COMMONWEALTH OFFICE OF TECHNOLOGY

Blockchain Working Group

Annual Report

December 2020

Blockchain Working Group

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Blockchain Working Group

Background

The Blockchain Working Group is a collaborative panel of subject matter experts defined in Senate Bill 55, and subsequently codified in Kentucky Revised Statute Chapter 42.747, with the mission to evaluate the feasibility and efficacy of using blockchain technology to enhance the security of and increase protection for the state's critical infrastructure, including but not limited to the electric utility grid, natural gas pipelines, drinking water supply and delivery, wastewater, telecommunications, and emergency services.

The membership of the working group is comprised of nine members defined in KRS 42.747 as well as an array of representatives from state and local government, public utilities, and private sector business who were chosen based on their knowledge and engagement with blockchain technology to ensure a broad depth of knowledge and insight. Through spanning these various government and business sectors, the group can explore and document those opportunities that place the Commonwealth in the forefront in the support and usage of blockchain technology as a tool to empower business in the state.

The group convened for the first meeting on September 9, 2020 and has held regularly occurring meetings to develop the contents within this report based on the mission as defined within the Senate Bill and resulting Kentucky Revised Statutes. The primary goals of the initial report are to define blockchain in relation to mission of the working group, provide short term tactical recommendations, and highlight those areas of opportunity where a more strategic analysis by the working group will be conducted over the next reporting year.

Blockchain Working Group

Report Abstract

Blockchain technology is a highly diverse and robust technology that can empower business through the sharing, movement and processing of data or transactions in a highly efficient and secure manner. While the most prevalent use of blockchain technology is digital currency such as Bitcoin, there are significant ways that blockchain technology that can enhance the integrity and security of systems that support critical infrastructure such as transportation, public utilities, healthcare, finances, logistics and emergency services. Through the establishment of the Blockchain Working Group, the Commonwealth is approaching this technology in a forward-thinking manner to identify those opportunities that can draw to, or empower current business in, the state.

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Blockchain Working Group

Report Summary

Blockchain technology is an innovative mechanism for protecting the confidentiality, integrity, and availability of data. Blockchain is commonly known as a foundation for digital currency, but the technology is well suited for a multitude of purposes where there is a need to share data or track transaction in a highly secure and efficient manner.

Recognizing the potential of this technology to contribute to the protection of the state's critical infrastructure and empower business in the Commonwealth, the Kentucky State Legislature introduced Senate Bill 55 to convene a working group of subject matter experts to explore this technology and the various ways that it could be used within the Commonwealth. This bill, later codified in Kentucky Revised Statute 42.747, defined a core group and a clear mission to help move the Commonwealth to the forefront in the exploration of this exciting technology.

In response to this legislation, the Commonwealth Office of Technology, in collaboration with Senator Brandon Smith, established the Blockchain Working Group. Using the legislation to guide the establishment of the initial membership and expanding it to include a range of subject matter experts spanning state and local government, public utilities, private sector business, and academia, a broad spectrum of expertise and experience was brought together to achieve the spirit and intent of this forward thinking legislation. This group had their initial meeting on September 9, 2020 and began the journey that has resulted in this report and set the direction of the group in the future.

Throughout the initial meetings, the group found that the challenge was not finding the opportunities where blockchain technology could provide a positive impact, it was constraining the scope in a meaningful and manageable way. The technology itself is so diverse and has the possibility to add benefit to any number of use cases, the group put considerable effort and careful thought in choosing the key areas where that were the most impactful and where the business sectors were most capable of exploring ground breaking approaches that could be empowered by blockchain. As a result, five key sectors were chosen as areas of focus for the group.

Finance

Blockchain technology has its foundations in the financial sector, in the realm of digital currency such as the popular Bitcoin in particular. While cryptocurrency is a core use case, the transactional and sensitive nature of personal, state, national, and global finances make it an ideal candidate to see the benefits of implementing blockchain. Ranging from inter and intra institution transactions to personal finance, there are a number of use cases that can be explored in greater depth.

Records Management

The security and integrity aspects of blockchain technology are well suited for various areas of records management. From the execution of legal contracts and agreement to professional and occupational licensing, the ability to protect, track, and validate these documents with tremendous levels of auditing and accountability through the use of blockchain technology makes this sector another ideal candidate.

Public Utilities

Public utilities such as water and power are the backbone of modern society and represent a sector that is at the very heart of critical infrastructure. The model for the delivery of these services continues to grow in complexity and relies increasingly on geographically diverse and disparate technology. Through the efficiency and security gains available with the integration of blockchain technologies, the delivery and protection of these critical services can be greatly enhanced.

Logistics and Supply Chain Management

The Commonwealth is well positioned centrally to serve as a logistics center for the eastern United States making this a highly intriguing use case and a potential draw for businesses within this sector. Modern logistics requires the close collaboration of suppliers, shippers, and receivers makings effective cross communication a vital need to ensure success. Through blockchain technology, these workflows and communications paths can be streamlined with enhanced integrity to ensure smooth operations.

Healthcare

The Commonwealth is already home to some of the most progressive and leading healthcare providers and research entities in the country. The need to share data among facilities and providers is key to facilitate effective and responsive treatment. In addition, as the nation works through the impacts of a global pandemic, the need to actively share data on a large scale for trending and research is more apparent than ever. Blockchain can serve as an empowering foundation for these use cases.

In the report, the working group expanded on the use cases that align to these five areas of focus, with the full knowledge that they represent the tip of the proverbial iceberg of what can be achieved through the creative use of blockchain technology. As the technology matures and adoption increases, it is expected that the use cases will evolve and grow exponentially. While these areas of focus are most prevalent today, the working group will continue to maintain monitor the larger picture and explore new avenues that arise.

As part of the larger perspective, also included in the report is a summary of the state of blockchain today that covers initiatives and legislation, pertaining to blockchain technology, at a national level. Combining the use cases in the report with the knowledge of the benefits and pitfalls experienced by others, the Commonwealth can be well prepared to step to the forefront and help participate in the business revolution that could be spurred by this technology.

Lastly, while there are tremendous benefits to blockchain, the benefits do not come without risk. The working group has put thought into identifying those risks. While difficult to quantify, the risk can be considered at a conceptual level while looking at the efficacy of the technology.

In closing, the initial working group report should be viewed as one of vision and direction. Blockchain technology, while in existence in some form beginning in 1982, remains a technology in its infancy. Over the coming year, the Blockchain Working Group will continue the research needed to identify the more tactical and immediate opportunities for the Commonwealth while maintaining a longer-term search for more strategic opportunities on the horizon. There are recommendations included throughout the detail report, most of which are exploratory in nature, but one overarching recommendation is that the Commonwealth should continue this investment and exploration of blockchain technology to provide real benefit to Commonwealth citizens and to the potential to drive business growth in the state.

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Introduction to Blockchain

Blockchain is a highly diverse and secure technology with far reaching potential to enhance and empower business and government. For the purposes of this report, the Blockchain Working Group has adopted the following core definition of blockchain:

> ***'Blockchain** is an encrypted, secure distributed ledger (decentralized database) system that maintains a digital record of transactions. Individual records, called blocks, are linked together in a single list, called a chain. Blockchain is a scalable technology used for recording transactions made with cryptocurrencies, such as Bitcoin, and it has many other applications such as supply chain and logistics monitoring, data sharing, digital voting, real estate and auto title transfer tracking, equities and energy trading, and much more.'*

Blockchain technology is purposely built to protect the integrity and confidentiality of data used in transactional systems. In addition to the security benefits inherent in the technology, there are efficiency and trust gains that help foster data sharing as well as improve the effectiveness and speed of business. Some of these key features are:

- **Decentralized Digital Ledger**
  By design, blockchain does not rely on a single central ledger for the documentation and validation of transactions. That role is shared among the participants in the blockchain enabled system. This allows the system to be highly secure, redundant, and robust. Without a single point of failure and with common knowledge of the transactions across the participants in the blockchain, business continuity and trust in the integrity of transactions can be assured.

- **Industry Standard High Levels of Encryption**
  Industry standard encryption is inherent to blockchain technology and ensures that data in the system is highly protected from exposure or alteration while in transit throughout the system and among the participants in the blockchain.

- **Transactional Trust and Nonrepudiation**
  The design of blockchain imparts an inherent trust between the participants and helps ensure the integrity of the transactions by preventing the interception, alteration, or injection of transactions in the blockchain that cannot be validated by the decentralized ledger. Any alteration of any block of the chain will invalidate the entire blockchain.

- **Low Latency Peer to Peer Transactions**
  Without the requirement that an intermediary server or authority validate the transactions, and with the ability of participants to communicate directly with each other, the flow of data is greatly improved. This simplifies the data flow and removes additional steps in the data path while maintaining the integrity and trust of transactions.

- **Public and Private Options**
  Public blockchains do not rely on a central authority to grant permission to participate in the blockchain to read, write, or proof transactions in the blockchain. One of the most common uses of public blockchain is digital currency such as Bitcoin but can be ideal for any public use system where broad public participation is needed. Private blockchains are restricted networks that require a central authority to grant permission to participants to

read and write transactions in the blockchain. This would be most applicable to use cases such as critical infrastructure where the security and efficiency of blockchain is needed but requires high levels of control over who can participate in the blockchain.

Blockchain Potential Use Cases

The efficiency and applicability of blockchain can be realized across any number of business and government sectors. Many public and private sector entities are exploring the efficacy of blockchain. The Commonwealth has taken the bold first step in establishing the Blockchain Working Group setting a path to explore the opportunities that this technology may offer. Some of these possible opportunities are:

FINANCE

The world of finance is entirely transaction driven. This is the ideal environment for blockchain to have a positive impact. Highly transactional based systems have the highest level of benefit from blockchain and align with the core design and principles of blockchain. Blockchain enhances conducting transactions across or in financial institutions, and other sectors involved in commerce, with the highest level of security.

Cryptocurrency

The most prevalent use of blockchain in the financial sector is the use of digital currency, also referred to as cryptocurrency such as the popular Bitcoin. Digital currency could empower business and trade through the ease and efficiency of financial transactions in a highly secure and attestable manner. Delays and complexities such as currency conversion and transaction clearing houses can be removed which will greatly enhance the speed and efficiency of business. Nations such as China and Canada have already pursued digital currency implementation and the foundations for the development of a "digital dollar" have been discussed by the U.S Congress. The current Comptroller of the Currency, Brian Brooks, served as Chief Legal Officer for Coinbase, one of the largest digital currency platforms in the world.

Though cryptocurrency may not fully replace traditional currency, for quite a while if ever, it is becoming a viable option as it continues to be adopted by younger, tech-centric generations.

Recommendation 1.0: The Commonwealth of Kentucky should explore the benefits of creating a new cryptocurrency to support a closed blockchain system.

Rationale: This report has identified risks and opportunities of adopting blockchain. The ideal implementation would be a closed blockchain system where members are able to participate in the block processing for the cryptocurrency. By owning and opting into the blockchain processing, the Commonwealth and other member institutions would have a vested interest in mitigating some of the inherent risks, while amplifying the potential benefits. The closed blockchain system would remove some of the cyber security threats inherent to open systems where processing takes place all over the world, by making the blockchain membership by invite only. Malicious actors attempting to impact or corrupt the blockchain would not have access to the blockchain at the same level as an open blockchain system. Additionally, by owning a cryptocurrency, Commonwealth would be able to extend financial processing capabilities into the digital realm. Finally, financial transactions related to Commonwealth of Kentucky and other member institution business would be processed on a system the members own and protect, which promotes a more secure financial ecosystem.

Banking

The state of Wyoming, in anticipation of potential banking needs in the cryptocurrency realm, adopted House Bill 74 in 2019 which authorized the chartering of *special purpose depository institutions (SPDI).* According to the Wyoming Banking Division these "institutions are banks that receive deposits and conduct other incidental activities, including fiduciary asset management, custody and related activities". Applications for charters began in October 2019 and the first charter was issued to Kraken Bitcoin Exchange in October of 2020 making it the first digital asset company to secure a bank charter in the United States. There are more charters in the pipeline that will be awarded over the next six months to a year.

> **Recommendation 1.1:** The General Assembly should pursue legislation creating charters for *special purpose depository institutions* during the 2021 legislative session.
>
> **Rationale:** Though Wyoming was the first state to develop this type of charter for digital asset management other states are predicted to soon follow. Kentucky, with its geographic location and amenities, could have a competitive advantage over other states including Wyoming. As mentioned in other portions of this report, Kentucky sits at the figurative if not literal "crossroads of the Eastern and Central United States".
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> Kentucky residency requirements for officers of the SPDI would provide Kentucky an added advantage as Kentucky provides significant benefits to relocating executives and employees such as access to low cost of living, major airports, arts and entertainment, major sporting events, metropolitan areas, rural attractions, low energy costs and all the other elements that make Kentucky a great place to live and work.

Payment Systems

Harvard Business Review identified two elements to the modern currency system, the "what" and the "how" of transactions. Prior to development of modern financial systems, the "what" was money (paper or coin), gold or some other commodity of value and the "how" was to hand over the commodity for the desired good or service. This process would evolve with the development of checks and credit cards and into even more complex systems with further development of technology. As mentioned in a previous section, though cryptocurrency may never supersede traditional currencies the "how" process could be significantly impacted by the implementation of blockchain technologies. Currently, most non-cash transactions, whether in person or online, utilize intermediaries that take a percentage of the transaction amount to complete the transaction between two entities. This increases the cost of business and commerce as each intermediary will take their "cut". Blockchain technology eliminates the need for any trusted intermediaries and therefore can lead to efficiencies in the system as well as lower the overall cost of transactions.

The Treasurer of the State of Ohio created a system in Fall of 2018 to allow Ohio citizens and organizations to pay up to twenty-three (23) different taxes via Bitcoin and the OhioCrypto.com website created by his office. However, about a year later, the Ohio Attorney General determined that these payments violated state law as BitPay, the platform utilized for the transactions, charged a fee and therefore made this a financial transaction device and subject to the Ohio Board of Deposit approval.

Recommendation 1.2: The Blockchain Technology Working Group should continue to monitor this ongoing development of alternative currency while also advising the Kentucky State Treasurer's Office of developments in this area and investigating potential opportunities in which the Treasurer's Office can pursue future blockchain technology adoption.

Rationale: The adoption and implementation of new payment systems and processes are coming; it is just a matter of "how soon". The state and the Treasurer's Office should be adequately prepared to adapt to this technology and its uses before it arrives, and the state is "playing catch up".

Public Finance

The development of websites such as Kickstarter and GoFundMe have promoted terms such as "crowdfunding" and "crowdsourcing" into the common lexicon. These terms represent a process that individuals or companies can use to source financial backing from a large number of persons through Internet mechanisms. The rapidly growing Braxton Brewery in Covington, KY was launched from the founder's garage into a brewery with multiple taprooms in the Northern Kentucky area through a Kickstart campaign in 2015. This crowdfunding process is beginning to gain traction in the world of public finance.

The traditional instrument for municipal financing is the General Obligation (GO) Bond or the Industrial Revenue Bond (IRB). These tax-free instruments were widely available to investors up until the late 1980's. There are stories of grandparents purchasing municipal bonds for grandchildren as birthday and Christmas gifts.

However, after the late 80's until today these instruments have become cost prohibitive to most small investors. A single share of a municipal bond can be $5,000 or higher. Small investors are no longer able to take advantage of the tax-free yields of 3% or higher (almost 30 times the yield of a saving account). This has significantly hampered the building of wealth in low- and middle-income homes. Municipal bonds are now usually purchased in whole by large investment firms and inserted into their mutual fund portfolios.

The ability of blockchain to fractionalize (break into an almost infinite number of smaller pieces) would allow municipal bonding to be more affordable to those lower income investors looking for opportunities outside of their 401k. This would also allow the financial benefits to remain on "Main Street" versus disappearing to "Wall Street". Citizens of a city or county could now invest in their own communities and see yield benefits from the taxes they may pay for the bonds. In 2019, the city of Berkeley, CA utilized blockchain "minibonds" to finance the purchase of a new fire truck. A hypothetical grandparent could have potentially bought part of an actual fire truck for their grandchild for their birthday.

Recommendation 1.3: The Commonwealth of Kentucky should investigate the use of blockchain based municipal bonds to fund future projects while at the same time increasing the opportunity for building wealth in its communities.

Rationale: The utilization of blockchain technology could not only aid in the financing of municipal and public infrastructure projects in the state but could lead to wealth development in the state. Eastern Kentucky faces the significant issue of the region's water and sewer systems needing to be replacement and modernization in the near future. Barring significant state grants and loans, this financing will need

to be completed through issuing municipal bonds. The citizens in these areas could purchase small portions of the issued bonds and take advantage of the associated tax-free yields by using blockchain technology.

RECORDS MANAGEMENT

Contracts

Advancement in electronic technology has led to the ability to execute contracts without needing to be present. Previously, the execution of a contract required the signatories of a contract be present and physically sign the contract document. This changed over the last decade with online services such as DocuSign and Adobe Acrobat. These electronic systems allow parties to a contract to sign documents without being physically present.

Though these platforms allowed the execution of contracts to become more efficient there are some basic weaknesses in these systems. The primary weakness is the guarantee of authenticity or validity of the signature. The common process is for the contract documents to be electronically forwarded or supplied to the parties. This is completed through a link provided in an email. The recipient follows the link to the documents that are hosted on a central server. The recipient reviews the documents and then when prepared to sign acknowledges their agreement to the electronic signature process and attaching an electronic signature. The issues in this process are that there is no guarantee the signatory is the actual party intended for the agreement, as the link is usually emailed through unencrypted email. The second issue is that all the signed documents are maintained in a central database that is vulnerable to cyber-attack.

A system that enables blockchain as part of the signature process allows the documents to be maintained in a decentralized system reducing the probability of cyber-attack. Additionally, blockchain will validate the identity of the signer. Blockchain provides a key that is unique to the individual allowing assurance that the signatory to the contract is the party intended.

Accounting/Auditing

Blockchain is widely considered to be one of the most significant innovations to accounting since the invention of the double-entry ledger system. The double-entry ledger has been the basis for accounting practices for roughly 500 years. The basic nature of double-entry accounting is that all credits and debits are recorded in a single ledger. Though this system may work effectively for the parties involved in a specific transaction it provides no transparency to other interested parties such as investors, auditors, taxing authorities, financial institutions, or other similar entities. The maintenance of a single ledger by the individual or corporation leads to many issues including criminal fraud. The idiom “cook the books” long ago entered into common slang. Recent financial crimes in large corporations and even government entities provide testimony to the potential for manipulation.

The nature of blockchain creates a transparent and immutable transaction trail that has been identified as “triple-entry accounting”. This creates an incorruptible link between the transactions recorded in a double entry ensuring the integrity of the transaction record. The only solution to identifying manual errors or fraud in the double-entry system was through costly and time-consuming audits. Even with full, comprehensive audits, intentional malfeasance has gone undiscovered. The implementation of blockchain in the accounting system of corporations, individuals and governments provides a transparent record of transactions that are nearly impermeable to fraud. This reduces the necessity for intensive audits leading to efficiencies and cost-savings in the systems, especially for budget restricted governments.

Recommendation 1.4: The Kentucky Auditor's Office should explore the benefits of implementing blockchain technology in their auditing processes, especially those that occur annually.

Rationale: The immutable audit trail would allow the Auditor's office to better automate and accommodate the auditing process for the government agencies it is required to audit every year. From the budgeting process through the audit process, a single system built on blockchain could provide significant cost and time savings in completing these regular audits allowing for concentration to be focused on special audits.

Legal Records and Documents

State and local governments are a vast depository of legal records and documents. These governments or associated agencies maintain numerous records including but not limited to state issued IDs, property records and land deeds, motor vehicle registrations, driving records, voter registrations, voting records, occupational and business tax records, corporate and non-profit entity registrations, criminal records, professional and occupational licensing records, alcoholic beverage licenses, gaming licenses, and a myriad of other records and documents. These records, when maintained electronically, are usually located on a local server at the county clerk's office, or a city hall, county courthouse or the state government servers. This central repository is vulnerable to a concentrated cyber-attack. Also, the electronic records may be susceptible to loss of information or data through the potential shut down or corruption of the central server. Sharing of these records and documents should be completed through either providing access directly to the database or providing a copy forwarded through an electronic means such as email.

Blockchain provides the opportunity to manage, transfer and store these legal and governmental documents within a distributed ledger addressing the risks of centralized storage as well as maintaining the custody of the records and ensuring the integrity and accuracy of the electronic documents. As a case study, the nation of Dubai, through the Department of Economic Development, initiates all business registrations, business licenses, and other business-related documents entirely by blockchain.

Recommendation 1.5: Legislation should be amended to include a member of the Blockchain Technology Working Group on the Task Force on Electronic Recording of Official Documents by County Clerks.

Rationale: In 2019, the Kentucky General Assembly created the Task Force on Electronic Recording of Official Documents by County Clerks (2019 SB 114) to study and implement the filing of documents with County Clerks in electronic form. This included identifying methods needed to provide electronic notarization of the official documents. This is an on-going task force with regular meetings. The task force includes representatives from companies that already operate in the e-filing and e-notary services. The inclusion of a member of the Blockchain Technology Working Group on this task force would provide the opportunity for blockchain to be researched and potentially implemented in the shift to electronic filing.

Recommendation 1.6: The Kentucky Secretary of State, as custodian of both elections and business filings, should research the benefits of blockchain in the issuance and/or management of these records to ensure the integrity and accuracy of these crucial records.

Rationale: The shift to alternate methods of voting during the Covid-19 pandemic has demonstrated that methods other than in-person voting can be provided. Utilization of blockchain, while not the panacea to

cure potential voting issues, could be a large step forward in ensuring that election fraud is impossible. Business registrations and licenses could also be maintained securely and efficiently.

Recommendation 1.7: The Commonwealth of Kentucky should continue to research opportunities that may benefit from blockchain technology in records and document management systems in the state government. To ensure interoperability blockchain will need to be implemented in an organized, centralized and efficient manner.

Licensing

From 2017-2019 the Occupational Licensing Policy Learning Consortium was facilitated by the National Council for State Legislatures, the Council for State Governments and the National Governor's Association through a series of grants, in excess of $3.5 million, from the US Department of Labor. The Commonwealth of Kentucky was one of eleven (11) primary states that participated in this Consortium. The Kentucky team consisted of members from the Governor's Office, the State House and Senate, the Public Protection Cabinet and the Department for Local Government.

The two main objectives of this Consortium were to study the barriers to entry in the state licensing systems as well as to identify opportunities for license portability between states. Blockchain technology can significantly advance the portability of professional and occupational licenses. The current standard for professional and occupational licensing is the establishment of oversight through state control either by individual licensing boards (such as currently utilized in Kentucky) or by central licensing agencies attached directly to a state office (Ohio and Tennessee are examples). Licensees that acquire their license in one state but desire to work in another must subsequently secure their license through the second state. For example, a licensed respiratory therapist may live in Jeffersonville, IN and possess an Indiana license. However, they may secure employment with one of the hospital systems in Louisville, KY. In order for them to be able to work in Kentucky they will have to go through the entire licensing process to secure a second license in the Commonwealth of Kentucky. This may cost the respiratory therapist a great deal of time and money completing the process just be able to practice their profession. They will then be required to maintain all requirements and fees for two licenses. A system which supports portability of licenses would remedy this situation and remove barriers to work.

A current solution utilized to promote portability of licenses is achieved through Interstate Compacts. These compacts are agreements between states and recognize licenses from other states. The portability only applies to the states that are signatories to the compact. The establishment and maintenance of compacts are both costly and legislatively complex. In addition, the information for the licensees is either maintained by the individual states or in some cases may be maintained in a central location managed by an entity that oversees the operations of the compact. In either case, this provides the opportunity for conflicting data, in the case of individual state-maintained data, or vulnerability to hacking if managed in a central database.

A blockchain system removes the centralized database and replaces it with a distributed ledger system which would allow all the states to have access to the same information on licensees and would significantly reduce the risk of corruption or theft of data. The licensee would have responsibility for the maintenance of their license and would allow access to the desired states in which they wish to practice. With a distributed ledger, the states would

have access to all licensees that may wish to practice in their states and would be able to immediately share information with other states if there is a change in the licensees status due to an events such as failure to complete continuing education, disciplinary actions, investigations, escrow or any other event that could impact public protection and the licensees ability to practice.

Recommendation 1.8: The Department for Professional Licensing, the Public Protection Cabinet (PPC) and the Commonwealth Office of Technology (COT) should research the opportunity provided by incorporating blockchain technology into Kentucky's licensing systems.

Rationale: Kentucky is already a signatory on several interstate compacts and new compacts are developing that will enter the legislative pipeline in the near future. During the Consortium process, the Kentucky team secured a 2018 US Department of Labor grant for $400,000. The initial grant $100,000 earmarked for COT to improve the state's licensing software. The grant went dormant April of 2019 and continued to be dormant through December of 2020. The grant was transferred from the Department for Local Government to the Public Protection Cabinet. At this point less than $40,000 has been expended. From March 2020 through current, the grant has been reviewed and may have been re-activated by PPC, but the extent of any progress is unknown. The grant is due to expire June 30, 2021. This provides a seven (7) month opportunity to examine blockchain use in the Kentucky licensing system.

PUBLIC UTILITIES

Modern public utility infrastructure is highly complex, automated, and distributed across wide areas. Ensuring the integrity of communications across this infrastructure is paramount to maintaining critical utility services for citizens and businesses of the Commonwealth.

While it is difficult to predict the impact of Blockchain technology on utilities at this early stage there are some potential implications for financial transactions, energy generation and distribution, renewable energy, infrastructure management, enhanced customer service, and service delivery. It's important to note that energy generation and distribution is heavily regulated by the Federal Energy Regulatory Commission (FERC), the North American Electric Reliability Corporation (NERC), and regional organizations such as the Southeastern Electric Reliability Corporation, therefore any integration of Blockchain technology in this process will need to be endorsed by these and other local regulatory organizations.

Financial transactions could utilize secure, innovative solutions that are automatically triggered by specific requirements being met between buyers and sellers at all levels of the supply chain. Retail consumers could benefit from timely and secure payment transactions. Utilities could also utilize similar transactions to simplify financial exchanges for mutual aid and shared resources. Energy generation and distribution could be improved by incorporating Smart Grid functionality.

Tokens referred to as "Renewable Energy Credits" or RECs are a method of monetizing renewable energy. Currently these tokens are thoroughly audited to ensure the token is only used once. Blockchain enabled RECs would be more efficient and eliminate the need for audits. As carbon emission tracking becomes more common, Blockchain could usher in an acceptable mechanism to track these emissions. The tracking system could be a unified platform offering a single solution for calculations.

Infrastructure management could benefit from far more detailed tracking and easier access to component information such as manufacturer, date and time manufactured, shipping details, time of installation, service life, load capabilities, and so much more. When coupled with augmented reality the real-time benefits of this information almost inconceivable. Blockchain technology could be incorporated into Automated Metering Infrastructure (AMI) processes that allow customers to access real-time usage data, flexible billing options, automatic disconnection/reconnection functionality, and reliable service transactions.

LOGISTICS AND SUPPLY CHAIN MANAGEMENT

The Commonwealth is geographically positioned well to serve as a central point for logistics through the eastern United States. The Commonwealth is recognized as the #1 Location in the U.S. for population served in one day's drive (Source: Claritas), GRADE A in Logistics Industry Health (Source: Manufacturing Scorecard 2019, Ball State Center for Business #1 and Economic Research) and we are within 600 miles of 54% of the US population, 56% of US manufacturing and 27 Major Metro markets. The Cincinnati/Northern Kentucky International Airport (CVG) is the 8th largest cargo airport in North America and home to the Amazon Air hub and DHL's North American super-hub. Two Class I railroads (CSX and Norfolk Southern) cross our region and the Port of Cincinnati and Northern Kentucky is the busiest inland river port in the United States (US Army Corps. of Engineers Navigation Data Center, 2016). With the addition of blockchain technology the area could present an even more appealing case to potential businesses looking to expand.

Modern logistics goes well beyond transferring goods from point A to point B and requires the coordination of multiple supply points of origin and a disparate spectrum of destination points ranging from individual consumers to large scale industry. This creates complex communication flows, often between untrusted parties, that not only have to be secure and validated but also timely to meet the speed of business. Blockchain is a much needed and obvious technological upgrade, particularly when paired with big data, IoT, smart contracts, and artificial intelligence. It can greatly reduce costly errors, decrease delivery time, and lower the overall costs that plague most large, centralized logistics platforms. As with many other blockchain use-cases, it can ensure greater transparency and access to information between the parties involved.

HEALTHCARE

The Commonwealth is home to some of the most progressive and nationally leading healthcare providers and institutions in the country. Anyone seeking treatment in the Kentucky healthcare system, beyond routine health concerns, will experiences the disparate nature of a service delivery that includes general practitioners, specialists, hospitals, and more. The effective and efficient flow of critical treatment data among these providers, typically in disparate institutions, could greatly improve the quality of service and the speed the critical health concerns can be treated. This data is extremely sensitive, profoundly critical to human safety, and heavily regulated by standards such as the Health Insurance Portability and Accountability Act (HIPAA). Blockchain has the potential to rapidly share this critical data with the highest level of protection, while also ensuring patient privacy and compliance with regulatory standards.

Data Analytics

The Centers for Disease Control is currently exploring the opportunities for using blockchain technology to monitor diseases at a national level. As seem throughout the global COVID-19 pandemic, the ability to track outbreaks across geographically diverse locations can aid in the rapid identification of outbreak hot spots, speed response times that can assist in containment and provide critical data analysis for tracking community spread of disease. While the benefits at a national level are obvious, the collaborative nature of blockchain enabled information sharing networks will allow for states to leverage the trending data to help drive informed policy decisions.

Recommendation 1.9: The Commonwealth of Kentucky should explore blockchain related grant and/or partnership opportunities with federal entities such as the Centers for Disease Control.

Rationale: The nature of these efforts at a national level cannot be addressed, nor funded, solely by the states. The efforts around preparing the nation and the states for current and future events such as the global COVID-19 pandemic will require concerted efforts and participation at both a state and national level.

Medical Research

The Commonwealth of Kentucky is home to some of the leading research and teaching hospitals in the country. With key healthcare leaders, such as University of Kentucky Healthcare, University of Louisville Health, Baptist Health, Norton Healthcare, and Jewish Hospital to name a few, there is a significant capacity already in place in the state. Finding those opportunities to enhance the existing capabilities in the state with technology advancements such as blockchain can position Kentucky to draw additional healthcare business to the state and help move the Commonwealth to the forefront of the healthcare industry.

Controlled Substances

Tracking use of controlled substances such as Opioids, that have a profound impact on the lives of citizens in the state, is critical in helping combat the misuse of these substances. The Commonwealth has made substantial investment in the current eKasper program to help gather and track this information to assist in addressing the national crisis. Blockchain technology could enhance this program by adding efficiency and security to the data flow and open opportunity for effective data sharing at a national level.

Recommendation 1.10: The working group should consult with the Cabinet for Health and Family Services to identify opportunities where blockchain may be used to enhance the existing eKasper program. In addition, working with other states, there is the potential for federal grant and funding opportunities.

Rationale: This is a specific use case that is an ideal candidate for blockchain technology to contribute to the greater good. Empowering effective and secure data sharing can aid in the identification of misuse of controlled substances across state lines at a national level. This is done today, but through the use of blockchain technologies, there is the potential for efficiency and security gains over and above current methods.

Blockchain Risks

This report describes a highly capable and valuable technology, but the technology also has risk. Blockchain is still developing a maturity level needed for a viable solution in some use cases. The technology is in an exploratory state in many industries. While each use case may have specific risks, there are risks that span across most, if not all, lines of business.

COST

Blockchain technology is rarely capable of being layered on top of existing technology. Many times, existing infrastructure and systems require redesign to accommodate the use of blockchain. This represents a high deployment cost in existing complex scenarios.

In addition to the programmatic implementation costs, blockchain technology may impart increased technology overhead requiring increased computing resources. It is likely that additional costs will be incurred to add processing power in systems that leverage blockchain.

LACK OF STANDARDIZATION

While blockchain at a conceptual level is well defined, there are multiple methodologies and mechanisms needed to deploy it. Without standardization and defined common operational standards there exists interoperability concerns.

In addition, there are databases and other software programs/platforms that are being marketed as being blockchain-based but, in reality, are not.

LACK OF CENTRALIZATION

The development of the internet over the last half century has conditioned users to certain expectations with their online experiences. Whether it is email, banking, e-commerce, social media, streaming services or any other of the myriad of platforms developed for the internet, users rely on some central authority to serve as intermediary. For example, Amazon serves this function with online sales transactions, whether through the services they offer, or through the storefronts that they provide other companies and individuals.

Blockchain is a decentralized system of record where individuals or nodes are the responsible entity. A banking customer, in the current system, could potentially lose their log in information to gain access to their account. Because the bank serves as the central authority, the customer follows a process to re-establish their identity and re-gain access to their account. However, in the decentralized system of blockchain, there is no central authority, clearinghouse or repository for this information. A lost key for cryptocurrency could result in that cryptocurrency being lost in the electronic void. This situation has already occurred with lost keys for Bitcoin. As a result, Bitcoin owners lost millions of dollars because they are unable to access their accounts.

REGULATION

Over regulation of a growing technology can be very restrictive to the technology reaching maximum potential. By restricting use, or applying standards that are too narrow, through constricting regulations government, officials can impede the innovation and adoption of the technology and delay or prevent the realization of the benefits of some use cases. However, lack of regulations could have the opposite effect leading to the potential for chaos and uncertainty in the development of a complex technology such as blockchain.

GARBAGE IN, GARBAGE OUT

Blockchain is designed and utilized as a system of record. Its immutable nature allows it to provide a strong, transparent and auditable record of transactions. However, when logging physical assets on the blockchain, there exists the potential for error or manipulation. For example, in supply chain management, a seller may log a valuable bottle of bourbon on the blockchain ensuring that collectors purchasing the bottle have an adequate record of where the bottle's location and any changing of ownership. The blockchain ledger securely records these transactions, however it cannot verify that the bottle originally placed on the blockchain was Pappy Van Winkle and not Kentucky Tavern.

OVER EXUBERANCE

Blockchain is heralded as the next greatest technological development since TCPIP was developed leading to the creation of the Internet. While possible, it is still much too early to predict the technology's scope and influence on everyday lives of individuals. The Internet, through TCPIP, was created in 1972, yet the consumer and public aspects of the Internet where not realized until the mid-1990s when the Dot Com explosion ignited. The Internet initially developed more in isolation through research, academic and military applications. This provided ample time to experiment and create a more usable and unified architecture.

Blockchain is developing in an entrepreneurial manner with corporations and individuals scrambling to be the first to market. Investment, or potentially what is better termed prospecting, is leading to huge influxes of capital into projects that may or may not come to fruition. Where the Internet did not see a bubble/burst cycle until a couple decades into development, blockchain may be seeing it more at its infancy. This may lead to a lack of standardization, as mentioned previously, as well as the risk of failure which may negatively impact future development and investment.

Another facet of over exuberance in the developing technology is that blockchain may be applied in situations where it is not necessarily needed. Blockchain has, or is becoming, a buzzword that attracts attention as something that "you must have". This could be analogous to when Echinacea was identified as having some health benefits and suddenly every herbal remedy, cough drop, nutraceutical or OTC medication began to add it into their blend and market it to capitalize on its perception and gaining popularity.

> **Recommendation 2.0**: Kentucky should explore the benefits of creating a state blockchain leadership position (officer, liaison, coordinator, etc.) to aid in the research and management of potential implementation of blockchain in the state government. This officer would consult with all branches of government, cabinets, agencies and even other local governments to manage the adoption and implementation of blockchain in a smart, methodical and unified manner. In the interim, the work group should identify an intake process for blockchain related inquiries.
>
> **Rationale:** This report has identified many opportunities for adopting and implementing blockchain to create efficiencies in the systems of the Commonwealth of Kentucky. This report has also identified that there are many risks and potential "landmines" that exist in pursing blockchain adoption. The state blockchain officer can identify opportunities in the state government where blockchain could be beneficial, but likewise rule out cases where it would be either unnecessary or even redundant. The officer could serve as the point of contact for blockchain inquiries, market the state to potential blockchain companies and investment, serve as liaison to blockchain organizations, aid or coordinate the operations of the Kentucky Blockchain Technology Working Group and provide general direction and advice for all

things “blockchain”. Additionally, with the creation of this position it will send a clear message nationally and globally that Kentucky is in the vanguard of innovation with blockchain technology**.**

ENVIRONMENTAL IMPACTS

The implementation of blockchain in support of some use cases can require large computational and support resources, such as cooling, that consumes large quantities of power. This increased power demand could result in increased carbon emissions and overall carbon footprint.

INCREASED CYBERSECURITY THREATS

As blockchain technology becomes more prevalent, it will likely be seen as an increased area of focus for bad actors in the realm of cybersecurity. As blockchain sees more widespread use in critical infrastructure, bad actors will tailor attacks focused on the blockchain as a means to interrupt, corrupt, or infiltrate these services. These threats can be more pronounced in smaller scale blockchain deployments.

Legislative Analysis 2015-2020

Disclaimer: This legislative analysis is intended to be used as a general reference guide to recent or current legislation only and will be developed more comprehensively over time as the Blockchain Technology Working Group continues to perform its duties under 2020 Senate Bill 55 and KRS 42.747.

The complete accuracy and comprehensive nature of this analysis cannot be fully guaranteed at the time of issuance of this report. Headings are general in nature to provide a general overview of legislation. Full content of legislative bills should be investigated to determine specific nature of identified legislation before utilizing in any official capacity.

Legislative Summary: The primary legislation based on blockchain technology over the last five years has been to create working groups, task forces or other similar investigative and research groups to explore the potential for development and implementation of blockchain technology within the specific state.

Secondary legislation has been to define or identify blockchain transactions within state legislation to "clear the way" for blockchain implementation and utilization in both corporate and governmental operations. This usage of blockchain technology includes creating/issuing government records, voter registration and voting, and even accepting cryptocurrency as payments by government agencies.

The United States Congress and several states have developed comprehensive blockchain acts that establish cryptocurrency and blockchain as viable technological advances within the state. South Carolina is pushing forward in the attempt to establish itself as the primary blockchain incubator while Wyoming is securing ground in the banking industry and Delaware in the registration, licensing and financing of businesses utilizing blockchain technology as a foundation.

> **Recommendation 3.0:** Kentucky should review the legislation adopted or enacted in other states.
>
> **Rationale:** Blockchain is a highly diverse technology that is still somewhat in its infancy. Because of this, effective legislation can help foster adoption of the technology and its success within the state. By leveraging the experience of other states that have already taken some of the preliminary steps, the Commonwealth can craft legislation that defines blockchain effectively and avoid the constraints that are often placed on an emerging technology through over, or under, regulation.

The following represents current initiatives as well as adopted or enacted(*) legislation:

Working Group, Study Group or Task Force (purposes may vary)

- Arizona: 2020 HB 2400, California: 2018 AB 2658*
- Colorado: 2019 HB 1247*, 2018 SB 443*
- Connecticut: 2019 HB 5417, 2018 SB 513
- Florida: 2019 HB 735, 2019 HB 1393*, 2019 SB 1024*
- Hawaii: 2020 HB 2594, 2017 HB 1481
- Illinois: 2018 SB 5553, 2017 HR 120,
- Kentucky: 2020 SB 55*
- Massachusetts: 2019 SB 200
- Nevada: 2019 AB 533*, 2019 SB 488
- New Jersey: 2019 SB 2297, 2018 SB 2297
- New Mexico: 2020 SB 113

- New York: 2020 SB 8887, 2020 SB 6036, 2020 SB 4562, 2020 AB 1502, 2020 AB 1427, 2020 AB 1371, 2020 AB 1351, 2019 AB 1371
- Oregon: 2019 HB 2179, 2019 HB 2487
- Puerto Rico: 2018 HR 829*
- Texas: 2019 HB 4517
- Utah: 2020 HB 292
- Vermont: 2018 SB 269*
- Wyoming: 2020 HB 27*, 2018 HB 1*

Establishes/Allows blockchain for electronic records, transactions and/or signatures

- Arizona: 2017 HB 2417*
- Arkansas: 2019 HB 1944*
- Delaware: 2019 SB 29*, 2019 SB 89*, 2019 SB 90*, 2019 SB 91*, 2018 SB 182*, 2018 SB 183*, 2017 SB 69*
- Illinois: 2019 HB 3575*
- Iowa: 2019 SF 137
- Maine: 2019 LD 909
- Maryland: 2019 SB 36*, 2018 SB 893, 2018 HB 1100
- Nebraska: 2018 LB 695
- Nevada: 2019 SB 162*, 2019 SB 163*
- New Jersey: 2020 SB 898, 2020 AB 1178, 2019 SB 2462, 2018 AB 3768, 2018 SB 2462
- New York: 2020 SB 6037, 2020 SB 4142, 2020 AB 1683, 2019 SB 4142
- North Dakota: 2019 HB 1045*, 2019 HB 1049
- Ohio: 2018 SB 220*, 2018 SB 300
- Oklahoma: 2020 SB 1741
- Rhode Island: 2019 HB 5683
- Tennessee: 2018 SB 1662*, 2018 HB 1507
- Kansas: 2019 HB 2039*, 2019 HB 2105
- Vermont: 2016 HB 868*, 2016 HB 737, 2015 SB 138*
- Washington: 2020 SB 6028*, 2019 SB 5638*
- Wyoming: 2018 HB 101*

Comprehensive Blockchain Acts

- Massachusetts 2020 SB 200 - Economic Development and Emerging Technologies Act.
- New Jersey 2020 AB 2891 - Digital Asset and Blockchain Technology Act.
- New Jersey 2020 AB 2155 - Digital Currency Jobs Creation Act.
- Oklahoma 2020 SB 1792 - Oklahoma Financial Technology Access and Improvement Act.
- Rhode Island 2020 SB 2777, 2020 HB 7989 - Economic Growth Blockchain Act
- South Carolina 2020 HB 4351 - SC Blockchain Industry Empowerment Act
- South Carolina 2020 SB 1158* - Blockchain Technology Act
- United States 2020 HB 6154 - Crypto-Currency Act of 2020
- United States 2020 HB 8153 - Blockchain Innovation Act
- United States 2020 HB 8132 - American COMPETE Act American Competitiveness of a More

Productive Emerging Tech Economy Act

- United States 2019 HB 1361, 2019 SB 553 – Blockchain Promotion Act of 2019
- United States 2019 HB 528 – Blockchain Regulatory Certainty Act

- United States 2019 HB 923 - U.S. Virtual Currency Market and Regulatory Competitiveness Act
- United States 2019 HB 2154 - Digital Taxonomy Act of 2019
- United States 2019 HB 2144 - Token Taxonomy Act of 2019

Defines cryptocurrency/blockchain transactions

- Arizona: 2018 HB 2602*, 2018 HB 2603*
- Hawaii: 2020 SB 2594, 2019 SB 250, 2019 HB 70
- Michigan: 2019 HB 4103
- North Dakota: 2019 HB 1043
- South Dakota: 2019 HB 1196*

Comprehensive Blockchain Acts (Continued)

- Tennessee: 2020 SB 2840
- Texas: 2019 SB 1859, 2019 HB
- Oklahoma: 2020 SB 1667, 2019 HB 1954
- Utah: 2019 SB 213
- Virginia: 2019 HB 2415
- Wyoming: 2020 HB 4621*, 2020 HB 43