blockchain is also potentially suitable for the recording of events like records management, identity management, transaction processing, food traceability and many other possibilities.

### How does the Blockchain work?

Blockchain works on a peer to peer architecture which in a closed system is shared and permissioned amongst its authorized participants. Each participant called a **node**, has access to the shared information. Each and every time a transaction is made to the Blockchain, this data is synchronized and updated to all Blockchain network participants. Blockchain is also a consensual medium whereby any



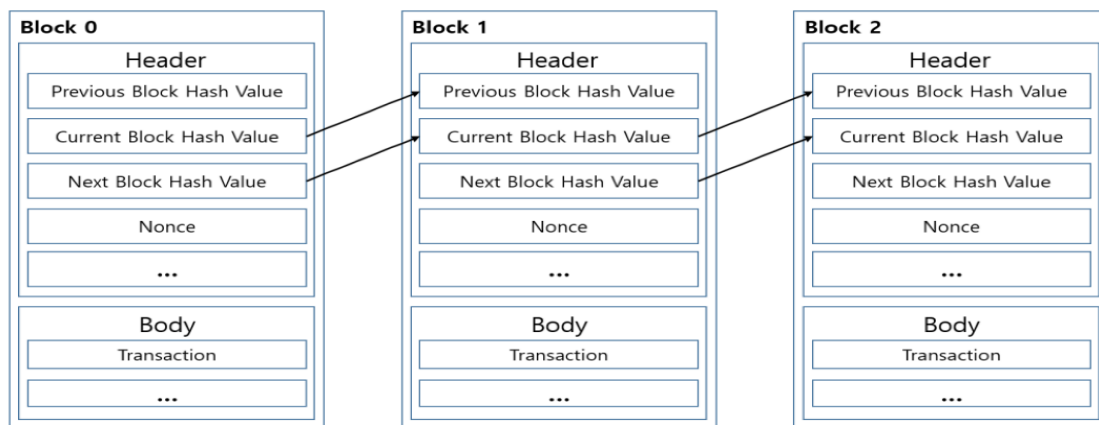
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<sup>40</sup> Economist, The. (2015) *Blockchains: The Great Chain of Bing Sure About Things* [Online]. Available: <https://www.economist.com/news/briefing/21677228-technology-behind-bitcoin-lets-people-who-do-not-know-or-trust-each-other-build-dependable>

transaction of a participant must gain a consensus of all participants in order to validate the transaction.

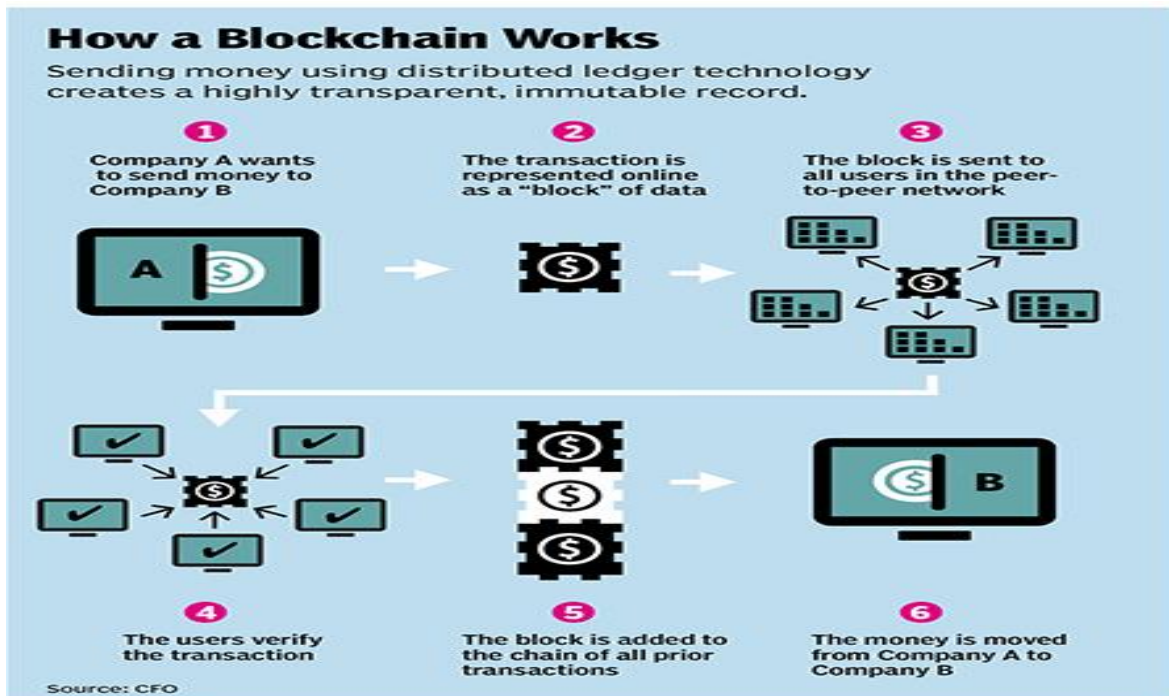
Blockchain is a continuously growing list of records called **blocks**, which are linked and secured using **cryptography**. Each block contains a link to a previous block called a **hash pointer**. By design, Blockchains are inherently resistant to modification of the data and serve as an open, **distributed ledger** that can record transactions between two parties efficiently and in a verifiable and permanent way. Once data is recorded in a block that data cannot be altered retroactively without the alteration of all subsequent blocks, which requires a consensus of the Blockchain network majority.

A Blockchain is formed with a beginning block of data called the **Genesis Block**; this data file block contains an agreed set of rules established by the participants. These rules can be established by the use of a **Smart Contract**. This block begins the digital record of transactions that will follow and form the Blockchain. Each transaction is added as a block of data, cryptographically and uniquely identified with a hash considered a digital fingerprint. Each will be timestamped and interlocked to the preceding block of data. Once interlocked, no additional data can be inserted between blocks. The Blockchain strengthens as each block is added thus, providing verified evidence of a transaction, transparent and tamper proof. All data within the Blockchain can be sent to all the participants or nodes through a shared ledger but the data cannot be copied.



Picture Source: MDPI-Symmetry (2017)

In today's current business environment, rules governing a transaction are guided by laws such as offer and acceptance, the placement of purchase orders, or other contractual legal agreements that bind parties to defined actions and remedies.



Blockchain transaction can also be established with a set of defining rules and guidelines, called **Smart Contracts**. These contracts are digitized computer codes that govern the expectations, obligations, performance and penalties associated within the Blockchain transaction. We will outline Smart Contracts a bit later.

Everyone on the Blockchain can view and validate transactions creating transparency and trust. Trust lays at the core of the Blockchain without the need for an intermediary being involved in the transactions. The Blockchain cannot (1) be controlled by any single entity, and (2) has no single point of failure.

The core of the Blockchain has some common elements that will be important in the order-to-cash process:

### Elements Common to all Blockchains:<sup>41</sup>

1. **A Blockchain is digitally distributed across a number of computers in almost real-time:** the Blockchain is decentralized and a copy of the entire record is available to all users and participants of a peer-to-peer network. This eliminates the need for central authorities, such as banks.
2. **A Blockchain uses many participants in the network to reach consensus:** the participants use their computers to authenticate and verify each new block. For

<sup>41</sup> Deloitte. (2016). *Blockchain: Enigma, Paradox, Opportunity* [Online]. Available: <https://www2.deloitte.com/content/dam/.../uk/.../deloitte-uk-Blockchain-full-report.pdf>

example, to ensure that the same transaction does not occur more than once, new blocks are only adopted by the network once a majority of its participants agree that they are valid.

3. **A Blockchain uses cryptography and digital signatures to prove identity:** transactions can be traced back to cryptographic identities, which are theoretically anonymous, but can be tied back to real life identities with some reverse engineering.
4. **A Blockchain has mechanisms to make it hard (but not impossible) to change historical records:** Data that exists earlier in a Blockchain (i.e. a prior block) cannot in theory be altered except where the rules embedded within the protocol allow for such changes - - for instance, by requiring the majority of its participants to agree to such change.
5. **Blockchain is time-stamped:** transactions on the Blockchain are time-stamped, making it useful for tracking and verifying information.
6. **Blockchain is programmable:** instructions embedded within blocks, such as “if” this “then” do that “else” do this, allow transactions or other actions to be carried out only if certain conditions are met, and can be accomplished by additional digital data.

### **Potential Benefits of Blockchain:**

Blockchain technology has the potential to offer some benefits over existing order-to-cash infrastructure, which we have identified six core benefits:<sup>42</sup>

1. **Transparency and Trust:** Blockchain offers better transparency compared to existing systems for many industries. Changes are visible to everyone on the Blockchain and cannot be altered or deleted. There is also an increased trust between parties, especially with countries where trust in banking and government does not exist.
2. **Security:** Data entered cannot be altered, significantly minimizing fraud. Transactions provide a clear trail, allowing any transaction to be easily investigated and audited.
3. **Reduced costs:** Transactions could be settled on one shared ledger, reducing the costs of validating, confirming, auditing each transaction across multiple organizations.
4. **Increased transaction speed:** The removal of intermediaries and settlement through multiple centralized third-party systems, allows for increased transaction speed compared to existing systems and processes.

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<sup>42</sup> Gates, Mark. (2017). *Blockchain: Ultimate Guide to Understanding Blockchain, Bitcoin, Cryptocurrencies, Smart Contracts and the Future of Money*. San Bernardino, CA: Amazon

5. **Wide range of uses:** Almost anything of value can be recorded on the Blockchain. There are already many companies and industries exploring and developing Blockchain based systems (i.e. financial services, food safety, music industry, etc.).
6. **Accessible:** Blockchain makes it easy to create applications without significant investment in infrastructure.

### **Potential Challenges of Blockchain:**

As the Blockchain ecosystem evolves and different cases for using this distributed-ledger technology emerge, there are some complex and potentially controversial array of issues, as well as new dependencies.

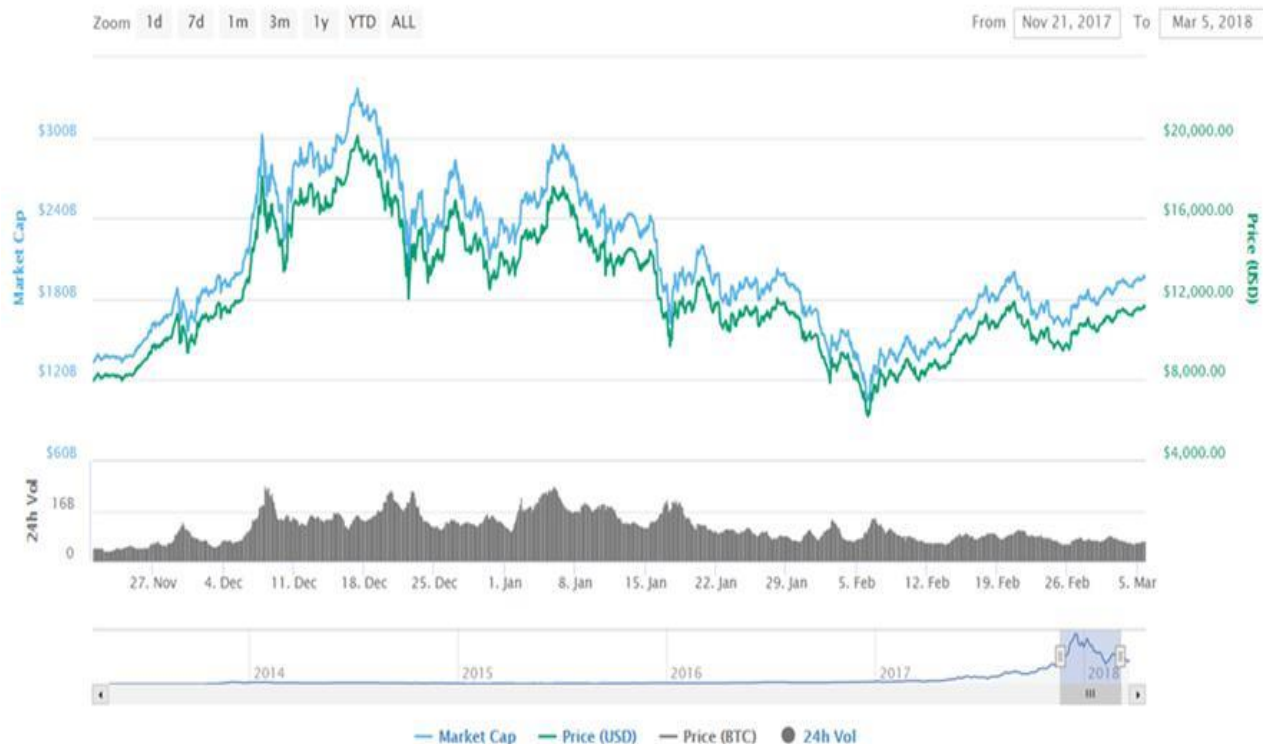
1. **Unproven New Technology:** There are no real-world applications to prove the effectiveness of Blockchain technology. Most of the potential applications are theoretical. How the Blockchain works and the potential benefits of it are difficult for many people to understand - - which clearly has social and behavioral change impact. Just because the technology may be better than existing systems, does not mean businesses will want to use it over existing systems.
2. **Regulation & Governance:** Regulation is going to be a major challenge for Blockchain. Bitcoin is the most commonly known use of the Blockchain, which has a strong connection with terrorism, drug dealing and crime. Some governments, like China, South Korea, and European Union are considering or have already put restriction of cryptocurrency mining and other related transactions. The European Parliament has revised and continues to evaluate its Payment Services Directive (PSD2), which was adopted in October 2015 and is set to be entered into force on January 13, 2018. PSD2 aims at promoting innovation and improving the security of payment services in the EU, which includes *Fintech* regulation around Blockchain. The U.S. Government is closely monitoring Fintech and actions by other governments. The Financial Stability Oversight Counsel (FOSC) is concerned about the vulnerability of fraud due to the existing small scale of Blockchain. Large financial institutions will be wary about moving to any system where government regulation is unclear.
3. **Lack of Scalability:** Blockchain networks have not yet proven to scale effectively to the same level of existing systems. Currently, Blockchain is only capable of handling around 7 transactions a second, whereas the Visa network is capable of handling over 20,000 transactions a second.
4. **Cost and Efficiency:** It takes a substantial amount of energy to power Blockchain. It is estimated that every half-an-hour the bitcoin network uses the same amount of electricity as the average US household does in an entire year. And the trend is toward using more energy in Blockchain, not less. This is due to



the very complicated algorithms and mathematical calculations that many Blockchain networks use to add a block to the Blockchain network.

5. **Security:** Although we considered security a benefit, there are some aspects of security that could be a challenge. Blockchain-based assets (like bitcoin) are like cash and use advanced cryptography and encryption that are more secure than standard internet passwords and access codes. However, if you forget your *private key* to your **cryptocurrency wallet**, you will not be able to access the money in your wallet. There is no way to reset or change your private key, like you can reset or change a password to access a system or reset the password to your ATM card.
6. **Cryptocurrency Limitations & Volatility:** There are many cryptocurrencies, but the most publicized is Bitcoin. Critics have also raised concerns about the long-term illiquidity because bitcoin is finite in quantity – 21 million by the year 2140 – and mined at a diminishing rate. The other challenge (beyond the regulation discussed above) is the volatility of cryptocurrency in the open market. Just look how Bitcoin has ranged in price on the public market from November 2017 to March 2018, with wild fluctuations.

## Bitcoin Charts



Source: [Coinmarketcap.com](https://coinmarketcap.com)



## The Future of Blockchain in the Order-to-Cash Process:

Blockchain technology could disrupt the order-to-cash process and more importantly provide huge operations benefits in terms of speed, greater security, and decreased workload by facilitating the exchange of information. The following outlines how Blockchain technology can bring value to the order-to-cash processes.<sup>43</sup>

1. **Improved validation and authentication:** The Blockchain would support swift authentication rights along the order-to-cash process, thereby helping to prevent fraud and improve security across the order-to-cash process.
2. **Reshaped invoice processing:** Invoice scanning would no longer be required due to the shared access to the database and the exchange of invoices supported by the Blockchain. This would also help make the reconciliation process far less cumbersome as all authorized parties could review the same transaction, eliminating the need for reconciliations. Blockchain hosted transactions would feed into the company's general ledger for general accounting and financial reporting purposes.
3. **Accelerated settlements:** Reconciliation and vendor/customer enquiries would not be required due to complete transparency and real-time access to shared database. This could potentially disrupt, in a positive sense, business practices with long settlement deadlines or payment terms.
4. **Greater trust among shareholders:** Help increase trust among clients and vendors through shared public IDs, referral mechanisms, and ratings/scores assigned to all market players based on quality of goods/services, reliability of delivery, and timely payment of invoices, etc. The accumulated and rated history of transactions would build trust and transparency.
5. **Strong audit trail:** As all parties are registered in the ledger, transactions are stored and a tamper-proof audit trail is maintained. This end-to-end visibility into procurement would make it easy to track-physical goods.
6. **Greater security of transactions:** This can be attained through cloud-based Smart Contract repository and an integrated e-signature feature that verifies signer identity and authority.

Blockchain technology provides a secured transaction database, shared between vendors and clients for additional efficiency gains. The database is immediately updated to reflect

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<sup>43</sup> Accenture (2016). *How Blockchain Can Bring Greater Value to Procure-to-Pay Process* [Online]. Available: <https://www.accenture.com/t20170103T200504Zw/us-en/acnmedia/PDF-37/Accenture-How-Blockchain-Can-Bring-Greater-Value-Procure-to-Pay.pdf>

any new transactions, thus accelerating the consent and validation of work orders and invoices.

Technology companies like Microsoft are now providing “Blockchain-as-a-Service” (BaaS) on their existing cloud platforms.<sup>44</sup>

### **Smart Contracts:**

The key to successful business to business Blockchain transactions on a permissioned Blockchain network is the implementation of Smart Contracts.

A Smart Contract is written as part of digital or computer code that governs business transactions and is embedded within the Blockchain contract (Genesis block). However, unlike a written contract that may require review and action between parties, a Smart Contract can be partially or fully self-executing or self-enforcing.<sup>45</sup>

The rules, performance actions and penalty consequences that govern any business transaction or multi-tiered complex transactions can be written into a Smart Contract and can be implemented during the performance of the transaction until completion. Performance completion, verified by the mutual parties to the Blockchain can trigger automatic actions defined by the Smart Contract.

Smart Contracts provide efficiency and help speed up transactional processing, eliminating the need or delay of contractual review or the exchanging of written or signed documents. With the transactional conditions established by a Smart Contract running in the background of a Blockchain agreement, the Smart Contract is specifically designed to help enforce the obligation without the need for intermediaries or middlemen.

“Smart Contracts are Awesome!”, so says Blockchain developers for BlockGeeks.com.<sup>46</sup>

Here’s what Smart Contracts give you:

**Autonomy** – You’re the one making the agreement; there’s no need to rely on a broker or other intermediaries to confirm. Incidentally, this also knocks out the danger of manipulation by a third party, since execution is managed automatically by the network, rather than by one or more, possibly biased, individuals who may err.

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<sup>44</sup> Rizzo, P. (2015, December). *Microsoft Explores Adding Ripple Tech to Blockchain Toolkit* [Online]. Available: <https://www.coindesk.com/microsoft-hints-future-ripple-Blockchain-toolkit/>

<sup>45</sup> Tapscott, Don & Alex. (2016). *Blockchain Revolution: How the Technology Behind Bitcoin is Changing Money, Business and the World*. New York, NY: Penguin Random House, LLC.

<sup>46</sup> Rosic, A. (2017). *Smart Contracts: The Blockchain Technology that will Replace Lawyers*. [Online] Available: <https://blockgeeks.com/guides/smart-contracts/>

**Trust** – Your documents are encrypted on a shared ledger. There's no way that someone can say they lost it.

**Backup** – Imagine if today you lost a signed contract with a customer. On the Blockchain, each and every one of your friends has your back. Your documents are duplicated many times over.

**Safety** – Cryptography, the encryption of websites, keeps your documents safe. There is no hacking. In fact, it would take an abnormally smart hacker to crack the code and infiltrate.

**Speed** – You'd ordinarily have to spend chunks of time and paperwork to manually process documents. Smart Contracts use software code to automate tasks, thereby shaving hours off a range of business processes.

**Savings** – Smart Contracts save you money since they knock out the presence of an intermediary. You may, for instance, have to pay a notary to witness your transaction with a traditional paper contract.

**Accuracy** – Automated contracts are not only faster and cheaper but also avoid the errors that come from manually filling out forms.

A word of caution:

Early use of Smart Contracts has not been flawless and hackers have compromised early contract code; while a Smart Contract is to be immutable or irrefutable computer code.<sup>47</sup> Smart Contract code will need to be written carefully so potential issues such as human error, asset loss, coding bugs and any element of fraud can be remedied. Of course, things such as Blockchain technology and related Smart Contracts could be subject to future governmental regulation and interdiction. Atlanta Federal Reserve Director Larry Wall writes: "to reach their potential fully, Smart Contracts are going to have to find a smart way of interfacing with the often complicated and messy real world."<sup>48</sup>

## **Cryptocurrencies:**

Known as a digital asset or virtual form of currency, cryptocurrency is decentralized and not governed by any central agency or bank. Ownership is conducted and verified on a public decentralized ledger via Blockchain. The first cryptocurrency, created in 2009 was Bitcoin. Since that time the Bitcoin Blockchain has operated without significant disruption. As of 2018, there is an estimated 1,500 bitcoin-like cryptocurrencies already

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<sup>47</sup> Myers, R. (2017, March 2). Betting on Blockchain. CFO Magazine, pp. 31-37.

<sup>48</sup> Myers, R. (2017, March 2). Betting on Blockchain. CFO Magazine, pp. 31-37.

on the Blockchain. New entrants to this growing field of cryptocurrencies are reported on every day. Currently, the most prominent are noted below.

Today, bitcoin (BTC) remains the largest market capitalized cryptocurrency as measured by value, \$163 Billion as reported March 2018 by CoinMarketCap.com.<sup>49</sup>

The next highest valued cryptocurrencies would be:



Ethereum (ETH)	\$72 Billion
Ripple (XRP)	\$32 Billion
Bitcoin Cash (BCH)	\$19 Billion
Litecoin (LTC)	\$10 Billion
Cardano (ADA)	\$ 6 Billion

Presently, the Market Capitalization value of the total cryptocurrency market is an estimated \$395 Billion dollars. Of this bitcoin represents 42% percent of the total market.

The growth of this new form of currency has drawn the interest of both the investing community and that of financial institutions for usage as an investment tool and as a monetary vehicle. Cryptocurrencies have also attracted the attention criminal and nefarious cartels looking to move large amounts of currency, unmonitored and undetected, along with those looking to find ways to unscrupulously steal from these exchanges. Luis Noriega, Senior Vice President-Global markets at Wells Fargo points out that "once you have currency outside of government control, it lends itself to money laundering and other activities outside of government control".<sup>50</sup>

It's important to note that as of January 2018, any problems associated with Bitcoin have been due to hacking or mismanagement. In other words, these problems came from bad intention and human error, not flaws in the underlying concepts of Blockchain.

As these currencies secure legitimacy in their ever-increasing use, it is likely that the intervention of governmental agencies and the establishment of regulatory guidelines will be imposed outlining further control and restriction of cryptocurrency usage.

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<sup>49</sup> Coin Market Cap [Online]. Available: [www.coinmarketcap.com](http://www.coinmarketcap.com)

<sup>50</sup> Noriega, Luis (2018, January 19) Senior Vice President-Global Advisory, Wells Fargo & Co., 12:00 pm ET, Conference Call

## **BITCOIN, the new coin on the block:**

We felt it important to include a brief discussion and overview of bitcoin. The reason for this is that bitcoin is the first utilization of "Blockchain technology". To be clear, bitcoin and Blockchain are frequently referenced synonymously, but both are completely different from the other. Blockchain technology is however, the behind the scenes workhorse that makes the functionality of bitcoin possible.

While it is not our intent to delve deeply into the topic, we offer a historical perspective and what the future may hold in store for Bitcoin.

Out of the looming 2008 Global financial meltdown, 2009 brought forth a new concept of a monetary financial transaction - Virtual.

Bitcoin first appeared and the dawn of what we now consider digital currency or "cryptocurrency" became known. Since its initial creation, more than 1,500 cryptocurrencies have been created and more will likely follow. Bitcoin remains the largest and most recognized of these currency types.



Credit for the creation of bitcoin is attributed to programmer Satoshi Nakamoto. Satoshi's key to creating value in bitcoin was, and is, the element of scarcity though bitcoin held virtually no value in its first year of concept. Designed as an open source code, it was intended to have others contribute to its formation and growth. Released on January 9, 2009 on a cryptography mailing list, its concept was interesting to some but again bitcoin remained with no value.<sup>51</sup> Curiously, as programmers engaged in the open source code, bitcoins were traded between them much like sports trading cards, or Pokémon cards. However, programmers took more serious interest when in late 2009 a currency exchange rate was calculated and issued to bitcoin by the New Liberty Standard, equal to 1309.03 BTC/\$1.00USD.<sup>52</sup>

Driving bitcoin's underlying value is the concept of scarcity. Like anything of limited quantity, demand drives value. Satoshi Nakamoto established bitcoin as a mathematical creation of which only 21 million solutions existed. Further, the time it takes to answer each one limits the issuance each bitcoin usually through a process called mining. Satoshi

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<sup>51</sup> Dodge, D. & Dixon, B. (2014). Bitcoin Basics 101 [Online] Available:

<http://www.bitcoinbasics101.com>

<sup>52</sup> <http://newlibertystandard.wikifoundry.com>

Nakamoto established a finite time line that was defined as 2140 after which bitcoins would no longer be created. Now with the element of both scarcity and perceived value, more programmers took the development of bitcoin as a digital currency as well as a serious and potentially profitable enterprise. Rules and guidelines were established to ensure that all participants were working and following the same rules of program development. Eventually, bitcoin exchanges or online trading marketplaces emerged, the first being MtGox. Today several Bitcoin exchanges are available with the most prominent being, Coinbase, BiBox, Bitmex and Changelly to name a few.

Mining for bitcoins does not involve going into a dark cavern with headlight, pick and shovel. Remember, Bitcoin is a mathematical solution. To engage programmers in the development of the Bitcoin program code, each time a solution was found and verified to a block of data or Hash, a bitcoin would be awarded to them. Initially, these solutions could be computed on a desktop or personal computer, but over time this required more high-powered resources beyond the means of home programmers.

Today, the mining of bitcoins requires serious investments in computer power and the energy to both power and support the operation of this equipment. This investment cost against the relative value of a bitcoin has limited the single programmer in obtaining bitcoin, but also acts as a barrier to prohibit those seeking to fraudulently obtain bitcoin. Today's mining of bitcoin is usually performed by large companies with significant computing capability or mining consortiums or guilds where many programmers unite their computing strengths and skills.

What makes bitcoin attractive as a currency? Again, part of its creation came from the economic turmoil around 2008. People distrustful of governmental control and currency valuation are open to Bitcoin's decentralized system in that no one individual can control or alter its value. Mr. William Strauss, Sr. Economist and Economic Advisor to Chicago's Federal Reserve Bank noted that "A typical 'Fiat' currency is one that enjoys the essence of trust in the organization or government issuing it. For example, most citizens of the United States rely that the US dollar is backed by the full faith and credit of the United States." Mr. Strauss goes on to say, "Bitcoin is a 'perceived' value, one that is controlled by a group, but not issued by any established government."<sup>53</sup>

Bitcoin, like other cryptocurrencies is not backed by the credit of a government or a precious metal reserve such as gold. It is not controlled by any central monetary agency and not subject to monetary inflation or failure of governmental system. While all of these features make it attractive to some, its highly speculative nature frightens many from acceptance and investment. However, since first appearing it has gained a

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<sup>53</sup> Strauss, William. (2017, November 6). Senior Economist, Economic Advisor, Federal Reserve Bank, Chicago, 1:00 pm ET, Conference Call

following and valuation even if speculative. The fact that so many other currencies have emerged since bitcoin we believe underscores its future legitimacy even if speculative.

Given the dramatic rise in value over the last couple of years, this marketplace interrupter has gotten the attention of various governments now concerned about their own fiat currencies and the impact of bitcoin on the global stage. Some governments or regulatory agencies may seek to impose restrictions in their own countries on the trading of bitcoin or disallow its trading or usage entirely so not to disrupt their own currencies. Bitcoin, as an openly traded, unmonitored currency causes great concerns by both governments and financial institutions and its potential use for nefarious and criminal activity.

In the traditional currency world, cryptocurrencies are viewed as foreign, strange and a bit mysterious. Bitcoin is relatively new and considered an interrupter to a traditional marketplace. Will room and acceptance be made for bitcoin use in a traditional marketplace? Bitcoin appears to have gained roots and it or its equivalent may not be easy to ignore or push by the wayside. In December 2017 the trading of bitcoin currency reached an all-time high of \$19,783.06 per bitcoin. Though its value has regressed since, valued at \$8,727.35 (as of March 24, 2018) and actively traded, though still considered highly speculative.

Like bitcoin itself, its future remains speculative. For bitcoin to be globally recognized as the standard for cryptocurrencies, its value must stabilize and it would need to be openly adopted as an accepted and trusted currency for use in most if not all countries. Ease of use and conversion to other currencies would need to be available and widespread. Luis Noriega shares, "All innovation is going to be ahead of regulators. G20 countries could have concerns with cryptocurrencies being super national, which could lead to regulation by many countries."<sup>54</sup> As noted, since its creation, many cryptocurrencies have emerged and bitcoin no longer remains the new coin on the block, but in the foreseeable future, it stands to be the largest. To learn more about bitcoin log on to [www.Bitcoinbasics101.com](http://www.Bitcoinbasics101.com)

### **Internet of Things (IOT):**

Some may remember a time when it was fashionable to say "Have your people call my people" or possibly "Have your agent contact my agent". Today's technology is evolving so quickly that no longer is it a person to person (P2P) world, and it seems like it's becoming less of a business to business (B2B) world. Whether we realize it or not technology and digitalization is moving our world more to an M2M (machine to machine) environment.

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<sup>54</sup> Noriega, Luis (2018, January 19) Senior Vice President-Global Advisory, Wells Fargo & Co., 12:00 pm ET, Conference Call



The Internet of Things (IOT) embodies any number of physical devices in every possible medium embedded with electronics (smart devices) to communicate via the internet to exchange data. Such data information can then be analyzed to optimally improve performance and control.

The infancy of internet connectivity gave us the ability to communicate to each other electronically; e-mail spawned a new era of information sharing and data exchange. The era of wireless technology emerged freeing everyone from the limitation of a hard wired, cabled leash. The advanced development of Infra-red remote, RFID (radio frequency identification) and blue-tooth technologies have provided the signaled ability to send information and control to other devices digitally and remotely.

The IOT, its use and influence are ever increasing. Our wireless world landscape is rapidly changing and information optimization is key. This digital communication is with us now every day, for instance; we can wear a device that tracks our steps and activity, this, in turn communicates with an application to our phone to provide an individual daily health profile. Now we are seeing vehicles able to self-diagnose for maintenance and even some refrigerators can order their own food. We can monitor and control the temperature and security of our home right from our phone.



Picture Source: Wikipedia

Today, IOT readily monitors and captures data of all types, temperature sensitive ship cargos can be monitored in the middle of the ocean and controlled. Retail locations can track, control and replenish inventory automatically. Transportation fleets can optimize loads and delivery routes for efficiency. Factory production cycles and equipment can be optimized for efficient use and output without manual intervention. These are just some of the many examples of today's IOT's application.

As IOT evolves, credit management can better assess the needs of a customer and anticipate product demand in conjunction with credit limit needs more proactively. More than just financial risk assessment, monitoring the trending data of sold stock and its usage in the market can provide credit management additional insight concerning customer risk valuation and a chance to identify possible opportunities to support business revenue growth.

## AI & BLOCKCHAIN IMPACT ON THE FUTURE OF AR & CREDIT

We have seen the impact of technology on retail in significant ways in recent months. Amazon and Walmart are leading the way by creating scan & go technology where consumers no longer need to wait in long checkout lines or for that matter, have any human interaction at all. Shoppers simply walk in to the stores, scan their Amazon Go or Walmart App when they enter the store, pick up what they need and walk out.

Can the accounts receivable and credit profession expect artificial intelligence and Blockchain technology to take us down a similar path in the future?

Today, the technology is available for businesses applying for credit through an online application, making their

purchase online, and having it shipped directly to them; now imagine AI and Blockchain automating this even further and then remitting payment via bitcoin currency. What role, if any, would the accounts receivable and credit professional play in this type of transaction? Is now the time to fear change or to embrace it? Ed Bell, PhD, National Credit Manager for W.W. Grainger, cites: "If you're not willing to embrace change and be knowledgeable and on the forefront of change, you are going to be left behind".<sup>55</sup> After all, artificial intelligence offers work solutions 24 hours-a-day-7-days-a-week, eliminates human error and offers a long-term investment at a fraction of the cost of human labor. With all these benefits, why shouldn't the credit and accounts receivable world become completely robotic and remove the human element?

Realistically, basic credit and accounts receivable responsibilities can and will be automated moving into the future. Payment applications, data storage, and risk analysis are among some of the credit and accounts receivable functions we can almost be assured will be automated, if they are not already. Automation potentials will accelerate as businesses look to streamline transaction-laden processes and boost customer service. The White House Counsel of Economic Advisors ranked occupations by wages and

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*"It will take people with passion that really want to understand, continue to learn and gain knowledge, who will be the ones that survive change."*

*Ed Bell, PhD - W.W. Grainger*

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<sup>55</sup> Noriega, Luis (2018, January 19) Senior Vice President-Global Advisory, Wells Fargo & Co., 12:00 pm ET, Conference Call.

found that, according to a Frey and Osborne analysis, 83 percent of jobs making less than \$20 per hour would come under pressure from automation, as compared to 31 percent of jobs making between \$20 and \$40 per hour and 4 percent of jobs making above \$40 per hour. Furthermore, the Organization for Economic Cooperation and Development study estimates that less-educated workers are more likely to be replaced by automation than highly-educated workers.<sup>56</sup> Research consistently finds that the jobs that are threatened by automation are highly concentrated among lower-paid, lower-skilled, and less-educated workers.<sup>57</sup> The account receivable adjuster, credit clerk and credit administrator positions will likely be replaced by AI and Blockchain technologies, with some possibilities that analyst level positions will have their roles and responsibilities repurposed by this technology.



*“We are going to see a transformation of roles, responsibilities and staffing and what is required in the order-to-cash space in the AR world related to new technology...and I think we are starting to see it today”*

*Chris Caparon – CEO & Founder, cforia*

This is not necessarily a bad problem. Every year, the labor force shrinks a little more than the previous year. Baby boomers are retiring at record levels and there are not enough people entering the workforce to account for the retirees. Talk to any organization today and you will find that one of their top five concerns is the shrinking labor force. If organizations are unable to find talent to replace those exiting the workforce, what options do companies have to continue to grow their business? Artificial intelligence and Blockchain technologies are two potential solutions. To the degree that AI-driven automation realizes its potential to drive tremendous positive advancement in diverse fields, it will make Americans better off on average. But, there is no guaranty that everyone will benefit. AI-driven changes in the job market in the United States will cause some workers to lose their jobs, even while creating new jobs elsewhere.<sup>58</sup>

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<sup>56</sup> Executive Office of the President of the United States (2016, December). Artificial Intelligence, Automation, and the Economy, pg. 14.

<sup>57</sup> Same as Reference #56 above, page 2

<sup>58</sup> Executive Office of the President of the United States (2016, December). Artificial Intelligence, Automation, and the Economy, pg. 7.

While the clerk and administrative functions in accounts receivable and credit will and have given way to automation, future demand for credit professionals will be dictated not by processes, but instead by the ability to make high-level strategic decisions, using the available technology along with adding strong analytical skills, and continuing to be a “face” of credit through negotiations and personal interactions.

While non-value-added processes can certainly be replaced by machines, the unique qualities that every human being brings to the table each day cannot be duplicated by a robot. There will be an increasing demand for employees who have a fundamental grasp of analytical and technical matters and who can work in strategic and complex areas as well.<sup>59</sup> Creativity and flexibility

will become increasingly important. In the future, critical and problem-oriented thinking will be expected of employees as the most important

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*“By failing to prepare, you are preparing to fail.”*

*Benjamin Franklin*

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requirement.<sup>60</sup> The skills required to truly be a successful credit professional include finding the balance between financial analytics, being technically savvy with new A/R & credit technology and knowing when to listen to that internal voice or your “gut”. Veteran Credit Manager Ed Bell, PhD, indicates that the credit profession is now facing a new evolution of technology and change, which credit professionals must be openly adaptable to change. Bell goes on to emphasize that people who lack a passion for credit will not survive, “It will take people with a passion, that really want to understand, continue to learn and gain knowledge, who will be the ones that survive change.” Bell further remarks, “How do you describe to a computer how to determine a gut feeling? You can’t”.<sup>61</sup> The continuum linking AI, big data, RPA and potentially Blockchain will result in new transformations that raise the bar on business performance and create high demand for skilled professionals capable of working side-by-side with the technology to intervene in cases where exceptions take place or high-level decisions need to be made.

How can credit professionals continue to demonstrate their value to top executives as these same executives strongly strategize toward increased efficiencies and bottom line savings?

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<sup>59</sup> Advisory Board. (2017, April). *Artificial Intelligence and Robotics and Their Impact on the Workplace*. IBA Global Employment Institute, pg. 20.

<sup>60</sup> Same as Reference #59 above.

<sup>61</sup> Noriega, Luis (2018, January 19) Senior Vice President-Global Advisory, Wells Fargo & Co., 12:00 pm ET, Conference Call

1. Find ways where credit can offer growth and support for the organization as a whole.
2. There is a story behind every number. Analyze the numbers and then tell the story.
3. Evaluate your own department for mundane, repetitive tasks, so that you may lead the effort towards automation. In other words, be the leader of change in your company, and become the expert in the move toward automation.
4. Bring your whole self to the “boardroom” every single day. Demonstrate to your executive team where you can drive efficiencies, cost savings and provide solid ROI. Creativity and uniqueness is next to impossible to replace.

The truth is that AI and Blockchain technology are only going to help push credit to the forefront of organizations. The value credit and finance professionals added prior to this technology being implemented will not be the same value they will add once the technology is implemented. Credit management professionals will have to push themselves to think at a higher level than ever before. They will drive analysis for their organizations, seek solutions with the latest technology, and endorse change by finding opportunities to keep advancing and progressing. The future looks to be an exciting time of change and development for credit management professionals!

## APPENDIX

### Blockchain Glossary of Terms<sup>62</sup>

#### **Bitcoin (Uppercase 'B'):**

Bitcoin, with an uppercase 'B' refers to the cryptocurrency payment network, protocols and Blockchain. As a protocol, Bitcoin is a set of rules that every client must follow to accept transactions and have its own transactions accepted by other clients.

#### **Bitcoin (Lowercase 'b'):**

When the word bitcoin has a lower case 'b' it is generally referring to units of bitcoin, for example "sending 1.0 bitcoins". The total number of bitcoins will be limited to 21 million.

#### **Block:**

A block is a record on the Blockchain that contains data about transactions and information to verify it is a valid part of the Blockchain. A block permanently records the transactions and data it contains onto the Blockchain. Each block contains information about the previous block, creating a chain linking the blocks. Blocks contain a block header, transactions, **timestamp**, **proof-of-work**, a record of previous block and new transactions that have not yet been recorded on the Blockchain.

#### **Blockchain:**

A shared, public, distributed ledger of all confirmed transactions. By referencing the previous **block**, the blocks are linked together creating a chain. Anyone with access can view the transactions and blocks on the Blockchain back to the first block (genesis block). A Blockchain is updated by mining blocks with new transactions. **Unconfirmed transactions** are not part of the block chain.

#### **Confirmed Transactions:**

A confirmed transaction is a transaction that has been processed, verified by the network and included in the Blockchain. This is done through **mining** or **proof-of-work** in **cryptocurrency** networks like Bitcoin. Once the transaction is confirmed, it is unlikely to be reversed.

#### **Consortium Blockchain:**

A consortium Blockchain is in between a private and public Blockchain, it is partially decentralized but verification of the blocks is completed by a select group of **miners**. It

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<sup>62</sup> Gates, M. (2017). *Blockchain: Ultimate Guide to Understanding Blockchain, Bitcoin, Cryptocurrencies, Smart Contracts and the Future of Money*. San Bernardino, CA.

allows private and efficient transactions without providing full control by one company or individual.

### **Cryptocurrencies:**

A cryptocurrency is a type of digital currency that is not issued by a government, central bank or authority. It is a combination of the words cryptography and currency as cryptocurrencies are created and operated using mathematics and encryption techniques.

### **Cryptocurrency Wallets:**

Stores the **public and private keys** which can be used to receive or send the cryptocurrency. A wallet can contain multiple public and private key pairs. The cryptocurrency itself is not in the wallet but is de-centrally stored and maintained in a publicly available **ledger**.

### **Cryptographic Hash (Security):**

A cryptographic hash function is an encryption method that hides data in a way that makes it almost impossible to decrypt without authorization. A computer algorithm which takes any length or amount of input data and produces a fixed length output, known as data's "hash". It can be used to easily verify that data has not been altered.

### **Cryptography:**

Cryptography is a field of mathematics focusing on encryption, security and data protection. Cryptography is the basis of cryptocurrencies that allows the creation, management and security of the networks to operate.

### **Decentralized Applications (dApps):**

Decentralized Applications are applications that are open source, not controlled by one person or entity and run across a distributed Blockchain or network of computers. dApps have no central server, the users connect to each other through **peer-to-peer** connections.

### **Distributed Ledger Technology (DLT):**

Provides resiliency and instant settlement by eliminating intermediaries.

### **Disruptive Technology:**

Those new technologies that significantly alter the way that business or entire industries operate. Often times, these technologies force companies to alter the way they approach their business or risk losing market share or risk becoming irrelevant.

### **Ether:**

Ether is a cryptocurrency that is used on the Ethereum network, it is used as payments for running distributed applications (dApps) on the Ethereum network.

### **Ethereum:**

Ethereum is a platform that allows distributed, decentralized applications such as smart contracts to run on a virtual machine on top of a Blockchain network.



**Fintech:**

Also referred to as financial technology or FinTech, is a new technology and innovation that aims to compete with traditional financial methods in the delivery of financial services. The use of mobile banking, Apple Pay and cryptocurrencies are examples of technologies aiming to make financial services more accessible to the general public.

**Genesis Block:**

A genesis block is the very block on a Blockchain with no previous block before it.

**Hash Key:**

For use in data structure, database and cryptographic applications, see **hash function**.

**Hash Function:**

A cryptographic hash function allows one to easily verify that some input data maps to a given value. This is used for assuring integrity of transmitted data and is the building block for providing message authentication. Hash functions are related to (and often confused with) check digits, fingerprints and other verification tools.

**Hash Pointer:**

A cryptographic hash pointing to a data block. Hash Pointer lets you verify that the previous block of data has not been tampered.

**Ledger (Distributed):**

A distributed ledger is a database that is spread across different computer systems, countries or organizations. Records are stored one after the other in a continuous ledger. Distributed ledger data can be either “permissioned” or “un-permissioned”.

**Ledger (Permissioned):**

A permissioned ledger is a ledger where permission is required across the ledger. There may be one or multiple owners of a permissioned ledger. When records are added to the ledger it is checked and confirmed by those with access. A permissioned ledger may be used by governments or banks where the data is confidential. A shared permission ledger is faster than using a un-permissioned ledger while still providing verified data blocks with digital signatures that can be seen by all those with permission.

**Ledger (Un-permissioned):**

Un-permissioned ledgers are not owned by any person or entity. Anybody can add data to the ledger and everybody with access has exact copies of the ledger. This creates protection from fraud or un-authorized entries to the ledger, continually reach consensus on the ledger and maintain the integrity of the ledger. Bitcoin is an example of a un-permissioned ledger.

**Mining:**

Mining is when computer power is used to solve mathematical problems that allow transactions to be verified and transaction blocks to be added to the Blockchain. Bitcoin mining is the process of using computer hardware to do mathematical calculations for the Bitcoin network to confirm transactions. Miners collect transaction fees for the transactions they confirm and are awarded bitcoins for each block they verify.

**Peer-to-Peer (P2P):**

Peer-to-peer (P2P) is a system where participants on a network interact with each other directly without needing to go through a centralized system or intermediary.

**Private Blockchains:**

Private Blockchains are where the permission and access are owned by one central organization. This could be for government, banks or other institutions where the data contained in the Blockchain is confidential or restricted. A private Blockchain may be used in the same manner as a private internal database.

**Public Blockchains:**

A public Blockchain is a Blockchain that allows access to anyone. Anybody can access the Blockchain, transact, verify transactions and decide which blocks are added to the Blockchain. Public Blockchains are generally referred to as decentralized Blockchains. Bitcoin is an example of public Blockchain.

**Private Key:**

A private key is a code or data that provides you access to a wallet containing cryptocurrency. Just like a PIN code gives you access to the money in your bank account when combined with your bank card, a private key gives you access to the money in your cryptocurrency wallet.

**Public Key:**

A public key is like your bank account number. When you combine the public key and the private key you can access the funds in your wallet. You can share your public key to receive money into that wallet, however to access the wallet you need to pair it with a private key.

**Proof-of-Work (PoW):**

Proof-of-Work is a solution to a mathematical puzzle that must be provided to add a block into the Blockchain. The puzzle is difficult to solve but easy to verify. In Bitcoin, proof-of-work is a hash of a block header. Each block refers to a previous block thus accumulating previous proof-of-work and forming a Blockchain.

**Shared Hash Algorithm (SHA):**

Secure Hash Algorithms are a type of cryptographic hash functions created by the National Institute of Standards and Technology (NIST) as a U.S. Federal Information Processing Standard (FIPS). The Secure Hash Algorithms are one way meaning that once data has been encrypted it is almost impossible for anyone without access to decrypt it.

**Signature:**

A signature in cryptocurrencies is a mathematical way to prove ownership and authority to access funds and conduct transactions. With Bitcoin a public key must match a private key to sign a transaction. The Bitcoin network can verify that the private key and public match on a signature for transactions but the private key remains hidden from the network.

**Smart Contracts:**

Smart contracts are contracts that are written in computer code and operate on a Blockchain or distributed ledger. They automatically verify, execute and enforce the contract based on the terms written in the code. Smart contracts can be partially or fully self-executing and self-enforcing.

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