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# THE GDPR: THE BIGGEST THREAT TO THE IMPLEMENTATION OF BLOCKCHAIN TECHNOLOGY IN GLOBAL SUPPLY CHAINS

Jessica Peel\*

## INTRODUCTION

Blockchain technology has revolutionized the supply chain world. It has enabled domestic and global companies, such as Walmart and Nike, to increase their worldwide supply chain visibility and solidify their positions as industry leaders. For example, in 2017, Walmart conducted an experiment to track a package of sliced mangos back to its source.<sup>1</sup> It took Walmart 7 days to locate the farm in Mexico that grew the fruit.<sup>2</sup> In contrast, when Walmart conducted the same experiment using blockchain technology developed by IBM, it took a mere 2.2 seconds.<sup>3</sup> This drastic decrease in time not only saves the company money, but it also helps improve food safety.<sup>4</sup> As a result, the Centers for Disease Control and Prevention has consulted with Walmart to help public officials investigate and pinpoint the source of food-borne disease outbreaks by improving the traceability of food products through the use of blockchain technology.<sup>5</sup>

However, on May 25, 2018, the European Union (“EU”) fully implemented its new data privacy law, the General Data Privacy Regulation (“GDPR”), which could halt the use of this groundbreaking technology. The GDPR protects the consumer data of EU citizens and one of its fundamental maxims is the consumer’s “right to be forgotten,” which is also known as the erasure right. In contrast, the blockchain ledger is immutable; therefore, the technology prohibits changing an entry after it has been added to the chain. As a result, information cannot be erased and blockchain technology is seemingly incompatible with the GDPR’s mandatory erasure right.

Moreover, penalties for noncompliance with the GDPR are large. Specifically, the maximum fine can be as high as 20 million euros or 4% of the company’s total *global* revenue, whichever is higher.<sup>6</sup> Consequently, unless the conflicting fundamental components of blockchain technology and the GDPR are

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<sup>1</sup> See Michael Corkery & Nathaniel Popper, *From Farm to Blockchain: Walmart Tracks Its Lettuce*, N.Y. TIMES (Sept. 24, 2018), <https://www.nytimes.com/2018/09/24/business/walmart-blockchain-lettuce.html>.

<sup>2</sup> *Id.*

<sup>3</sup> Jessica McKenzie, *Why Blockchain Won't Fix Food Safety – Yet*, NEW FOOD ECON. (Feb. 4, 2018), <https://newfoodeconomy.org/blockchain-food-traceability-walmart-ibm/>.

<sup>4</sup> See Corkery & Popper, *supra* note 1.

<sup>5</sup> See Soundarya J, *Walmart, Sam's Club to Put Food Products on Blockchain*, REUTERS (Sept. 24, 2018, 2:06 PM), <https://www.reuters.com/article/us-walmart-blockchain/walmart-sams-club-to-put-food-products-on-blockchain-idUSKCN1M42AW>.

<sup>6</sup> See Kris Lahiri, *What is General Data Protection Regulation?*, FORBES (Feb. 14, 2018), <https://www.forbes.com/sites/quora/2018/02/14/what-is-general-data-protection-regulation/#2b5ce03562dd>.

resolved, the EU's implementation of the GDPR could significantly impact global companies, such as Walmart, from using blockchain technology in their worldwide supply chains. Thus, the GDPR may limit businesses' ability to increase cost savings and provide greater food safety. Nevertheless, there is a possible solution to the GDPR. Instead of relying on a public blockchain, companies could use a private blockchain or a federated blockchain and limit the information placed on the chain.

Part I of this Comment examines the importance of supply chain management across a variety of industries in the increasingly global market. Next, Part II discusses how the implementation of blockchain technology has revolutionized supply chain management. Part III examines blockchain technology itself, including an in-depth comparison of the three types of blockchains. Then, Part IV analyzes the GDPR and the inherent conflicts between the GDPR and the use of blockchain technology in supply chain management. Lastly, Part V proposes how the GDPR and blockchain technology could be compatible despite their fundamental differences.

## **I. THE IMPORTANCE OF SUPPLY CHAIN MANAGEMENT IN TODAY'S GLOBAL BUSINESS WORLD**

Unbeknownst to most consumers, everyday products have gone on a worldwide adventure before landing on the shelf. Moreover, companies track that worldwide adventure: the countries the product has traveled through, the hands it has moved in and out of, as well as the ships, airplanes, trucks and trains it has traveled on. This tracking and monitoring process is known as supply chain management. However, as globalization has become an undeniable component of commerce over the past few decades, a company's supply chain has grown increasingly complex and has become more challenging to manage. Nevertheless, organizations must achieve effective supply chain management in order to compete in today's continually global market.<sup>7</sup>

Specifically, a supply chain is the flow of physical goods and related information from the source to the consumer.<sup>8</sup> It is the "connected network of individuals, organizations, resources, activities, and technologies involved in the manufacture and sale of a product or service."<sup>9</sup> Beginning with a supplier delivering raw materials, continuing to a manufacturer and ending with the delivery of the finished product or service to the end consumer, the supply chain

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<sup>7</sup> See Michael Wilson, *The Strategic Importance of Supply Chain Management*, AFFLINK (Mar. 14, 2017), <https://www.afflink.com/blog/the-strategic-importance-of-supply-chain-management>.

<sup>8</sup> See ANDY SCHMITZ, *Global Supply Chain Management in FUNDAMENTALS OF GLOBAL STRATEGY*, (Saylor Acad. 2012), [https://saylordotorg.github.io/text\\_fundamentals-of-global-strategy/s11-global-supply-chain-management.html](https://saylordotorg.github.io/text_fundamentals-of-global-strategy/s11-global-supply-chain-management.html).

<sup>9</sup> Adam Hayes, *Supply Chain Management (SCM)*, INVESTOPEDIA (Aug. 11, 2019), <https://www.investopedia.com/terms/s/scm.asp>.

can span across several countries and a multitude of people and organizations.<sup>10</sup> “Essentially, the world can be viewed as one large supply chain.”<sup>11</sup>

Businesses closely monitor their supply chains to gain a competitive advantage in the market and maximize customer value.<sup>12</sup> Supply chain managers look for efficiencies based on the idea that almost every product in the marketplace is the result of efforts by multiple organizations and businesses that make up the supply chain.<sup>13</sup>

Most of the great businesses around the world have improved their growth rates only by adopting innovative supply chain management practices. Whether it is the retail giants or the fashion industry or [the] electronics industry, careful management of the supply chain has become imperative to great quality products and better business performance.<sup>14</sup>

Despite existing for decades, most companies have only recently paid attention to supply chains as a mechanism for adding value to their operations.<sup>15</sup> Successful supply chain management can add value to a company by reducing operating costs and by improving the company’s financial position. Specifically, supply chain management can reduce operating costs by decreasing purchasing costs, production costs and total supply chain costs.<sup>16</sup> For example, when an automobile part is unexpectedly delayed during shipment causing the automobile manufacturing plant to shut down, the company’s production costs drastically increase, potentially costing the company \$20,000 per minute and millions of dollars per day.<sup>17</sup> However, these consequences can be minimized or avoided through effective supply chain management by anticipating, monitoring and correcting the situation as soon as possible.

In addition to reducing operating and production costs, supply chain management can also help improve a company’s financial position by increasing profits leverage, decreasing fixed assets and increasing cash flow.<sup>18</sup> By utilizing supply chain management to increase profits leverage, a company can significantly increase its profits and consequently, its overall financial position. For example,

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<sup>10</sup> See *id.*

<sup>11</sup> Wilson, *supra* note 7.

<sup>12</sup> See *id.*

<sup>13</sup> See Hayes, *supra* note 9.

<sup>14</sup> Abhijeet Pratap, *Nike Supply Chain Management: Ethics, Sustainability and Efficiency*, NOTESMATIC (Feb. 22, 2018), <https://www.cheshnotes.com/2018/02/nike-supply-chain-management/>.

<sup>15</sup> See Hayes, *supra* note 9.

<sup>16</sup> See COUNCIL OF SUPPLY CHAIN MGMT. PROFS., *The Importance of Supply Chain Management*, [https://cscmp.org/CSCMP/Develop/Starting\\_Your\\_SCM\\_Career/Importance\\_of\\_SCM/CSCMP/Develop/Starting\\_Your\\_Career/Importance\\_of\\_Supply\\_Chain\\_Management.aspx?hkey=cf46c59c-d454-4bd5-8b06-4bf7a285fc65](https://cscmp.org/CSCMP/Develop/Starting_Your_SCM_Career/Importance_of_SCM/CSCMP/Develop/Starting_Your_Career/Importance_of_Supply_Chain_Management.aspx?hkey=cf46c59c-d454-4bd5-8b06-4bf7a285fc65).

<sup>17</sup> *Id.*

<sup>18</sup> See *id.*

United States consumers eat 2.7 billion packages of cereal per year.<sup>19</sup> If the United States' domestic cereal industry reduced supply chain costs by just 1 cent per cereal box, \$13 million dollars would be saved industry-wide as 13 billion boxes of cereal flow through the improved supply chain during a 5-year period.<sup>20</sup>

Further, Nike leveraged successful supply chain management to solidify its position as a global industry leader. Overall, Nike has an expansive worldwide supply chain that is not only agile and efficient, but it also has continued to evolve over the past decade by providing primary support to its global business.<sup>21</sup> In the first stage of the supply chain alone, Nike encompasses several nations with suppliers making its products "in 42 countries at 567 independent factories that employ more than 1 million workers . . . ."<sup>22</sup>

In the second step of its supply chain, Nike has 75 distribution centers across the world. These distribution centers add speed to the entire supply chain by acting as critical touch points and by helping meet the needs of over 30,000 retail locations in over 190 countries, in addition to online sales and individual consumers.<sup>23</sup> Consequently, Nike utilizes a smarter distribution and logistics network to enable the company to ship products faster around the world and respond to customer demands quicker.<sup>24</sup> Always looking to improve its supply chain, three years ago, Nike opened its largest distribution center in Memphis, Tennessee.<sup>25</sup> The state of the art facility is over 2.8 million square feet and caters to more than 2,000 Nike stores in North America.<sup>26</sup> The Memphis distribution center allows Nike to achieve a higher cost efficiency by increasing service capabilities and reducing shipping time.<sup>27</sup> Furthermore, in Europe, Nike utilizes four distribution centers located in Belgium as its European logistics hub.<sup>28</sup> These Belgian distribution centers have also helped Nike manage a smarter and faster supply chain,<sup>29</sup> resulting in 55% of Nike's revenue coming from international business.<sup>30</sup> Ultimately, Nike's successful supply chain has propelled it to the number one market share in all markets and in all major categories for footwear.<sup>31</sup>

In sum, effective supply chain management is vital to the success and sustainability of businesses in today's continually global market. However, "[t]o enjoy the current and long-term benefits of a more efficient, sustainable and

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<sup>19</sup> *Id.*

<sup>20</sup> *Id.*

<sup>21</sup> See Pratap, *supra* note 14.

<sup>22</sup> *Id.*

<sup>23</sup> See *id.*; see also FY 16/17 Sustainable Business Report, NIKE, INC. (2018), <https://purpose-cms-production01.s3.amazonaws.com/wp-content/uploads/2019/05/15141732/NIKE-SASB-FY1617-SBR.pdf>.

<sup>24</sup> See Pratap, *supra* note 14.

<sup>25</sup> See *id.*

<sup>26</sup> See *id.*

<sup>27</sup> See *id.*

<sup>28</sup> See *id.*

<sup>29</sup> See *id.*

<sup>30</sup> See FY 16/17 Sustainable Business Report, *supra* note 23, at 7.

<sup>31</sup> *Id.*

dependable supply chain that reduce[s] the ultimate costs of the finished product while maintaining a high performance and quality levels will require involving technology . . .” such as blockchain.<sup>32</sup>

## II. THE REVOLUTION OF SUPPLY CHAIN MANAGEMENT THROUGH THE IMPLENTATION OF BLOCKCHAIN TECHNOLOGY

One of the major threats to a company ensuring successful supply chain management is the lack of supply chain visibility (“SCV”). A significant contributor to a lack of SCV is the use of outdated mechanisms, such as reams of paper, used by companies to maintain and share accurate, current information among all actors in the chain.<sup>33</sup> If left uncorrected, a lack of SCV can have major consequences on a company by negatively impacting its reputation and bottom line.<sup>34</sup> For example, in 2015, Chipotle Mexican Grill’s (“Chipotle”) lack of SCV led to an E.coli breakout that left 55 customers ill.<sup>35</sup> Chipotle has a complex supply chain involving multiple suppliers who deliver various ingredients<sup>36</sup> to more than 2,000 restaurants worldwide.<sup>37</sup> Chipotle’s lack of SCV prevented the company from monitoring its supply in real time and Chipotle was unable to prevent the contamination or contain it in a targeted way after discovering it.<sup>38</sup> Store shutdowns, investigations and news stories devastated Chipotle’s reputation.<sup>39</sup> Sales plummeted and the company’s share price dropped 42%, a three-year low.<sup>40</sup>

Consequently, failing to correct a lack of SCV can have significant negative consequences on a company and the general public. To resolve this issue, organizations across a variety of industries have begun to implement blockchain technology in their global supply chains. This Part begins by examining the lack of visibility inherent in traditional supply chain information keeping methods. Then, this Part examines how utilizing blockchain technology to correct SCV issues has positively impacted companies’ supply chain management.

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<sup>32</sup> Joyce G. Mazero & William W. Sentell, *Global Supply Chains Supporting International Franchise Expansion: The Impact of Blockchain Technology*, POLSINELLI (Aug. 2018), [https://www.supplychainscene.org/sites/default/files/inline-files/UpdatedBlockchainArticle\\_0.pdf](https://www.supplychainscene.org/sites/default/files/inline-files/UpdatedBlockchainArticle_0.pdf).

<sup>33</sup> See generally *id.*

<sup>34</sup> See Anna Scott, *Firms Face ‘Major Consequences’ Due to a Lack of Supply Chain Visibility*, SUPPLY MGMT. (Nov. 23, 2015), <https://www.cips.org/en/supply-management/news/2015/november/firms-face-major-consequences-due-to-lack-of-supply-chain-visibility/>.

<sup>35</sup> See Michael J. Casey & Pindar Wong, *Global Supply Chains Are About to Get Better, Thanks to Blockchain*, HARV. BUS. REV. (Mar. 13, 2017), <https://hbr.org/2017/03/global-supply-chains-are-about-to-get-better-thanks-to-blockchain>.

<sup>36</sup> See *id.*

<sup>37</sup> See STATISTA, *Number of Chipotle Mexican Grill Restaurants Worldwide from 2007 to 2017* (2019), <https://www.statista.com/statistics/221456/number-of-chipotle-restaurants/>.

<sup>38</sup> See Casey & Wong, *supra* note 35.

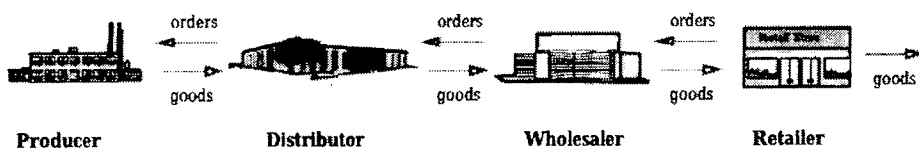
<sup>39</sup> See *id.*

<sup>40</sup> *Id.*

### A. Lack of Visibility Inherent in Traditional Supply Chain Information Keeping Methods

In its simplest form, a basic supply chain consists of four actors: producers (or suppliers), distributors, wholesalers, and retailers.<sup>41</sup> As demonstrated in Figure 1 below, first, a distributor will place an order with a producer and the producer will send the goods to the distributor.<sup>42</sup> Next, a wholesaler will place an order with a distributor and the distributor will send the goods to the wholesaler.<sup>43</sup> Third, a retailer will place an order with a wholesaler and the wholesaler will send the goods to the retailer.<sup>44</sup> Lastly, a retailer will sell the goods to the end user, the customer.<sup>45</sup>

**Figure 1: A Basic Supply Chain Model<sup>46</sup>**



As globalization increases, the interactions among these four actors have become increasingly complex. “Depending on the product, the supply chain can span over hundreds of stages, multiple geographical (international) locations, a multitude of invoices and payments, have several individuals and entities involved, and extend over months of time.”<sup>47</sup> Consequently, the producer, distributor, wholesaler and retailer may each be located in different countries, speak different languages and operate in different time zones. Thus, sharing accurate and current information among all supply chain actors has become more difficult.

When the flow of information among the actors in the supply chain breaks down, a lack of SCV results.<sup>48</sup> Specifically, SCV “is knowing where inventory is

<sup>41</sup> See JACK VAN DER VORST, *Supply Chain Management: Theory and Practices*, in THE EMERGING WORLD OF CHAINS & NETWORKS (Theo Camps et al. eds., 2004), available at [https://www.researchgate.net/publication/40122004\\_Supply\\_Chain\\_Management\\_theory\\_and\\_practices](https://www.researchgate.net/publication/40122004_Supply_Chain_Management_theory_and_practices).

<sup>42</sup> See *id.*

<sup>43</sup> See *id.*

<sup>44</sup> See *id.*

<sup>45</sup> See *id.*

<sup>46</sup> *Id.*

<sup>47</sup> Bernard Marr, *How Blockchain Will Transform the Supply Chain and Logistics Industry*, FORBES (Mar. 23, 2018, 12:28AM), <https://www.forbes.com/sites/bernardmarr/2018/03/23/how-blockchain-will-transform-the-supply-chain-and-logistics-industry/#353461f75fec>.

<sup>48</sup> See generally Amy Hill, *How Can Lack of Supply Chain Visibility Put Your Business At Risk?*, INNOVATION ENTERPRISE CHANNELS (Jan. 15, 2016), <https://channels.theinnovationenterprise.com/articles/how-can-lack-of-supply-chain-visibility-put-your-business-at-risk>.

at any given time, and how well parts, components or products in transit can be tracked as they move from manufacturer to their final destination.”<sup>49</sup> Furthermore, “[t]he goal of SCV is to improve and strengthen the supply chain by making this information readily available to all stakeholders, so as to enable a quick response to any shocks to the chain.”<sup>50</sup> The key to achieving SCV is providing all actors within the supply chain with controlled access and transparency to accurate data and events in a timely manner.<sup>51</sup>

However, traditional supply chain information keeping methods are a primary cause of a company’s lack of SCV. Specifically, the traditional methods for maintaining and sharing information among the various international and domestic actors across the supply chain include utilizing reams of paper to record each actor’s individual operations.<sup>52</sup> As expected, accessing updated and accurate information is difficult, time consuming and impedes SCV.

For example, after a company sends a purchase order to the supplier, the company often has no means of tracking the order’s status until the shipment is received at the warehouse. As a result, there is ‘manually intensive and inefficient supply and demand management and reduced order fill rates.’ In addition, ‘there is no central repository of data available to enable an analysis of what went wrong and how suppliers, carriers, and other third-party participants performed. This is primarily because the data required is distributed across various systems in warehousing, purchasing, transportation management, supplier systems, and carrier systems. Moreover, in certain cases, the data does not even exist.’<sup>53</sup>

Therefore, companies have started to use blockchain technology to solve their lack of SCV issues.

### **B. The Utilization of Blockchain Technology to Correct SCV Issues and Its Positive Impact on Supply Chain Management**

Blockchain technology provides companies with a real-time digital ledger of every transaction and movement in their global supply chain.<sup>54</sup> Importantly, there is only one ledger, each participant has a copy of it, and it is constantly refreshed,<sup>55</sup> thereby enhancing the company’s vitally important SCV. As a practical example, the blockchain ledger enables a distributor located in the United

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<sup>49</sup> *Id.*

<sup>50</sup> *Id.*

<sup>51</sup> *See id.*

<sup>52</sup> *See Mazero & Sentell, supra* note 32.

<sup>53</sup> *Id.*

<sup>54</sup> *See* Paul Brody, *How Blockchain is Revolutionizing Supply Chain Management*, DIGITALIST MAG., Aug. 23, 2017, at 4, available at [https://www.ey.com/Publication/vwLUAssets/ey-blockchain-and-the-supply-chain-three/\\$FILE/ey-blockchain-and-the-supply-chain-three.pdf](https://www.ey.com/Publication/vwLUAssets/ey-blockchain-and-the-supply-chain-three/$FILE/ey-blockchain-and-the-supply-chain-three.pdf).

<sup>55</sup> *See id.*



States to know precisely when a specific supplier in China has fulfilled the distributor's order and exactly which products the supplier placed on the truck for transportation. Both parties can then track the order from the truck to the shipping container where it will make the long journey to the United States. Once the ship arrives at port, another block is added to the chain, notifying the parties of the order's current location and status. Again, as the order is transferred from the shipping container to another form of transportation, such as rail, plane or truck, the blockchain's single digital ledger is providing the actors in the chain with real-time updates.

Consequently, when a company implements blockchain technology into its global supply chain, its SCV is increased by resolving the issue of fragmented records as well as inaccurate and outdated information. Accordingly, blockchain technology has been called "a breakthrough that will transform the way transactions are recorded, verified and shared,"<sup>56</sup> and companies across multiple industries have begun to utilize the technology to enhance their SCV and improve their overall supply chain management.<sup>57</sup> The benefits of doing so can be significant and one company considering implementing blockchain into its worldwide supply chain is the global manufacturer Samsung Electronics Co. ("Samsung").<sup>58</sup>

Samsung predicts its shipping costs could be cut 20 percent by using a blockchain ledger system to keep track of its global shipments worth tens of billions of dollars per year.<sup>59</sup> Moreover, according to Song Kwang-woo, the blockchain chief and a vice president at Samsung's logistical information and technology arm, Samsung SDS Co., "[blockchain] will have an enormous impact on supply chains of manufacturing industries."<sup>60</sup> Garter Inc. predicts this impact will result in blockchain-related businesses creating \$176 billion of value by 2025.<sup>61</sup> In addition, Manav Gupta of IBM has stated,

Supply chains are prime examples of blockchain's potential for transformation that spans industries. Initial blockchain efforts could have quick impact by transforming even a small portion of the supply chain, such as the information used during importing. If import terminals received data from bills of lading earlier in the process, terminals could plan and execute more efficiently and without privacy concerns.

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<sup>56</sup> Sam Kim, *Samsung Jumps on the Blockchain Bandwagon*, BLOOMBERG (Apr. 15, 2018, 4:00 PM), <https://www.bloomberg.com/news/articles/2018-04-15/samsung-jumps-on-blockchain-bandwagon-to-manage-its-supply-chain>.

<sup>57</sup> See Jeffrey Neuburger & Tiffany Quach, *Supply Chain Adoption of Blockchain Continues to Gain Steam and Generates Many Legal Issues*, BLOCKCHAIN AND THE LAW (Jan. 26, 2018), <https://www.blockchainandthelaw.com/2018/01/supply-chain-adoption-of-blockchain-continues-to-gain-steam-and-generates-many-legal-issues/>.

<sup>58</sup> See Kim, *supra* note 56.

<sup>59</sup> *Id.*

<sup>60</sup> *Id.*

<sup>61</sup> *Id.*

Blockchain technology could make appropriate data visible in near real-time (for example, the departure time and weight of containers) without sharing information about the owners or value of the cargo. Costly delays and losses due to missing paperwork could be avoided.<sup>62</sup>

Overall, blockchain technology has the capability of resolving the costly SCV issues currently plaguing global supply chains. It has revolutionized the existing information-keeping process and will become an integral component of major worldwide supply chains if the GDPR does not prevent its implementation.

### III. AN OVERVIEW OF BLOCKCHAIN TECHNOLOGY

Initially gaining fame through its connection with Bitcoin, “blockchain” is one of the most talked about forms of technology today. However, most people are unaware of how the technology works and how it has been adapted to serve companies operating across various industries. This Part first discusses how blockchain began and its inaccurate conflation with Bitcoin. Second, this Part examines the basic concepts of blockchain technology. Lastly, this Part conducts an in-depth comparison of the three types of blockchains.

#### A. Bitcoin Beginnings

Bitcoin was the first use case for blockchain technology and the two have been conflated since.<sup>63</sup> Yet, Bitcoin and blockchain are not synonymous.<sup>64</sup> Bitcoin is an unregulated digital currency or cryptocurrency “launched with the intention to bypass government currency controls and simplify online transactions by getting rid of third-party payment processing intermediaries.”<sup>65</sup> Consequently, if one individual wants to transfer digital currency to another individual, he or she can do so without a third party intermediary, such as a bank, needing to process the transaction.<sup>66</sup> The technology used to complete this cryptocurrency transaction is blockchain.<sup>67</sup> Specifically, the records of each of these transactions are kept on the Bitcoin ledger, which is maintained and powered by blockchain technology.<sup>68</sup> Therefore, Bitcoin is the cryptocurrency itself, while blockchain is the underlying

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<sup>62</sup> Mazero & Sentell, *supra* note 32.

<sup>63</sup> See Matt Lucas, *The Difference Between Bitcoin and Blockchain for Business*, IBM: BLOCKCHAIN PULSE (May 9, 2017), <https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-bitcoin-and-blockchain-for-business/>.

<sup>64</sup> See *id.*

<sup>65</sup> *Id.*

<sup>66</sup> See Eric Kintner, *The Blockchain Moment*, COLO. LAW., Oct. 2018, at 10.

<sup>67</sup> See Lucas, *supra* note 63.

<sup>68</sup> See *id.*

technology that is used as a secure way to complete the transactions made with Bitcoin or other cryptocurrency.<sup>69</sup>

Furthermore, the blockchain technology that supports Bitcoin was developed specifically for Bitcoin.<sup>70</sup> However, companies have discovered blockchain's potential use beyond the cryptocurrency industry and have begun to adapt the technology to better suit their needs.<sup>71</sup> Overall, three main changes have been made. First, the modified "blockchain can be used for a much broader range of assets than just cryptocurrency."<sup>72</sup> The transactions can include tangible assets such as food products or cars and intangible assets such as securities and bonds.<sup>73</sup> Second, although the Bitcoin blockchain thrives on anonymity, the modified blockchain allows for identity of the parties.<sup>74</sup> Third, the parties can control the consensus process so that it may be achieved faster and without the approval of the whole network.<sup>75</sup> The consensus process is described in more detail below. Moreover, blockchain technology has evolved from its beginning with Bitcoin and proponents say it "has the potential to bring the biggest change to modern life since the introduction of the Internet."<sup>76</sup>

## B. Basic Concepts of Blockchain Technology

At its core, blockchain is a shared ledger.<sup>77</sup> This shared ledger is essentially a database taken up a notch,<sup>78</sup> and the information in the database is stored on a network of distributed ledgers.<sup>79</sup> As a result, the blockchain is decentralized. In contrast, a centralized ledger is the type traditionally used by banks and other companies to track transactions.<sup>80</sup> Centralized ledgers are the predominant type used in supply chain management. As the name denotes, one party holds the power to control the centralized ledger. While centralized ledgers can provide some benefits, "they lack transparency, add an additional layer of transaction costs and are only as safe as the security of that central database."<sup>81</sup> The blockchain's distributed ledger provides the same benefits as the centralized ledger but in a far

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<sup>69</sup> See *id.*

<sup>70</sup> See *id.*

<sup>71</sup> See *id.*

<sup>72</sup> *Id.*

<sup>73</sup> See *id.*

<sup>74</sup> See *id.*

<sup>75</sup> See *id.*

<sup>76</sup> See Kintner, *supra* note 66, at 10.

<sup>77</sup> See Mike Echternacht & Elsbeth Magilton, *Confidence in Contracting and Cutting Transactional Costs: Why Attorneys Need to Pay Attention to the Rise of Blockchain Systems*, 29 S.C. LAW. 31, 31 (2018).

<sup>78</sup> *Id.*

<sup>79</sup> See Kintner, *supra* note 66, at 10.

<sup>80</sup> *Id.*

<sup>81</sup> Stuart D. Levi, *Blockchains Offer Revolutionary Potential in Fintech and Beyond*, SKADDEN (Jan. 30, 2017), <https://www.skadden.com/insights/publications/2017/01/blockchains-offer-revolutionary-potential-in-finte>.

more secure and efficient manner.<sup>82</sup> Specifically, blockchain ledgers are distributed across the entire network and each network user or “node” has its own verified copy of the ledger.<sup>83</sup> A node can be any computer with an internet connection.<sup>84</sup>

Before a new transaction or “block” is added to the blockchain ledger, multiple nodes have to agree on the validity of the transaction by achieving “consensus.”<sup>85</sup> A consensus is reached through a process called “mining.”<sup>86</sup> Through mining, a “proof of work” is created when each node in the network solves a “complex, resource-intensive cryptographic problem . . . .”<sup>87</sup> Before a transaction can be considered valid and added to the blockchain ledger as a new block, the transaction must have this proof of work to demonstrate that consensus was achieved.<sup>88</sup> Importantly, the blockchain ledger is immutable.<sup>89</sup> Therefore, once a block is added to the ledger, it cannot be changed or tampered with.<sup>90</sup> Also, each block added to the ledger is time stamped and every ledger distributed across the entire network is updated simultaneously.<sup>91</sup> The “chain” is created by each block that is added referencing the immediately preceding block using randomly assigned numbers called “hash.”<sup>92</sup> Figure 2 demonstrates a simplified version of the blockchain process.

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<sup>82</sup> See *id.*

<sup>83</sup> See Chris Meuse, *Bitcoin, Blockchain and Cryptocurrency: How it Works*, in 2018 ADVANCED FAM. L. 28-III (2018).

<sup>84</sup> See Harry Pokrandt, *Blockchain Mining: The Key to Powering a Decentralized World*, FORBES (July 6, 2018, 7:00 AM), <https://www.forbes.com/sites/forbestechcouncil/2018/07/06/blockchain-mining-the-key-to-powering-a-decentralized-world/#709455805a11>.

<sup>85</sup> See Bryce Suzuki et al., *Blockchain: How it Will Change Your Legal Practice*, 54 AZ. ATT'Y. 12, 14 (2018).

<sup>86</sup> See generally Jimi S., *Blockchain: How Mining Works and Transactions are Processed in Seven Steps*, MEDIUM (May 2, 2018), <https://medium.com/coinmonks/how-a-miner-adds-transactions-to-the-blockchain-in-seven-steps-856053271476>.

<sup>87</sup> See Praveen Jayachandran, *The Difference Between Private and Public Blockchain*, IBM: BLOCKCHAIN PULSE (May 31, 2017), <https://www.ibm.com/blogs/blockchain/2017/05/the-difference-between-public-and-private-blockchain/>.

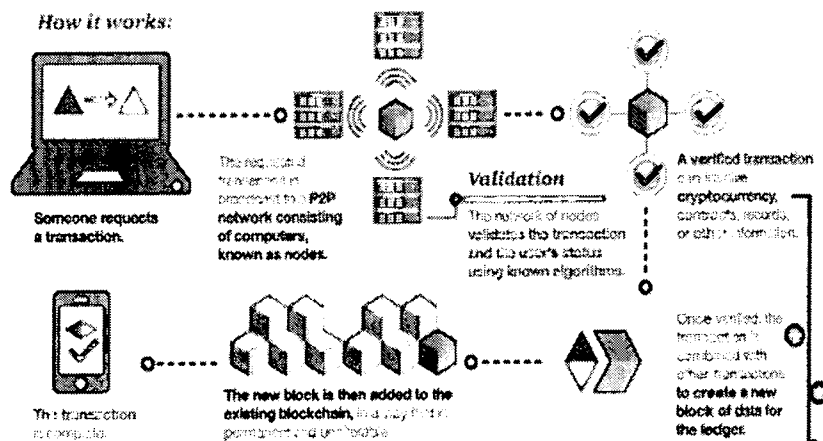
<sup>88</sup> See Jake Frankenfield, *Blockchain, Explained*, INVESTOPEDIA (Dec. 10, 2018), <https://www.investopedia.com/terms/b/blockchain.asp>.

<sup>89</sup> See Claire Henly et al., *Energizing the Future with Blockchain*, 39 ENERGY L.J. 197, 202 (2018); see also Levi, *supra* note 81.

<sup>90</sup> See Lucas, *supra* note 63.

<sup>91</sup> See Levi, *supra* note 81.

<sup>92</sup> See Shawn S. Amual et al., *The Fundamentals of Blockchain Technology § 1:1*, in THE BLOCKCHAIN: A GUIDE FOR LEGAL & BUS. PROFS. (2016).

Figure 2: The Simplified Blockchain Process<sup>93</sup>

Ultimately, blockchain's distributed ledger provides companies with additional fraud protection through its decentralized nature and immutability. The time stamps and simultaneous updates also enhance transparency and trust. Moreover, it allows accurate information to be efficiently and effectively maintained and available to the potentially thousands of participants across the network.

### C. The Three Types of Blockchains

Currently, there are three main types of blockchains: (1) public or "permissionless" blockchains; (2) private or "permissioned" blockchains; and (3) federated or consortium blockchains.<sup>94</sup> The process described above represents the public blockchain. The most well-known example of this type is Bitcoin.<sup>95</sup> The other two types were developed from the public blockchain. Consequently, private and consortium blockchains work similarly to the public blockchain model described above, but with a couple of distinctions. One such difference is who is allowed to participate in the network. A public blockchain has no limitations on who can participate.<sup>96</sup> It is completely open and anyone can join and contribute to

<sup>93</sup> John Shipman, *Infographic: Blockchain Explained*, PWC: DIGITAL PULSE (July 28, 2016), <https://www.digitalpulse.pwc.com.au/pwc-blockchain-infographic/>.

<sup>94</sup> See SHERMIN VOSHMIGIR, *Blockchains & Distributed Ledger Technologies*, in *TOKEN ECONOMY* (2019), available in excerpt at <https://blockchainhub.net/blockchains-and-distributed-ledger-technologies-in-general/>.

<sup>95</sup> See Jayachandran, *supra* note 87.

<sup>96</sup> See Mark Fenwick et al., *Legal Education in the Blockchain Revolution*, 20 VAND. J. ENT. & TECH. L. 351, 383 (2017).

the network; no permission is needed.<sup>97</sup> Therefore, it is “permissionless.” In contrast, users must have an invitation or permission to join a private blockchain.<sup>98</sup> Thus, it is “permissioned.” Federated blockchains share this permissioned characteristic with private blockchains.<sup>99</sup>

Another primary distinction among the three types is who has control over the network. As described above, a key advantage to the public blockchain is its decentralization. No single organization has the power to control the network and anyone and everyone can join the network and participate. In contrast, in a private blockchain, users need permission to join the network and only a single organization, operating as a highly trusted node, has the power to grant that access.<sup>100</sup> This concentrated power is why private blockchains are best suited for organizations wanting to verify transactions *internally* and away from the public eye.<sup>101</sup> Federated blockchains differ from private blockchains in this sense because they remove the sole organization influence over the network.<sup>102</sup> Specifically, in a federated blockchain, multiple organizations, operating as pre-selected authority nodes, are working together to exchange information, verify transactions and run the network.<sup>103</sup> When these multiple organizations work together, they are known as a federation or consortium.<sup>104</sup> Hence, the name federated blockchain or blockchain consortium.<sup>105</sup>

Closely related to the control distinction is who participates in reaching consensus to add a block to the chain. To achieve consensus in a public blockchain, every node in the network must verify the transaction by solving a complicated and resource-intensive problem to create the necessary proof of work.<sup>106</sup> This is a major disadvantage to a public blockchain because of the substantial amount of computational power needed to maintain a distributed ledger on such a large scale.<sup>107</sup> Although it slows down the transaction speed, it also helps keep the network secure, which is needed because it is completely open to the public.<sup>108</sup> In contrast, private blockchains do not require such energy-intensive computations to reach consensus because the participants must be granted access to the network;

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<sup>97</sup> See Vitalik Buterin, *On Public and Private Blockchains*, ETHEREUM BLOG (Aug. 6, 2015), <https://blog.ethereum.org/2015/08/07/on-public-and-private-blockchains/>.

<sup>98</sup> See Jayachandran, *supra* note 87.

<sup>99</sup> See generally Hasib Anwar, *2019 The Year of the Federated Blockchain – Blockchain Consortium Simply Explained*, 101 BLOCKCHAINS (Oct. 25, 2018), <https://101blockchains.com/federated-blockchain/>.

<sup>100</sup> *Id.*

<sup>101</sup> *Id.*

<sup>102</sup> See *id.*

<sup>103</sup> See *id.*

<sup>104</sup> See *id.*

<sup>105</sup> See *id.*

<sup>106</sup> See Jayachandran, *supra* note 87.

<sup>107</sup> See *id.*

<sup>108</sup> See generally James Bennett, *Public vs. Private Blockchain Protocols: What's the Difference?*, BRAVE NEWCOIN (Mar. 18, 2018, 2:46 PM), <https://bravenewcoin.com/insights/public-vs-private-blockchain-protocols-whats-the-difference>.

therefore, the additional security provided by the computations is not necessary.<sup>109</sup> As a result, private blockchains have a faster transaction speed and better scalability for business solutions.<sup>110</sup>

Similar to private blockchains, federated blockchains do not require energy-intensive computations to reach consensus and create the vital proof of work.<sup>111</sup> Instead, federated blockchains require a “proof of vote” to reach consensus and add a block to the chain.<sup>112</sup> Which nodes get to vote and how many votes of approval are needed are predefined by the authority nodes on the network.<sup>113</sup> For example, the authority nodes may predetermine 10 specific nodes are allowed to vote in a particular scenario and only 8 votes of approval are needed to create the necessary proof of vote to add the block to the chain. As a result, the consensus process in federated blockchains is faster than public blockchains because the number of nodes needed for consensus is significantly less, but it is also slower than private blockchains because there is still a procedure in place that must be followed and multiple nodes must be coordinated.<sup>114</sup>

In sum, each of the three types of blockchains offer advantages and disadvantages. However, private blockchains and federated blockchains are the most compatible for a company wanting to implement blockchain technology into its supply chain. Specifically, access controls allow a company to utilize the revolutionary technology and improve its supply chain management away from the public eye.<sup>115</sup> Importantly, access controls also protect the confidentiality of the users.<sup>116</sup> Furthermore, the simultaneous updates provide each user in the network with immediate access to accurate information which enhances a company’s vitally important SCV.

#### IV. THE GDPR AND ITS IMPACT ON THE USE OF BLOCKCHAIN TECHNOLOGY IN SUPPLY CHAIN MANAGEMENT

Despite the significant advantages of implementing blockchain into a company’s supply chain, the recently implemented GDPR threatens the future use of this technology. One of the most challenging obstacles companies must overcome is the incompatibility of blockchain technology and the GDPR’s erasure right. This Part first examines the EU’s recent implementation of the GDPR. Then, this Part analyzes conflicts between the GDPR and blockchain technology.

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<sup>109</sup> See generally *id.*

<sup>110</sup> See Kintner, *supra* note 66, at 11.

<sup>111</sup> See Anwar, *supra* note 99.

<sup>112</sup> See *id.*

<sup>113</sup> See *id.*

<sup>114</sup> See generally *id.*

<sup>115</sup> See *id.*

<sup>116</sup> See *id.*

### A. The EU's New Data Privacy Law: The GDPR

On April 14, 2016, the EU approved the GDPR, and after a two-year transition period, the GDPR went into effect on May 25, 2018.<sup>117</sup> It replaces the EU's 1995 Data Protection Directive and "standardizes data protection law across all 28 EU countries and imposes strict new rules on controlling and processing personally identifiable information . . . ."<sup>118</sup> Importantly, in addition to applying to all organizations located within the EU, the GDPR also applies to organizations located outside of the EU.<sup>119</sup> Specifically, if an organization is (1) processing and holding personal data of individuals located in the EU; (2) offering goods or services to individuals located in the EU; or (3) monitoring the behavior of individuals located in the EU, then the GDPR applies, regardless of the organization's location.<sup>120</sup> Therefore, United States companies that serve EU residents must comply with the GDPR.

Moreover, penalties for noncompliance are large. The maximum fine for committing the most serious violations can be as high as 20 million euros or 4% of the company's total global revenue, whichever is higher.<sup>121</sup> In addition, a company can be fined 2% for not having their records in order or for not notifying the supervising authority and the individual whose data has been compromised about a data breach.<sup>122</sup> Nevertheless, the GDPR is only applicable to "personal data" and these penalties may only be imposed if a company has not met the requirements for this specific type of information.<sup>123</sup> As stated in Article 4 of the GDPR, "personal data" means:

Any information relating to an identified or identifiable natural person ('data subject'); an identifiable natural person is one who can be identified, directly or indirectly, in particular by reference to an identifier such as a name, an identification number, location data, an online identifier or to one or more factors specific to the physical, physiological, genetic, mental, economic, cultural or social identity of that natural person[.]<sup>124</sup>

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<sup>117</sup> See *The EU General Data Protection Regulation (GDPR) Is the Most Important Change in Data Privacy in 20 years*, EU GDPR, <https://eugdpr.org>.

<sup>118</sup> See Lahiri, *supra* note 6.

<sup>119</sup> See *GDPR FAQs*, EU GDPR, <https://eugdpr.org/the-regulation/gdpr-faqs/>.

<sup>120</sup> See Kyle Peterson, *GDPR: What (And Why) You Need to Know About EU Data Protection Law*, 31 Utah Bar J. 12, 12 (2018).

<sup>121</sup> See Lahiri, *supra* note 6.

<sup>122</sup> See *id.*

<sup>123</sup> See *GDPR FAQs*, *supra* note 119.

<sup>124</sup> See Commission Regulation 2016/679 of 27 April 2016, The Protection of Natural Persons with Regard to the Processing of Personal Data and on the Free Movement of Such Data, and Repealing Council Directive 95/46/EC, 2016 O.J. (L 119), art. 4(1) [hereinafter *GDPR*].



This also includes all data that is or can be assigned to a person in any way. For example, a person's credit card number, account information, telephone number, address and customer identification number all constitute personal data.<sup>125</sup> However, personal data does not have to be objective.<sup>126</sup> Subjective information such as judgements, opinions or estimates can also be personal data.<sup>127</sup> Ultimately, due to the definition including "any information," the term "personal data" should be interpreted as broadly as possible.<sup>128</sup>

Lastly, the definition of personal data explicitly states the information must refer to a "natural person."<sup>129</sup> Therefore, the data must be assigned to an identified or identifiable living person to be considered personal.<sup>130</sup> Consequently, the GDPR does not apply to information about legal entities such as institutions, foundations and corporations.<sup>131</sup>

Aimed at increasing protection for an individual's personal data, Article 5 of the GDPR lists seven key principles: (1) lawfulness, fairness, and transparency; (2) purpose limitation; (3) data minimization; (4) accuracy; (5) storage limitation; (6) integrity and confidentiality; and (7) accountability.<sup>132</sup> In addition to these principles, the GDPR provides eight rights to increase an individual's control over his or her personal data:

1. the right to be informed;
2. the right of access;
3. the right of rectification;
4. the right of erasure;
5. the right to restrict processing;
6. the right to data portability;
7. the right to object; and
8. rights in relation to automated decision making and profiling.<sup>133</sup>

Specifically, Article 17 of the GDPR explicitly codifies the right of erasure or the "right to be forgotten," which provides individuals with the power to have their personal data erased.<sup>134</sup> Initially, this right emerged in the EU's 1995 Data Protection Directive, which gave individuals the right to erasure of incomplete or incorrect data.<sup>135</sup> In 2014, the Court of Justice of the European Union ("ECJ")

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<sup>125</sup> See INTERSOFT CONSULTING, *GDPR Personal Data*, <https://gdpr-info.eu/issues/personal-data/>.

<sup>126</sup> See *id.*

<sup>127</sup> See *id.*

<sup>128</sup> See *id.*

<sup>129</sup> See *GDPR*, *supra* note 124.

<sup>130</sup> See INTERSOFT CONSULTING, *supra* note 125.

<sup>131</sup> See *id.*

<sup>132</sup> See INFO. COMM'R.'S OFF., *Individual Rights*, <https://ico.org.uk/for-organisations/guide-to-the-general-data-protection-regulation-gdpr/individual-rights/>.

<sup>133</sup> *Id.*

<sup>134</sup> See GLOB. LEGAL RES. CTR., LAW LIBR. OF CONG., *Laws on Erasure of Online Information*, 4 (Nov. 2017), <https://www.loc.gov/law/help/laws-on-erasure-of-online-information.pdf>.

<sup>135</sup> See *id.* at 1.

expanded this right when it upheld a Spanish man's complaint about Google searches of his name resulting in links to a newspaper article from 1998 about the repossession of his home.<sup>136</sup> The ECJ held, "Google can be required to remove data that are 'inadequate, irrelevant or no longer relevant, or excessive in relation to the purposes for which they were processed and in the light of the time that has elapsed.'"<sup>137</sup> The ECJ reasoned when an individual's privacy has been infringed, the individual's privacy interest outweighs the public interest in maintaining the information.<sup>138</sup>

The inclusion of the right of erasure in the GDPR demonstrates the drafters' intent to clarify and update the right for the digital age as well as provide legal certainty.<sup>139</sup> Specifically, the GDPR's right to erasure provides individuals with the right to require controllers to erase personal data if certain conditions are met.<sup>140</sup> As defined in Article 4 of the GDPR, a "controller" is a "natural or legal person, public authority, agency or other body which, along or jointly with others, determines the purposes and means of the processing of personal data."<sup>141</sup> Ultimately, the right "requires that if an individual requests . . . that his or her data be removed from a company's records, that company must comply 'without undue delay and in any event within one month of receipt of the request.'"<sup>142</sup> Individuals can make the request either orally or in writing.<sup>143</sup> However, the right to be forgotten is not an absolute right and only applies in certain circumstances.<sup>144</sup> Under the GDPR, an individual may demand that a controller erase the individual's personal data if:

1. the personal data are no longer necessary in relation to the purposes for which they were collected or otherwise processed;
2. the individual withdraws the consent on which the processing is based and there is no other legal ground for processing;
3. the individual objects to the processing on the basis of legitimate interests and there are no overriding legitimate grounds for the processing;
4. the personal data have been unlawfully processed in breach of the GDPR;

<sup>136</sup> See Foo Yun Chee, *European Court Says Google Must Respect 'Right to be Forgotten'*, REUTERS (May 13, 2014, 4:00 AM), <https://www.reuters.com/article/us-eu-google-dataprotection-idUSBREA4C07120140513>.

<sup>137</sup> *Id.*

<sup>138</sup> See *id.*

<sup>139</sup> See GLOB. LEGAL RES. CTR., *supra* note 134.

<sup>140</sup> *Id.*

<sup>141</sup> *GDPR*, *supra* note 124, at art. 4(7).

<sup>142</sup> Dalmacio V. Posadas, Jr., *The Internet of Things: The GDPR and the Blockchain May be Incompatible*, 21 No. 11 J. Internet L. 1, 22 (2018).

<sup>143</sup> See INFO. COMM'R.'S OFF., *Right to Erasure*, <https://ico.org.uk/for-organisations/guide-to-the-general-data-protection-regulation-gdpr/individual-rights/right-to-erase/>.

<sup>144</sup> See *id.*

5. the personal data must be erased to comply with an EU or Member State legal obligation to which the controller is subject; or
6. the personal data have been collected in relation to the offer of information society services directly to a child and consent was given by the child, but he or she was not fully aware of the risks involved by the processing at the time, and later wants to remove such personal data.<sup>145</sup>

Also, even without a request from an individual, a controller has a continuous obligation to take every reasonable step to ensure inaccurate personal data are corrected or erased.<sup>146</sup> Therefore, a controller must periodically review the personal data.<sup>147</sup>

In sum, the GDPR eliminates territorial restrictions and extends its reach beyond the EU to companies based in the United States who serve EU residents.<sup>148</sup> Overall, the GDPR increases an individual's control over his or her personal data through the promulgation of 8 rights, one of which is the right to erasure or the right to be forgotten.<sup>149</sup> Through this right, individuals are allowed to demand that a company erase the individual's personal data if certain criteria are met.<sup>150</sup> However, global companies utilizing blockchain technology in their supply chain management are at significant risk for noncompliance with the GDPR's erasure right.

### **B. Conflicts Between the GDPR and Blockchain Technology**

There are two main issues companies face when attempting to reconcile the GDPR and their desire to implement blockchain technology into their supply chains. First, companies must determine whether the GDPR applies to all information stored on their supply chains. For instance, the GDPR protects personal data if it relates to a *natural person*.<sup>151</sup> The GDPR does not protect the personal data of corporations.<sup>152</sup> Therefore, if a company's supply chain consists only of interactions with other companies, rather than individuals or natural persons, does a blockchain containing the data of those other companies in the chain violate the GDPR? What if the last step in the company's supply chain consists of the end user or the customer? An example would be if a customer shops online from the Nike store and wants to have the product shipped directly to his or her home.

The second main issue is whether the immutability of the blockchain can be reconciled with the GDPR's erasure right. Through the erasure right, individuals

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<sup>145</sup> GLOB. LEGAL RES. CTR., *supra* note 134.

<sup>146</sup> *See id.*

<sup>147</sup> *See id.*

<sup>148</sup> *See generally* GDPR FAQs, *supra* note 119.

<sup>149</sup> *See generally* INFO. COMM'R.'S OFF., *supra* note 132.

<sup>150</sup> *See* GLOB. LEGAL RES. CTR., *supra* note 134.

<sup>151</sup> *See* GDPR, *supra* note 124.

<sup>152</sup> *See* INTERSOFT CONSULTING, *supra* note 125.

have the power to have their personal data erased.<sup>153</sup> Due to its immutability, the blockchain ledger cannot be changed. At first glance, the GDPR's erasure right and blockchain technology seem in direct conflict with one another, but potential solutions may lie in the type of blockchain a company uses for their supply chain as well as other anonymization techniques.

## V. THE POTENTIAL COMPATIBILITY OF THE GDPR AND BLOCKCHAIN TECHNOLOGY DESPITE THEIR FUNDAMENTAL DIFFERENCES

Fundamentally, the GDPR and blockchain technology appear to be at odds. If the two cannot be reconciled, the significant penalties for noncompliance with the GDPR will hinder companies from fully implementing blockchain technology into their global supply chains. However, there are potential solutions companies may use to resolve the two main conflicts between the GDPR and blockchain technology.

First, and most importantly, companies should use a private or federated blockchain, rather than a public blockchain. In addition to the other benefits of scalability and faster speed, private and federated blockchains require every user to have an invitation to join the network.<sup>154</sup> Therefore, only the people necessary to operate the supply chain will be able to view and participate in the network. Private and federated blockchains also provide the owners with significantly more control over the blockchain.<sup>155</sup> As a result, they can limit exactly what information is allowed to be put on the chain. For example, the owner could program the blockchain to only allow a company's information to be inputted, not a natural person's information. This strategy helps provide a company with the potential argument that the GDPR does not apply to this specific company's blockchain because a corporation's personal data is on the chain, not a natural person's, and the GDPR does not protect a corporation's personal data. For additional protection, companies could use unique identifiers to hide the actual identity of users participating in the network.<sup>156</sup> However, companies must be careful because if someone holds the code to decrypting the key, then the encrypted key itself may constitute personal data.<sup>157</sup>

Another solution is to strictly limit the use of blockchain technology to the steps of the supply chain involving other companies. As a result, the company could still use blockchain technology to track the progress of the product from the

<sup>153</sup> See INFO. COMM'R.'S OFF., *supra* note 132.

<sup>154</sup> See Jayachandran, *supra* note 87; see also Anwar, *supra* note 99.

<sup>155</sup> See generally Anwar, *supra* note 99.

<sup>156</sup> See Bruce Bennett et al., *The GDPR and Blockchain*, COVINGTON (July 24, 2018), <https://www.insideprivacy.com/international/european-union/the-gdpr-and-blockchain/>; see also Dan Cooper et al., *The CNIL Publishes Report on Blockchain and the GDPR*, COVINGTON (Nov. 28, 2018), <https://www.insideprivacy.com/financial-institutions/the-cnil-publishes-report-on-blockchain-and-the-gdpr/>.

<sup>157</sup> See Bennett et al., *supra* note 156.

supplier to the distributor and from the distributor to the wholesaler. However, if the last step in the supply chain involves the individual customer such that the company would have to input the customer's personal data on the chain (name, shipping address, payment information, phone number, etc.), then the blockchain should only be used up until this last step. The company could use traditional information keeping methods off of the chain for the last step. Although using these methods for the last step is not ideal, it is better to use the revolutionary technology for the vast majority of the supply chain than not at all.

Lastly, one of the most widely perceived challenges is the compatibility of the immutability of the blockchain ledger and the GDPR's erasure right. However, this concern primarily pertains to the use of public blockchains. Due to the significant amount of control one organization or a handful of organizations has over a private or federated blockchain, it is possible for the controllers to set up mechanisms to modify or delete information from a private or federated blockchain.<sup>158</sup>

Moreover, the best and safest solution is to avoid putting any personal information on the chain. However, if it is impossible to do so, then companies should be proactive by taking the precautions above in order to reduce their potential liability for noncompliance with the GDPR so they may implement the significantly beneficial blockchain technology into their global supply chains.

## VI. CONCLUSION

Supply chain management plays a vital role in a majority of the everyday products people use. Due to the high level of globalization of the market, a company's supply chain has grown increasingly complex and has become more challenging to manage. Yet, companies must achieve effective supply chain management to maximize customer value and attain a sustainable competitive advantage.<sup>159</sup> However, traditional supply chain information keeping methods are preventing companies from accomplishing this goal. A harmful result of these methods is a lack of SCV. If left uncorrected, it could have major consequences for a company, such as negatively impacting its reputation and bottom line.<sup>160</sup>

Blockchain technology can resolve costly SCV issues currently plaguing global supply chains. "[T]he essence of blockchain technology is to allow for quicker, more efficient and more reliable data exchanges . . . ."<sup>161</sup> As a result, the technology has revolutionized the existing information-keeping process and will become an integral component of major worldwide supply chains. However, the EU's recent implementation of the GDPR threatens to prevent companies from utilizing blockchain technology in their worldwide supply chains. Nevertheless,

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<sup>158</sup> See Claudio Lima, *Blockchain-GDPR Privacy by Design: How Decentralized Blockchain Internet will Comply with GDPR Privacy* (June 2018), <https://blockchain.iccc.org/images/files/pdf/blockchain-gdpr-privacy-by-design.pdf>.

<sup>159</sup> See Wilson, *supra* note 7.

<sup>160</sup> See Scott, *supra* note 34.

<sup>161</sup> Levi, *supra* note 81.

using a private or federated blockchain, as opposed to a public blockchain, and limiting the type of information placed on the chain could be potential solutions to the seemingly incompatible GDPR and blockchain.

Moreover, one organization or a handful of organizations has a significant amount of control over a private or federated blockchain. Therefore, a private or federated blockchain's ledger is not completely immutable, and it is possible for the controllers to set up mechanisms to modify or delete information from these specific types of blockchain. This helps resolve the conflict of the GDPR's erasure right and the immutability of the blockchain ledger. Furthermore, a company can help prevent noncompliance with the GDPR by only placing information about companies on the blockchain because the GDPR only protects a natural person's data, not a corporation's. Ultimately, the use of blockchain technology in a company's global supply chain is compatible with the GDPR if the company strategically utilizes a private or federated blockchain and is thoughtful in the amount and type of information added to its closed blockchain network.

