BLOCKCHAIN AND THE LAW OF THE CAT: WHAT CRYPTOKITTIES MIGHT TEACH*

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INTRODUCTION

The invention and wide-scale usage of the internet has created a ripple effect on the behavior of everyday life. The internet allows us to rent homes from strangers,[1] bid on unknown goods from strangers in auctions,[2] find strangers to help move your things,[3] donate computing power to strangers searching for extraterrestrial life forms,[4] and otherwise enter into situations that, without a combination of social norms, market forces, and trustworthy code, otherwise be illegal. This highlights something important about the internet: it exists because people created it to exist. As the semantics of information connections become more sophisticated, there is an increased opportunity for social connections—those moments that augment our ability to connect and interact digitally in ways that

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*In 1996, Frank Easterbrook suggested that the study of Cyberlaw was as useful as the study of the Law of the Horse. What he meant by this was that the best way to teach Cyberlaw would be to teach the most foundational areas of law—torts, property, contracts, etc.—and apply them in this fancy new environment called cyberspace. At the time, this assertion provided a novel way to understand the impact of these new concepts on the practice of law. Yet, as more devices are connected to the Internet and greater advances are made in computer science, the distinctions between real space and cyberspace become muddled. The digital world becomes simultaneously less comparable to the real world and more ingrained in it.

As new technologies like artificial intelligence, machine learning, and blockchain realize more of their potential, the way behavior is regulated in digital space becomes similarly muddled. Innovations such as the sharing economy and the Internet of Things have demonstrated how difficult these challenges can be. In these new digital environments, direct forms of regulation, like law, become less compatible to the unique considerations of the internet, while indirect forms of regulation, such as the architecture (i.e., software code), markets, and social norms, become more effective. This means, in short, there is a growing need to understand the different behaviors a new technology enables in a quantifiable way before designing regulatory frameworks that may or may not meet stated policy goals. Yet, many practical challenges have inhibited the ability of lawmakers to experiment with the way behavior is regulated, including lack of useful data, data security, and implementation costs.

This article surveys early legal scholarship about the ways that behavior on the internet is regulated, explores the opportunity of blockchain and distributed ledger technology through an analysis of the first game built on the blockchain, Cryptokitties, and its associated apps and services, the Kittyverse, and examines the strengths and weaknesses of various approaches to regulating behavior that can be supplemented through the usage of a blockchain.

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[1] See https://www.airbnb.com/.

[2] See https://www.ebay.com/.

[3] See https://bungii.com/.

[4] See https://setiathome.berkeley.edu/ ("SETI@home is a scientific experiment, based at UC Berkeley, that uses Internet-connected computers in the Search for Extraterrestrial Intelligence (SETI). You can participate by running a free program that downloads and analyzes radio telescope data.").

were not previously possible.[5]

Exhibit 1[6]
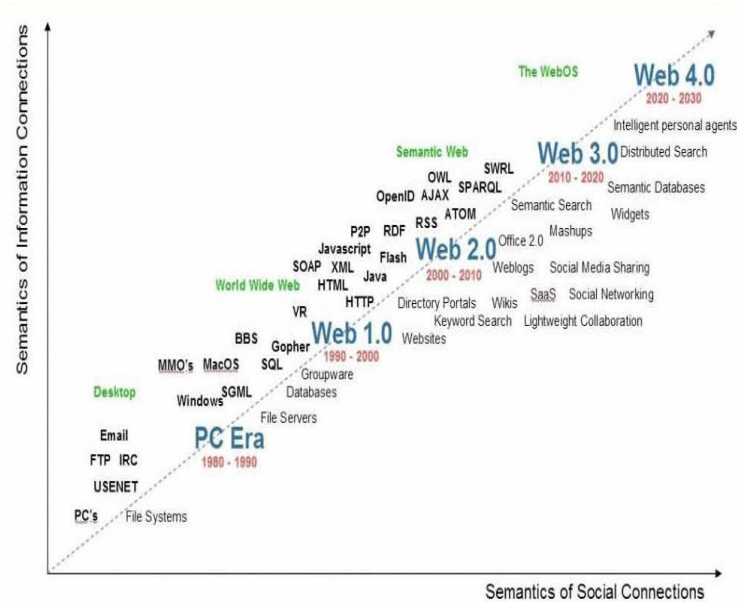
Changes to the way data is collected allow us to make more use of it. Currently, the usage of data from places like social networks, sharing economy platforms, and even dating websites, offers an improved ability to quantify people into groups based on their different characteristics within those apps as a way to better understand the way those groups operate at scale.[7] This information can be used for banal tasks that are often taken for granted, such as recommendations for what restaurant to eat at,[8] what songs to listen to,[9] what professionals to network

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[5] Nova Spivack, *Web 3.0: The Third Generation Web is Coming*, 2007 (Available at https://lifeboat.com/ex/web.3.0).

[6]   https://www.researchgate.net/figure/Evolution-of-the-Web-source-Radar-Networks-Nova-Spivack-2007_fig1_308400135.

[7] Douglas Rushkoff, The Online Economy is Breaking Businesses and Stealing Our Time and Energy, April 9, 2016 (Available at https://medium.com/@rushkoff/the-online-economy-is-breaking-businesses-and-stealing-our-time-and-energy-d62382048a64)("When the Internet came around we all thought we're all going to work at home in our underwear in our own time exchanging value with one another, but instead we've ended up with an Internet that takes more time from us, an Internet that we feel exhausted and drained when we're done using it. And that's because we're not using it; it's using us. The Internet is really just the technological front on a whole series of business plans that are looking to extract money from us, time from us, attention from us, and if we have none of those things, at least data from us.").

[8] See https://www.yelp.com/.

[9] See https://www.spotify.com/us/.

with,[10] and recommendations about which products to buy at a given time of year.[11] However, that same data can be used to positively benefit some of the most critical issues facing society, like monitoring the spread of contagious disease through an analysis of the data exhaust produced from social media platforms or helping health inspectors more effectively use the same data about which restaurants to eat at as a way to more effectively identify possible health code violations.[12] Yet, the fact that all this information we are producing every day can be used to tap into subconscious behavior patterns to keep us using these apps, buying products, and producing data that can further be used to manipulate our decision making is cause for pause. And, in general, this can be seen to have had an impact on the way that people think about trust in America.
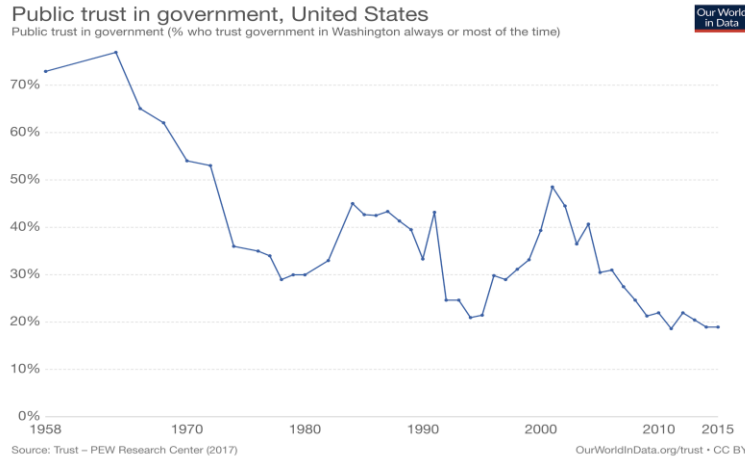
        The idea that new advances in technology might open up even more sophisticated ways of using our data to our benefit is further cause for excitement and caution. In the same way that the decentralized framework of the internet led to the creation of the worldwide web and the semantic web, the advance of blockchain has improved ability to decentralize information, manage that information through permissions and bring users either a higher degree of control of their personal data or further compound many of the issues related to data protection that are being faced today.[13]

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[10] See https://www.linkedin.com/.

[11] See https://www.amazon.com/.

[12] arXiv:1401.2815v2 [physics.soc-ph] (Available at: https://arxiv.org/abs/1401.2815)("Physical contact remains difficult to trace in large metropolitan networks, though it is a key vehicle for the transmission of contagious outbreaks. Co-presence encounters during daily transit use provide us with a cityscale time-resolved physical contact network, consisting of 1 billion contacts among 3 million transit users. Here, we study the advantage that knowledge of such co-presence structures may provide for early detection of contagious outbreaks. We first examine the "friend sensor" scheme - a simple, but universal strategy requiring only local information - and demonstrate that it provides significant early detection of simulated outbreaks. Taking advantage of the full network structure, we then identify advanced "global sensor sets", obtaining substantial early warning times savings over the friends sensor scheme. Individuals with highest number of encounters are the most efficient sensors, with performance comparable to individuals with the highest travel frequency, exploratory behavior and structural centrality. An efficiency balance emerges when testing the dependency on sensor size and evaluating sensor reliability; we find that substantial and reliable lead-time could be attained by monitoring only 0.01% of the population with the highest degree."); The Winning submission for Driven Data, a project that attempted to use data from Yelp to identify trends for social impact, noting in particular that the the winning algorithm "extracted three classes of features: information about a restaurant's history of inspections, metadata about restaurants from Yelp (e.g., the type of cuisine), and data she extracted from the Yelp reviews. Her approach to creating features from the review text involved both sentiment analysis and topic modeling. Ultimately, she combined these features into a model that averaged the predictions of a random forest and gradient boosted decision trees." (Available at http://drivendata.co/blog/keeping-it-fresh-results/).

[13] Matthew Hooper, "Top Five Blockchain Benefits Transforming Your Industry," IBM Blockchain Developers, February 22, 2018 (Available at https://www.ibm.com/blogs/blockchain/2018/02/top-five-blockchain-benefits-transforming-your-industry/)("Across global supply chains, financial services, healthcare, government and many other industries, innovators are exploring ways to use blockchain to disrupt and transform traditional business models. Many industry leaders have already achieved significant business benefits, including greater transparency, enhanced security, improved traceability, increased efficiency and speed of transactions, and reduced costs.").

Exhibit 2[14]

Public trust in government, United States
Public trust in government (% who trust government in Washington always or most of the time)

Our World in Data

Source: Trust – PEW Research Center (2017)   OurWorldInData.org/trust · CC BY

As one of the technologies that promises some of these unimagined possibilities, Blockchain represents a unique study in how, together, it is possible to design for a better future. Popularized as the infrastructure upon which many cryptocurrencies have been built, blockchain has received a great deal of hype for its' ability to reshape how societies interact.[15] The technology, however, also has great implications about how humans interact with one another in the legal system.

> Blockchain technology enables the creation of decentralized currencies, self-executing digital contracts (smart contracts) and intelligent assets that can be controlled over the Internet (smart property). The blockchain also enables the development of new governance systems with more democratic or participatory decision-making, and decentralized (autonomous) organizations that can operate over a network of computers without any human intervention.[16]

This all sounds great and helpful and positive. But the internet was supposed to fulfill some of the same promises blockchain did, but failed because the economic operating system of the internet has been optimized for data extraction.[17] And in a lot of ways, a lack of thorough understanding about the way

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[14] Esteban Ortiz-Ospina and Max Roser, "Our World In Data," (Available at: https://ourworldindata.org/trust).

[15] Tom Espiner, "Is blockchain living up to the hype?" BBC News, October 23, 2018 (Available at: https://www.bbc.com/news/business-45919700).

[16] Wright, Aaron and De Filippi, Primavera, Decentralized Blockchain Technology and the Rise of Lex Cryptographia (March 10, 2015). Available at SSRN: https://ssrn.com/abstract=2580664 or http://dx.doi.org/10.2139/ssrn.2580664.

[17] Douglas Rushkoff, *Throwing Rocks at the Google Bus*, p. 133 ("[a]n economic operating system designed by thirteenth-century Moorish accountants looking for a way to preserve the aristocracy of

the internet is used has led to some misunderstandings. It is now easier than ever to copy some intellectual property that is stored on the internet and use it without paying for it. Deep fakes can make it appear as though a politician is saying things that they never said.[18] Thieves can steal your personal information, such as credit card details, without ever physically coming into contact with you. And, perhaps most broadly, through social engineering it is possible for one nation state to buy advertisements on social media sites, spread disinformation, and influence the results of elections.[19] So it begs wondering: how can blockchain be different? How can blockchain realize more of this potential and do so in ways that actually solve some of these existing problems?

The answer is by experimenting with game theory, social interactions that are incentivize positive behaviors more and disincentivize negative behaviors.[20] Much of the conversation revolving around the technology has concentrated on a relatively small number of narrowly focused use cases that for the most part are, cumbersome, complicated, experimental, and costly. There is one important exception to this.

As one of the first games to be built on the blockchain, Cryptokitties,[21] and the associated constellation of interoperable apps and services, the Kittyverse,[22] solved a big problem for blockchain and helps us better understand the possibility of the third generation of the world wide web, web 3.0, by turning it into a game that can be experimented with. In introducing blockchain under the digital feline equivalent to a trojan horse, Cryptokitties shows that the future will be won through not just smarts, but also through creativity and design.

In the Cryptokitties White Pa-Purr, the developers of the game outline four main tactics for making blockchain more accessible, and these are: 1) gamifying features that leverage blockchain's unique applications, 2) an approachable,

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Europe has worked as promised… This is the real cause of the severity and longevity of the 2007 crash. Rather than figuring out how to compensate for years of central currency's extractive bias, a highly digital finance industry chose to exploit it. The digital perspective that allows us to see money as an operating system doesn't necessarily motivate people to revise the core code so that it serves people better. That would be a pretty heavy lift, even for the most idealistic among us. So instead, bankers and financiers sought to leverage the structural flaws of the money system for their own gain.").

[18] Oscar Schwartz, "You thought fake news was bad? Deep fakes are where the truth goes to die," The Guardian, November 12, 2018 ("Fake videos can now be created using a machine learning technique called a "generative adversarial network" or a GAN… For instance, a GAN can look at thousands of photos of Barack Obama, and then produce a new photo that approximates those photos without being an exact copy of any one of them, as if it has come up with an entirely new portrait of the former president not yet taken. GANs might also be used to generate new audio from existing audio, or new text from existing text - it is a multi-use technology").

[19] *See e.g.,* James Carson, "Fake news: What exactly is it—and how can you spot it?" The Telegraph, March 21, 2019.

[20] *See* https://ncase.me/trust/notes/ Through playing this game, a user can experiment with what personas and roles "win" by looking at the way that interactions are rewarded or punished. As applied to the legal system, this can also serve as a way to understand how regulations can be experimented with in an effort to incentivize the right types of behavior.

[21] https://www.cryptokitties.co/about.

[22] https://www.cryptokitties.co/kittyverse.

consumer-facing brand based on a genuine passion for blockchain technology, 3) an open platform inclusive to users of all levels of technical knowledge, and 4) a sustainable revenue-based model.[23] And these principles have helped the app achieve a great amount of success without any major complications. As of the time of this writing, over a period of approximately two years, there have been 538,043 sales of 431,680 unique cryptokitties, for a total of 56,400.74 Ether at time of sale, or $27,233,377.22—all without leaked data, stolen funds, or any other headline worthy controversy.[24] The game has merely provided a safe environment for learning about future use cases.

From a legal perspective the concept of blockchain represents the difficulty of modernizing regulatory frameworks to new technologies and the opportunity to design a legal system that can more effectively make use of technology as a means for regulation. With the growing number of data breaches and as data intensive applications like the Internet of Things continues to proliferate, the value of approaching new technologies as both a challenge and an opportunity will only continue to grow in importance.

This article looks at how the four guiding principles of Cryptokitties— gamifying technology to leverage its unique applications, capitalizing on genuine interest in the application of the technology, building something in an open way that is inclusive to users of all levels of technical knowledge, and doing so sustainably—can actually serve a larger purpose than playing a game on the internet with fake cats that are bought and sold using a collectively agreed upon store of value. Simply put, the four principles of the Law of the Cat can serve as a model for how to imagine, design, and build regulatory frameworks that compliment emerging technologies instead of impeding them.

To that end, these same principles can empower legal professionals, designers, and technologists to build regulatory frameworks that are as advanced as the technologies they intend to regulate. For example, these four principles can also be used to help create more effective, understandable, and enjoyable experiences on the internet through bringing about a stronger debate of what policy and ethics means in the AI and ML contexts—an area of study that will become more important with the sale of each smartphone, sensor, or device that gets connected to the internet and produces more information about our interactions.

This article unfolds in three parts that, together, seek to provide a broad level of understanding for how to optimize the potential of blockchain for a legal system that regulates behavior more effectively. Part I takes a look at the ways in which regulation has evolved in tandem with various technological advances. Part II provides an overview of Cryptokitties and the Kittyverse to help demonstrate the utility of blockchain for legal and regulatory functions. And Part III looks at specific areas within the practice of law that can be impacted by the same technology used to trade, breed, race, and accessorize digital cats.

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[23] Cryptokitties White Pa-Purr (available from: https://www.cryptokitties.co/about).
[24] https://kittysales.herokuapp.com/ (checked at 6:07 pm on Sunday, March 3).

I. LAW AND CODE

In seeking to understand the way that regulation takes place on the internet there have been two schools of thought. On one side, there are those who recommend studying general themes and applying them to emerging applications. This school of thought represents *The Law of the Horse* crowd.[25] On the other side, there are those who think the Internet and cyberspace is so different from real space that it deserves special attention for its unique properties. This school of thought is best represented by Larry Lessig's Pathetic Dot Model.[26] What is problematic, however, is that both are helpful in different contexts. An individual can gain a better broad understanding through an approach grounded in the Law of the Horse. While another individual can gain a better holistic understanding of regulation by looking at the various factors at work in the Pathetic Dot Model.

What this article seeks to prove is that using a data-centered approach, rooted in Social Physics,[27] along with the four generalized tactics identified in the Cryptokitties White Pa-Purr, there is actually a third approach to regulating behavior on the internet—through building and testing regulations quantitatively—and that is the Law of the Cat. This part provides into an overview of the strengths and weaknesses of the Law of the Horse, the Pathetic Dot Model, and then looks at the concept of social physics to better imagine what some of the regulatory frameworks of the future might look like.

A. Law of the Horse

One of the early suggestions about how to regulate behavior on the internet was from Frank Easterbrook. In 1996, Frank Easterbrook suggested that Cyberlaw was much like the Law of the Horse. What he meant by this was that an understanding of Cyberlaw would come from those foundational areas of law—torts, property, contracts, etc.—and applying them to this new environment of cyberspace.[28] And while general knowledge does help inform more complicated situations, Easterbrook's analysis failed to account for the complexities of the indirect forms of regulation that exist on the internet.

And while there is some merit to the suggestion that studying general concepts as a way to better understand more complex concepts, this theory ignores the unique realities of the way the internet is constructed, what it allows for, and how differently it behaves from real space. Walter Maner's theory of Computer Ethics demonstrates some of the vulnerabilities of this approach.[29] For example,

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[25] Note 29 infra.

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[28] Frank Easterbrook, "Cyberspace and the Law of the Horse" 1996 U Chi Legal F p. 207.

[29] Walter Maner, "Is Computer Ethics Unique?" p.1: "[C]ertain ethical issues are so transformed by the use of computers that they deserve to be studied on their own, in their radically altered form, or… the involvement of computers in human conduct can create entirely new ethical issues, unique to
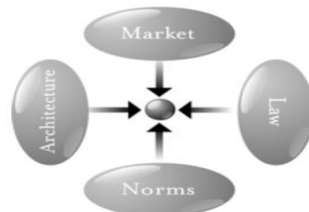
there are difficulties in finding real world analogs to problems that are native to digital environments—such as data breaches, duplication of information, digital surveillance, and even understanding of the value of their personal information—because the technology itself creates a layer of abstraction that makes those given acts more unique from ones that are native to the real world.[30]

The Supreme Court underscored this difference in *United States v. Jones*, Justice XXXXX indicated a reverence for the distinction between physical space and digital space when it held that the placing of a GPS device onto a defendant's vehicle was tantamount to trespass and violated the defendant's reasonable expectation to privacy.[31] And this highlights the main vulnerability of the Law of the Horse: there is a lack of nuance that prevents it from being as agile as it can be. The Law of the Horse will necessarily lag behind disruptive technologies for the very fact that the technologies have caused a disruption. By waiting to look at what law has been in the past and balking at a deeper study of disruptive technologies, future opportunities for that technology are inherently discounted. With the rate of technological advance increasing, this problem can only continue to grow until new methods for regulating are adopted.

B. The Pathetic Dot Model

Famous for stating "Code is Law," Larry Lessig was able to recognize that the internet offered lots of new opportunities that traditional analysis of the law.[32] That is, Lessig recognized that sometimes there were additional factors at play that did a better job of regulating. For example, a safe might be a more effective deterrent against crime than a regulation would be because a safe provides an architecture the prevents a thief from stealing in an instance where a law might not.[33] The same is true of software code.

Exhibit 3[34]

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computing, that do not surface in other areas." https://www.cs.unm.edu/~pgk/readings/unique-ethics2.pdf.
[30] *Id.*
[31] U.S. v. Jones.
[32] See generally, http://codev2.cc/.
[33] *Id. at 120.*
[34] *Id.* at p. 123.

A couple years after Frank Easterbrook's lecture on the Law of the Horse, Larry Lessig offered the Pathetic Dot Model as a mechanism for understanding both the direct means of regulating behavior (i.e., through law) and the indirect means of regulating behavior (i.e., through social norms, markets, and architecture).[35] With the internet, this is especially helpful because this model is more dynamic and adaptive to changes in technology. For example, each of the forms of regulation can directly interact with the pathetic dot, as shown above. The forms of regulation can also work with one another or in various combinations to change each other and their respective impact upon the pathetic dot.

Exhibit 4[36]

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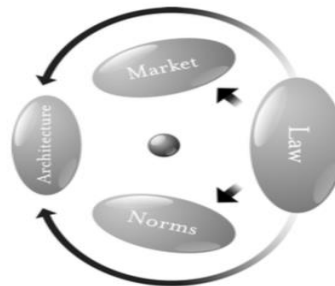
[35] *Id.* at p.124-125; "Law regulates behavior in cyberspace… Norms also regulate behavior in cyberspace. Talk about Democratic politics in the alt.knitting newsgroup, and you open yourself to flaming; "spoof " someone's identity in a MUD, and you may find yourself "toaded"; talk too much in a discussion list, and you are likely to be placed on a common bozo filter. In each case, a set of understandings constrain behavior, again through the threat of ex post sanctions imposed by a community. Markets regulate behavior in cyberspace. Pricing structures constrain access, and if they do not, busy signals do. (AOL learned this quite dramatically when it shifted from an hourly to a flat-rate pricing plan.) Areas of the Web are beginning to charge for access, as online services have for some time. Advertisers reward popular sites; online services drop low-population forums. These behaviors are all a function of market constraints and market opportunity. They are all, in this sense, regulations of the market. Finally, an analog for architecture regulates behavior in cyberspace—code. The software and hardware that make cyberspace what it is constitute a set of constraints on how you can behave. The substance of these constraints may vary, but they are experienced as conditions on your access to cyberspace. In some places (online services such as AOL, for instance) you must enter a password before you gain access; in other places you can enter whether identified or not. In some places the transactions you engage in produce traces that link the transactions (the "mouse droppings") back to you; in other places this link is achieved only if you want it to be. In some places you can choose to speak a language that only the recipient can hear (through encryption); in other places encryption is not an option.19 The code or software or architecture or protocols set these features, which are selected by code writers. They constrain some behavior by making other behavior possible or impossible. The code embeds certain values or makes certain values impossible. In this sense, it too is regulation, just as the architectures of real-space codes are regulations."

[36] "Since *Roe v. Wade*, the Court has recognized a woman's constitutional right to an abortion. This right, however, has not stopped government from seeking to eliminate or reduce the number of abortions. Again, the government need not rely on direct regulation of abortion (which under Roe would be unconstitutional). It can instead use indirect means to the same end. In Rust v. Sullivan, the Court upheld the power of the government to bias the provision of family planning advice by

The Pathetic Dot Model gives us a framework for analyzing the various factors that can contribute to the regulation of different behaviors. In the context of law, though, this stop short of figuring out how to test for ways that regulation could work better. In fact, problem with the Pathetic Dot Model is the same problem as with the Law of the Horse—each of these frameworks for understanding what the law is does little to help us understand how to do the law better. There is not the same type of intellectual rigor as is faced by mathematicians, chemists, physicists, or other scientific types. In those situations, the scientific method can be met and used to more objectively understand how the world around us works. And as a social science, the practice of law ought to be no different.

C. Social Physics

Science has long been an effort that takes data about events, uses it to understand those events, and make it more accessible to people. Looking at the practice of law as a social science, where behaviors and interactions between different parties can be quantified at a broad level, it is a beneficial exercise to explore the science of law. One way this can be done is through social physics. "Social physics is a quantitative social science that describes reliable, mathematical connections between information and idea flow on the one hand and people's behavior on the other.[37] Social physics looks at the way the interactions that people enter into on a daily basis can be used for beneficial reasons. With the internet, the amount of data that is constantly being produced by our apps allows us to measure and quantify the way people interact with each other in new and exciting ways. Further, advances in computer science improve the ability to understand more precisely which factors contribute to certain behavior patterns.

The growth of the internet has changed the way that problems are solved. Cloud computing and the number of endpoints for a given webpage dwarf that of the early internet. And this has been the case for a while. In 2013, Hal Varian, Chief Economist at Google pointed out "a billion hours ago, modern homo sapiens emerged. A billion minutes ago, Christianity began. A billion seconds ago, the

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forbidding doctors in "government-funded" clinics from mentioning abortion as a method of family planning. This is a regulation of social norms (within the social structure of medical care) to regulate behavior. In Maher v. Roe, the Court upheld the right of the government to disable selectively medical funding for abortion. This is the use of the market to regulate behavior. And in Hodgson v. Minnesota, the Court upheld the right of the state to force minor women to wait forty-eight hours before getting an abortion. This is the use of real-space code (the constraints of time) to regulate access to abortion. In all these ways, Roe notwithstanding, the government can regulate the behavior of women wanting abortions. In each of these examples, law functions in two very different ways. When its operation is direct, it tells individuals how to behave and threatens punishment if they deviate from that behavior. When its operation is indirect, it modifies one of the other structures of constraint. The regulator selects from among these various techniques according to the return from each— both in efficiency and in the values that each might express."

[37] Alex Pentland, *Social Physics: How Social Networks Can Make Us Smarter*, Penguin Books, 2014, at pp.4.

IBM PC was released. A billion Google searches ago . . . was this morning."[38] There are no signs that this will slow down. In the paradigm of Big Data and Smart Cities, data has turned into something of a fuel that can be used to derive deeper insights about how and why people interact the way that they do.

Exhibit 5[39]
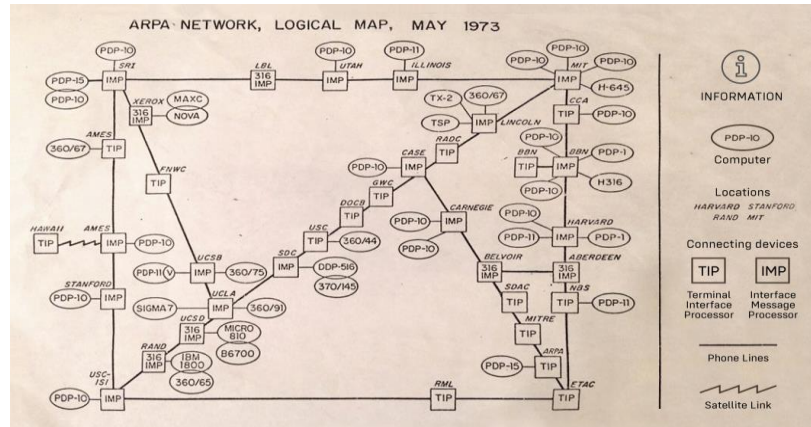
One of the challenges of something like the internet is that it is there is not exactly a straightforward metaphor for understanding web traffic. In the early days of the internet, the traffic of the Internet could have fit under the construction of the Law of the Horse, in as far as learning about the ways that the real world equivalent of zoning and public safety could be used to reduce undesired behaviors such as congestion, speeding, and mortality.

But when comparing that with the map below, which shows all of the different websites and computers that transmit information after typing "http://amazon.com" into my browser, the challenge of web traffic is painted in a more sobering picture.[40] Note, there are 329 different requests that are automatically executed just by typing that in.[41]

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[38] Hal Varian, "Beyond Big Data," lecture, National Association of Business Economists, San Francisco, September 10, 2013. -- from Prediction Machines, available at: http://pombo.free.fr/agrawal2018.pdf

[39] https://www.visualcapitalist.com/paper-map-early-internet/?utm_source=linkedIn&utm_medium=social&utm_campaign=SocialWarfare

[40] *Infra* not 33.

[41] http://webpagetest.org/result/190305_A7_abdedd529fa9eeba26c9c1c21055adc4/.

Exhibit 6[42]
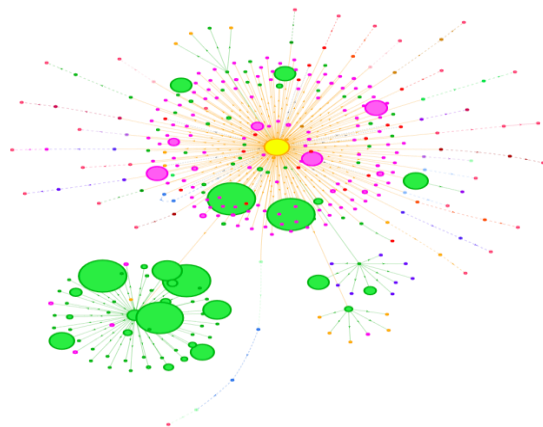
Having lots of data about the way that different people on the internet interact with each other can be quite a good thing. If used with reckless regard for the individuals who produced the data or worse, that same information could also be quite a bad thing. In the case of Social Physics, controlled use of data has been shown capable of producing positive outcomes. Social physics is the idea that game theory can be used to mathematically examine the properties of human societies.[43] This means, through a combination of data producing applications, a way to collect and store that information, and mathematics, it is now possible to see the degrees to which laws actually help produce outcomes that all of us in different networks or jurisdictions, believe to be important.

Information about quantitative function of law, produced, stored, and used in a safe and ethical way can improve the feedback loops for those laws and then, as the future becomes increasingly open and technologically enabled, these legal interactions help quantify the value of those laws in the same manner of markets and exchanges.[44]

Looking at how this occurs daily on the eBay, there is an indication of what one model for this might look like. eBay is an open, technology enabled, way to achieve legal efficiency through a combination of regulatory behaviors (law, markets, social norms, and architectures).[45] There, a user enters into a contract to buy or sell goods for a set cost under set conditions. Technology creates a record

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[42] http://requestmap.herokuapp.com/ → search result for http://amazon.com.

[43] Alex Pentland, "Social Physics and the Human Centric Society" in *From Bitcoin to Burning Man and Beyond: The Quest for Identity and Autonomy in a Digital Society*. Edited by John H. Clippinger and David Bollier, p. 5.

[44] *Id.* at p. 4 "We should think of the economy as an exchange network: a complex web of specific exchange relationships. In fact the idea of a market, in which it is imagined that all the participants can see and compete evenly with everyone else, is almost always an oversimplification. In reality, some people have better connections, some people know more than others, and some purchases are more difficult than others, due to distance, timing, or other secondary considerations.

[45] *See e.g.,* https://www.ebay.com/help/home.

of transactional details, like the parties involved, the goods to be sold, the time in which to sell them. Then, in the event of disputes, there are resolution processes that automatically execute based on a number of factors to ensure that the most efficient and effective outcomes occur. The regulatory framework of eBay offers some insight into what the built future of regulation looks like.

Advances in technology provide further cause for optimism. Artificial Intelligence and machine learning allow us to learn without necessarily knowing. These insights can be used to more agnostically show which patterns contribute to good behaviors and which patterns contribute to bad behaviors.

Decentralized blockchain networks provide a better way to understand mechanisms that more effectively, transparently, and equitably regulate behavior by creating immutable, auditable, sources of records.[46] These records can be used for verifying identity, authenticating ownership, ad determining rights and liabilities issues that have proven to be challenging under the current regulatory paradigm.

In thinking about the ways that technology could be combined with the above approaches, two themes emerge: 1) Technology allows us to measure and quantify things that previously avoided quantification and 2) As technology continues to advance, direct regulation (e.g., law), becomes less effective than code at regulating behavior. This opens up opportunities to experiment with regulations in new and exciting ways, perhaps realizing a notion of Computational Law.[47] In order to better understand how such regulatory frameworks might be built to measurably improve legal outcomes, there is no better place to look than Cryptokitties.

Social Physics requires lots of data, in order to be measured. In the wake of the Cambridge Analytica scandal and the era of distrust in social media platforms, people are growing more concerned about the way their data is used. If there were a safer and more trustworthy way to share data, this concern might be reduced. Then, if there were also incentive structures that allowed people a greater degree of control over how their data is being used, a system of incentives could be set up so that they might share their data, and people could then be empowered to share as much or as little of their data as they like. In this big data era, where social physics can be applied to better understand interactions with one another, the blockchain game Cryptokitties demonstrates a safe, low cost way for storing

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[46] *See e.g.,* Michael Casey and Paul Vigna: The Age of Cryptocurrency: How Bitcoin and Digital Money Are Challenging the Global Economic Order: "At their core, cryptocurrencies are built around the principle of a universal, inviolable ledger, one that is made fully public and is constantly being verified by these high-powered computers, each essentially acting independently of the others."

[47] https://law.stanford.edu/publications/computational-law-the-cop-in-the-backseat/ "In a sense, Computational Law is the natural next step in a progression that began millenia ago. Around 1750 BC, Hammurabi had the laws of the land encoded in written form (literally cast in stone) so that citizens could know what was expected of them and what would happen if they violated those expectations. Since then, it has been the norm to encode rules in written form and disseminate first via books and more recently via the Internet. However, with the proliferation of rules and regulations, just writing things down is not enough when the laws are voluminous and difficult to understand. In a way, Computational Law is the next step in the evolution of the legal system."

information on a blockchain.

II. THE LAW OF THE CAT

Exhibit 7[48]

In the same way that Cryptokitties has helped teach many people about blockchain, it can also help teach people about how to regulate behavior more effectively. The reason this is possible is because the foundation of Cryptokitties is rooted in tactics that can be helpful in improving our understanding of just about any technology.

> Cryptokitties is a game played on the Ethereum blockchain, with ether, the second biggest cryptocurrency after Bitcoin. [In Cryptokitties] you can buy and sell cats, breed them to make a new cat, or rent them out to breed. It makes Kitty DNA a sort of metaphor for blockchain. Each cat has a unique digital identity, and from that it gets its unique features, like green eyes and spots. Kitties with rare traits are more likely to have rare traits in their offspring, though cheap common kitties can, in theory, be bred to produce a rare and expensive cat.[49]

In the Cryptokitties White Pa-Purr, the designers of the game identified four areas that would help make the nebulous concept of blockchain technology more accessible to the average consumer, and those are: 1) gamification of features that leverage blockchain's unique applications, 2) creating an approachable, consumer-facing brand based on a genuine passion for blockchain technology, 3) an open platform inclusive to users of all levels of technical knowledge, and 4) a sustainable revenue based model.[50] The rest of this section looks at the different ways that these four steps can creatively solve the problems that have been

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[48] www.cryptokitties.com.
[49] Vice News Tonight: December 5, 2017. Available at: https://www.youtube.com/watch?v=qk7gRljIKww.
[50] Supra Note 36.

compounded by an out of date regulatory operating system.

A. Gamification

The early days of the internet surely had a much different feel than the internet of now. In those days, the internet was more like a science experiment that transmitted connections with cans and ropes than it was the backbone of a thriving, digital economy. And, critically, the utility of gamification is highlighted by the requirement of experimentation. Ethical issues that other emerging technologies have faced could be avoided by first testing it out in a gamified setting.

Exhibit 8[51]

```
struct Kitty {
    uint256 genes;
    uint64 birthTime;
    uint64 cooldownEndBlock;
    uint32 matronId;
    uint32 sireId;
    uint32 siringWithId;
    uint16 cooldownIndex;
    uint16 generation;
}
```

Cryptokitties helps educate users about the unique features of blockchain, like digital scarcity and smart contracts by turning cats into data, in this case a set of cattributes[52] that are stored as a hash value on the Ethereum blockchain, and creating an exchange where users can buy, sell, and breed Cryptokitties.[53] Then, through the associated applications of the Kittyverse, there is a deeper understanding about how networks of loosely related collaborators (like varying branches within a government, for example) could possibly use common data formats and common systems of record keeping to prevent you from having to fill out your address every time you go to the DMV. Now, like in the early days of the internet, what cryptokitties is demonstrating for blockchain is that most of the fun is in experimenting and creating things.

With lower stakes that reduces the flow of sensitive information, there is more opportunity to iterate and determine which solutions work better than others. Many blockchain applications use test networks as a way to experiment with what works and what does not work before building something that could be used for a long period of time and that has easily avoidable flaws built into the code. This framework for experimentation even seems to be in line with Justice Brandeis' suggestion in *New State Ice Co. v. Liebmann*, where he highlights the role of

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[51] James Martin Duffy "How to Code Your Own Cryptokitties-Style Game on Ethereum" https://medium.com/loom-network/how-to-code-your-own-cryptokitties-style-game-on-ethereum-7c8ac86a4eb3.

[52] https://guide.cryptokitties.co/guide/types-of-cats.
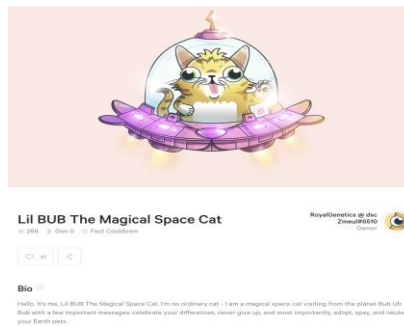
[53] *Infra* Note 19.

experimentation with his famous laboratories for democracy.[54]

To this point, Computational jurisdictions could be set up and modeled to create probabilistic ways for testing what policy language is the best to achieve which stated outcome. And, to some extent, this has started to happen. In the public sector, 18F, a branch of the General Services Administration, created the U.S. Data Federation, a tool to create, collect, and combine data across various government offices.[55] In the private sector, smart city giant, Cisco, has created a series of open APIs that allow users to play in their Devnet Sandbox as a way to test out the viability of new applications.[56]

B. Passionate

Another feature that is helping propel Cryptokitties to such heights is the approachable consumer-facing brand based on a genuine passion for blockchain technology. By leveraging social media presence, a wealth of instructional blogs, demos, and videos about how collaborate in the cryptokitties community, and through special releases that generate excitement. At one point, the game accounted for 15% of the traffic on Ethereum.[57] Rare and exclusive cryptokitties have sold for as much as $100,000.[58] There is even a celebrity cryptokitty that was modeled after Lil Bub.[59] All of these efforts create a sense of contagious excitement about the new ways that blockchain can be used because something as universally appreciated as a digital cat game is less ambiguous and more approachable than something like currency or a digital contract.

Exhibit 9[60]

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[54] https://supreme.justia.com/cases/federal/us/285/262/.

[55] https://18f.gsa.gov/2019/03/05/the-us-data-federation/.

[56] https://developer.cisco.com/site/sandbox/.

[57] Rakesh Sharma, "Cryptokitties Rule Traffic on Ethereum's Blockchain" December 4, 2017 https://www.investopedia.com/news/cryptokitties-rule-traffic-ethereums-blockchain/.

[58] According to https://kittysales.herokuapp.com/ Kitty #896775 was purchased for 600.000 ether, the equivalent of $172,625.79.

[59] https://www.cryptokitties.co/lil-bub?utm_campaign=bub&utm_medium=blog&utm_source=blog

[60] https://www.cryptokitties.co/kitty/266.

And this is certainly an area where the legal system could improve. The legal system is often seen as unnecessarily complex, pedantic, and even directed at achieving the wrong types of outcomes.[61] Such a bad user experience with the law means that people are less likely to want to engage with lawyers, legal professionals, and government workers. Adopting an approach that more directly focused on improving the way that people interact with the legal system could bring about some great benefits. And to some extent, this has started happening in the legal community, grass roots organizations, like Legal Hackers. Legal Hackers is a federated group of volunteers and people genuinely interested in collaborating with one another to improve the way that technology and law interact with one another, with chapters all around the globe.[62] Through hosting distributed and decentralized events, such as the Computational Law and Blockchain Festival (CL+B Fest) this vast network of people are able to build some of the components that will make the legal system more compassionate and accessible.[63]

C. Inclusivity

Like many other mainstream blockchain applications, Cryptokitties uses a transparent approach that harkens all the way back to 2009 when the whitepaper on Bitcoin was produced.[64] Where Cryptokitties is different from a lot of cryptocurrencies, though, is that it has such a heavy focus on inclusion of users of all levels of technical knowledge. The fact that Cryptokitties runs on the Ethereum blockchain means that the game is inclusive of all users in one sense—anyone with

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[61] Lauren-Brooke Eisen and Miriam Aroni Krinsky, "America's Justice System has the Wrong Goals" CityLab, April 26, 2018 (Available at https://www.citylab.com/equity/2018/04/americas-justice-system-has-the-wrong-goals/558761/).

[62] https://legalhackers.org/ ("Legal Hackers is a global movement of lawyers, policymakers, designers, technologists, and academics who explore and develop creative solutions to some of the most pressing issues at the intersection of law and technology. Through local meetups, hackathons, and workshops, Legal Hackers spot issues and opportunities where technology can improve and inform the practice of law and where law, legal practice, and policy can adapt to rapidly changing technology.").

[63] Jameson Dempsey https://stanford-jblp.pubpub.org/pub/clb-fest-overview "The CL+B Fest was a "decentralized conference," a global event centered around a common theme taking place simultaneously in more than fifty independent, self-organized "nodes" around the world (from Australia to Zimbabwe). Each node functioned as a stand-alone conference featuring tracks, content, and speakers chosen by the local node organizers. Node organizers were encouraged to rely on local experts and to tailor each node to local interests and resources, including by developing local language materials to enhance accessibility. Nodes were connected through a central website and several initiatives, including a Global Challenge, a 24-hour hackathon to develop prototypes related to smart legal contracts and blockchain-for-law use cases, and a Global Symposium, a worldwide policy discussion about blockchain-related law and policy issues."
See generally https://legalhackers.org/.

[64] See generally, https://bitcoin.org/bitcoin.pdf. "One of the things that makes the Ethereum community different: Everybody, even if they're working on potentially competitng projects, works together to figure stuff out. It goes against the capitalist, startup world where everyone's trying to beat out everyone. I've never seen anything like this in any other crypto-community this large." https://media.consensys.net/the-inside-story-of-the-cryptokitties-congestion-crisis-499b35d119cc.

a MetaMask wallet can play in the game.[65] This means that the only step to playing around and building apps for Cryptokitties is getting involved. Anyone who wants to play around with the source code of Cryptokitties and look for errors or try to improve it can do so.[66] Additionally, all of the transactions that take place in the game can be viewed on Etherscan show people that their transactions are included in the ledger of transactions and this improve the trust in both the game and technology.[67]

Arguably the most important feature of this inclusion, though, is the fact that this degree of inclusivity is meant for users of *all* levels of technical experience. This focus on inclusivity does two things—it implies a focus that is clear enough for people to understand and requires those designing the law do so with a higher degree of specification. Inclusivity did not stop after Cryptokitties was created. No, the cryptokitties team has continued to use its social media presence, blogs, and videos as a way to create a feedback loop to better understand the pain points of their users. In the context of the legal system, this would be especially important because opening up the law so that it is easier to use can help improve Access to Justice, increase the transparency of the legal system, and improve collective trust in the administration of justice. A local government office in Washington D.C. is experimenting with open-sourcing their regulatory code publicly available through GitHub.[68]

Exhibit 10[69]

This might not seem like that big of a deal, but when you consider what

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[65] https://metamask.io/.

[66] https://ethfiddle.com/09YbyJRfiI.

[67] https://etherscan.io/.

[68] https://arstechnica.com/tech-policy/2018/11/how-i-changed-the-law-with-a-github-pull-request/. Generally, git or "Global Information Tracker" is a type of version control whereby content is stored in a repository, each time an update is made to the content, those changes are stored with a set of information about the content, and others are able to see a log of this content. https://github.com/git/git/blob/e83c5163316f89bfbde7d9ab23ca2e25604af290/README.

[69] https://creativecommons.org/licenses/.

can be done with that information once it is in a form that is more friendly to developers, the potential starts to get more exciting. For example, Creative Commons licenses use a "three-layer" framework to turn legal code of a contract into something that is also human readable (i.e., readable by a non-lawyer) and also that is machine readable.[70] By moving in a more open and collaborative direction, these sorts of design decisions make social physics applications to the legal system much more viable.

D. Sustainable

Like any business model, success is best assured when it is sustainable. Cryptokitties ensures sustainability through by taking a stated fraction of ether any time a cat is bred or sold, sort of like a tax.[71] The validation of this sustainability is clear when looking at the usage statistics after only a couple of years. Kittysales, a site dedicated to monitoring transactions of the game, sheds some light on exactly how well the game is doing.[72] As of the time of this writing, there have been 538,043 sales of 431,680 unique cryptokitties, for a total of 56400.74 Ether at time of sale, or $27,233,377.22.[73]

Another way that Cryptokitties is able to remain sustainable is because it functions as a platform and not just a game. Like in the same way the iTunes store works, Cryptokitties allows developers the opportunity to build new apps on top of the infrastructure that is in place. This demonstrates that interoperable potential for apps that use a blockchain. Because the code is rendered in a format that is agreed upon by the network of miners verifying the ledger, owners can race one of their cryptokitties against another cryptokitty in KittyRace,[74] put their cryptokitty in a battle with another cryptokitty in KittyBattles,[75] or purchase accessories for their cryptokitty on kittyhats.[76]

Exhibit 11[77]

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[70] *Id.*

[71] *Infra* Note 19.

[72] *Infra* Note 20.

[73] *Id.*

[74] https://kittyrace.com/.

[75] https://alpha.kittybattles.io/#/.

[76] https://kittyhats.co/#/.

[77] *Infra* Note 17.

In the e-Discovery space, software provider Relativity has shown the value of creating a sustainable marketplace of legal apps and services. Last year, they were used by all of the AmLaw 200, crunched through pedabytes of data, and have 120 spin-off applications that help address the needs of the e-Discovery ecosystem.[78] After seeing the data about what is possible, this invites more discussion about how these four principles can be applied to existing legal contexts.

Not only do the four general principles I have started calling the Law of the Cat—gamification of a new technology that better understands unique applications, approachable and accessible brand that generates genuine passion for the use of that technology, an open platform that simplifies complex ideas for wide-scale usage, and a sustainable design for implementation of a new technology—serve as a model for how we can implement and use new technologies moving forward, they also serve as a way for better understanding the ways that we might build regulatory frameworks for increasingly complex ideas to improve the function of the legal system moving forward.

III. TOWARDS LEX CRYPTOGRAPHIA

While the law of the horse provides an absolutely necessary overview of the importance of holistic, systems-based, generalized understanding of the legal system, Larry Lessig's Pathetic Dot model and, specifically, the study of new technologies illustrates a more surgical path to understanding the ways specific areas of regulation might be improved or better understood. This much is evident through the creation of the internet, and the subsequent increase in understanding concepts of identity, authentication, cryptography, and distributed networks. We started with a vague and general understanding of where what the internet could do, how it might function in the legal system, and then used the tools at our disposal to more effectively regulate the behaviors of cyberspace. Now, we have apps and services, like the Sharing Economy,[79] High Frequency Trading,[80] automated dispute resolution,[81] instantaneous copyright infringement detection,[82] etc. that simply would not be possible without the types of technology that we take advantage of on a daily basis.

Yet many problems still remain. Lots of people are arrested. Laws,

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[78] https://www.relativity.com/ediscovery-training/academic-partners/.

[79] See generally, Sofia Ranchordas Ranchordas, Sofia, Does Sharing Mean Caring? Regulating Innovation in the Sharing Economy (September 7, 2014). Minnesota Journal of Law, Science & Technology (Winter 2015). Available at SSRN: https://ssrn.com/abstract=2492798.

[80] *See generally,* Kirilenko, Andrei A. and Kyle, Albert (Pete) S. and Samadi, Mehrdad and Tuzun, Tugkan, The Flash Crash: High-Frequency Trading in an Electronic Market (January 6, 2017). Journal of Finance, Forthcoming. Available at SSRN: https://ssrn.com/abstract=1686004 or http://dx.doi.org/10.2139/ssrn.1686004.

[81] https://pages.ebay.com/services/buyandsell/disputeres.html.

[82] https://lifehacker.com/you-cant-fool-youtubes-copyright-bots-1822174263.

especially those governing the internet, can be difficult to understand.[83] The current build of the legal system is expensive and full of vulnerabilities. New technologies will only magnify these issues.

In a lot of ways, blockchain represents creatively solving for the failures of our financial and economic operating system. Created in the aftermath of the 2008 financial crisis, Bitcoin designed a regulatory vehicle that could solve for specific issues, such as information asymmetry, and allow us to fix known vulnerabilities in the code of our laws.[84]

To these ends, the cryptokitties white pa-purr sees several trends begin to emerge that help crystallize our collective understanding about the most viable ways for adopting new technologies to legal use cases. A combination of Lessig's key forces from the pathetic dot model with the distilled principles from the Cryptokitties white pa-purr—the law of the cat—we might develop a better understanding of the different ways that technology (blockchain, in particular), design, and regulation can be used to build a better and more efficient legal system.

The architecture of Cryptokitties demonstrates the opportunity for better efficiency of multiple legal use cases.[85]The Law of the Cat shows how new technology can be instructive in the way that we adopt, understand, and use new technology to regulate increasingly complex sets of behaviors in quantifiable and experimental ways. This part looks at opportunities to build a better and more trustworthy legal system through the inclusion of blockchain and identifies concerns that will need to be addressed before the technology can realize its full potential.

A. Privacy and Data Protection

Like it or not, apps collect high-resolution data of which the user has no specific knowledge or control.[86] The way that our information is managed, through a morass of click-through Terms of Service agreements, becomes increasingly laughable against the backdrop of the Internet of Things because there is no meaningful way for people to understand or control how their data is used. While the EU's General Data Privacy Regulation and the associated Right to be Forgotten go some way to righting this wrong, in light of the frequency of data breaches and cyber security attacks, these do not go far enough.

The problem is so bad that well known companies, such as Facebook and Amazon, stand to make money off the data of its users without them even realizing

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[83] Kerr, Orin S., Vagueness Challenges to the Computer Fraud and Abuse Act (December 22, 2009). 94 Minnesota Law Review 1561 (2010) . Available at SSRN: https://ssrn.com/abstract=1527187.

[84] *See generally, Infra* Note 3x.

[85] It is important to note that the below list is not intended to show, comprehensively, how the law could be improved by new technology. That is something that would take more time than is available to spend on this article.

[86] G. Zyskind, O. Nathan and A. '. Pentland, "Decentralizing Privacy: Using Blockchain to Protect Personal Data," *2015 IEEE Security and Privacy Workshops*, San Jose, CA, 2015, pp. 180-184. doi: 10.1109/SPW.2015.27 https://ieeexplore.ieee.org/abstract/document/7163223.

it, sometimes with disastrous consequences.[87] Privacy self-management,[88] the most popular characterization of how data is controlled, demonstrates that our regulatory framework for privacy rights is woefully equipped to handle the challenges that are unwittingly produced daily, without knowledge, or an effective way to control these rights. In effect, privacy self-management is the reckoning that we are using laws for travel by horse during manifest destiny to govern the automobiles on roads. At a conceptual level, privacy self-management fails to address the problems that are posed by new technologies—there is no centralized way to manage data that an individual produces on a daily basis.

Looking to Cryptokitties for a solution, there is hope for those trying to maintain better control of information that they produce through architecture and design. In order to play the Cryptokitties game, a user must first have a wallet.[89] This piece of infrastructure serves as a central area for a user to review and manage the myriad transactions they enter into. The wallet that is specifically used for Cryptokitties, MetaMask, "includes a secure identity vault, providing a user interface to manage your identities on different sites and sign blockchain transactions."[90]

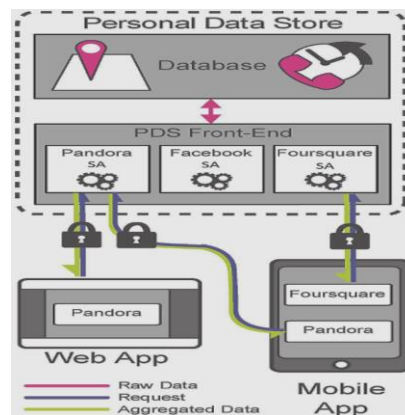[87] https://www.nytimes.com/2018/03/19/technology/facebook-cambridge-analytica-explained.html.
[88] Solove, Daniel J., Privacy Self-Management and the Consent Dilemma (November 4, 2012). 126 Harvard Law Review 1880 (2013); GWU Legal Studies Research Paper No. 2012-141; GWU Law School Public Law Research Paper No. 2012-141. Available at SSRN: https://ssrn.com/abstract=2171018 ("Under the current approach, the law provides people with a set of rights to enable them to make decisions about how to manage their data. These rights consist primarily of rights to notice, access, and consent regarding the collection, use, and disclosure of personal data. The goal of this bundle of rights is to provide people with control over their personal data, and through this control people can decide for themselves how to weigh the costs and benefits of the collection, use, or disclosure of their information. I will refer to this approach to privacy regulation as "privacy self-management." Privacy self-management takes refuge in consent. It attempts to be neutral about substance—whether certain forms of collecting, using, or disclosing personal data are good or bad—and instead focuses on whether people consent to various privacy practices. Consent legitimizes nearly any form of collection, use, or disclosure of personal data. Although privacy self-management is certainly a laudable and necessary component of any regulatory regime, I contend that it is being tasked with doing work beyond its capabilities. Privacy self management does not provide people with meaningful control over their data").
[89] *Infra* Note 19.
[90] https://metamask.io/.

Exhibit 12[91]
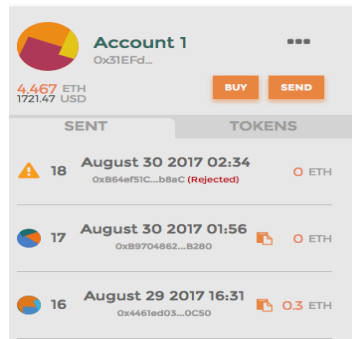
Efforts directly aimed at protecting privacy such as User-Managed Access[92] and Personal Data Stores (PDS)[93] are working to modernize privacy rights for new technologies, while groups like Pribot[94] are using machine learning to automate the creation and analysis of the privacy policies that are out there. Through the implementation of a model similar to that of MetaMask, users will be able to login to their PDS and determine what apps are able to users their data and also determine how much data those apps can use. An example of how this transaction plays out is included, below.

Exhibit 13[95]

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[91] https://medium.com/hellogold/adding-tokens-to-metamask-60b2fedd5bd9.

[92] https://kantarainitiative.org/confluence/display/uma/Home.

[93] de Montjoye Y-A, Shmueli E, Wang SS, Pentland AS (2014) openPDS: Protecting the Privacy of Metadata through SafeAnswers. PLoS ONE 9(7): e98790. https://doi.org/10.1371/journal.pone.0098790.

[94] H. Harkous, K. Fawaz, R. Lebret, F. Schaub, K. G. Shin, and K. Aberer. "Polisis: Automated Analysis and Presentation of Privacy Policies Using Deep Learning", in USENIX Security Symposium, Aug. 2018. Available at: https://pribot.org/files/Polisis_USENIX_Security_Paper.pdf

[95] http://openpds.media.mit.edu/.

Additionally, progressive legal scholars are calling for the regulation of data as a human right.[96] "While new technology solutions are emerging to address the use of our data online, the threat is not solved with technology alone. Rather, it is time for our attitudes and legal frameworks to catch up."[97]

B. Intellectual Property

Intellectual property law has been another area that has failed to adapt to the technological sophistication of the internet.[98] In particular, challenges with the way that information being copied poses the greatest challenge. And, under the existing frameworks, the only real way

Looking at how Cryptokitties might provide deeper understanding of the ways intellectual property protections could be improved, the game can help shine light on registration of intellectual property rights. Cryptokitties demonstrates how to trace the lineage of a good in order to see all of the different owners that have bred with a particular cat or identify previous owners. This is a helpful exercise to understand licensing and sales. The distributed, peer-to-peer nature of these transactions also show how the transactions can function more efficiently, with a similar degree of trust, by reducing the number of intermediaries that need to be involved.

Cryptokitties can also help with IP rights management through smart contracts by programmatically enforcing rights. Anytime a cryptokitty is offered for purchase, it exists in a marketplace. When the reserve price is met, a smart contract creates a hash value of the transaction, that information is recorded, and we are able to see who the new owner is and which rights they own. Further, because cryptokitties exist as non-fungible property, they provide us with a way to understand how to verify authenticity of non-fungible goods.[99] This is another way that it would be possible to verify the authenticity of a given work of art.

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[96] Elizabeth Reneiris and Dazza Greenwood, "Do We Really Want to Sell Ourselves? The Risks of a Property Law Paradigm for Data Ownership" Medium, September 23, 2018. https://medium.com/@hackylawyER/do-we-really-want-to-sell-ourselves-the-risks-of-a-property-law-paradigm-for-data-ownership-b217e42edffa ("[T]here are some uses of (and interests in) our data that transform it from an interest in property to an interest in our personal privacy—that take it from the realm of property law to constitutional or human rights law.")

[97] *Id.*

[98] Gürkaynak, Gönenç and Yılmaz, İlay and Yeşilaltay, Burak and Bengi, Berk, Intellectual Property Law and Practice in the Blockchain Realm (August 1, 2018). Computer Law & Security Review, Volume 34, Issue 4, August 2018, 847-862, doi.org/10.1016/j.clsr.2018.05.027. Available at SSRN: https://ssrn.com/abstract=3285287.

[99] "[U]sing OpenLaw and Ethereum, an original piece of artwork can be uploaded to IPFS and automatically represented as an ERC-721 NFT. Once uploaded, an artist can create an unlimited number of licensing rights, including issuing tokenized non-exclusive licenses and fractional ownership interests for a given piece of artwork. Property and ownership interests are represented by the NFT token and can include different classes of ownership, licensing rights, and resale royalty rights in the original artwork." https://medium.com/@OpenLawOfficial/modernizing-art-with-blockchains-6cba4694833d.

C. Governance

Finally, looking at the topic of governance, there are several ways in which blockchain and, specifically, the governance structured that is used by Cryptokitties can improve the current legal avenues available for regulating behavior between people in some type of group.[100] For many years, difficulty in quantifying ownership of goods led to a sort of heavy handed and binary spectrum of governance at the state level. Narratives about governance primarily center around two forms of governance—capitalism and socialism. Yet, these forms of governance have fallen prey to the same sorts of failures that have been going on for quite a while. And if these issues are not dealt with effectively, especially as technology progresses and the world becomes more complex, there will be less hope that people can govern themselves effectively.

Exhibit 14[101]
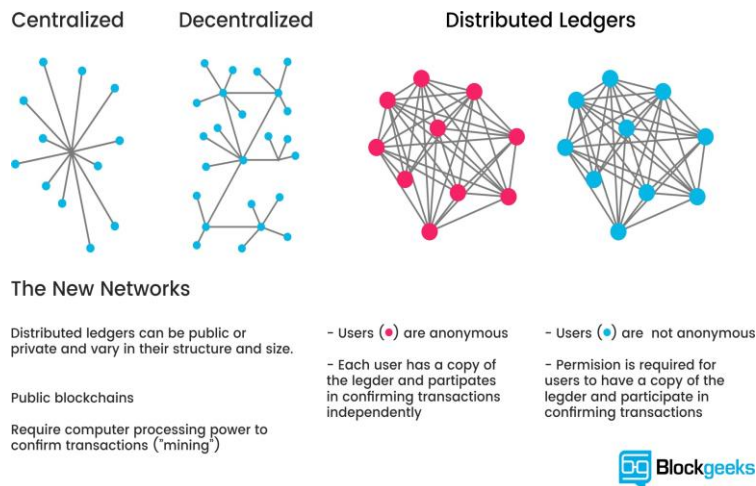
The ability of the blockchain to programmatically make auditable and transparent decisions at scale, now means it is possible to design new types of operating systems for governance that allow us to solve for some of the issues brought about by tragedy of the commons in the same way that Bitcoin helped solve for the financial crisis. Recognizing that governance can be at a low level or a high level, there are different places that illustrate the legal potential of

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[100] David Bollier and John Clippinger, "Authority & Governance" *From Bitcoin to Burning Man and Beyond: The Quest for IDentity and Autonomy in a Digital Society* p. 23 ("Governance is about legitimate authority making decisions that are respected by members of a given community. These decisions generally allocate rights of access and usage of resources, among other rights and privileges. Such governance generally requires a capacity to assert and validate who we are -- to determine our identity in one aspect or another.").

[101] https://blockgeeks.com/guides/proof-of-work-vs-proof-of-stake/.

blockchain as a governance tool.

With a low level of participants, blockchain governance can be examined in the same ways that corporate governance can be examined. In regards to corporate governance, or the way corporate claimholders in a firm interact with one another to best serve their individual and collective interests, blockchain shows there is greater room for creativity and experimentation in the ways that enterprises are set up. And this notion that better, more user friendly solutions might be designed is exciting. Current strategies for Corporate Governance are limited.[102] In cases where disputes arise, some ruling document will govern how different maneuvers are effected. Yet, these require action on the part of those involved. In the context of smart contracts, such as those that are executed when a Cryptokitty is bought and sold for a reserve price on an exchange, there are any number of options that will automatically be executed, free from manipulation or outside interference. Notably:

> Blockchain technology can lower shareholder voting costs and the organization costs for companies substantially. Moreover, blockchain technology can increase the speed of decision-making, facilitate fast and efficient involvement of shareholders. In addition, the main problems with the current chains of intermediaries and remote voting system have to do with transparency, verification and identification–issues that are directly linked to the advantages of blockchain technology.[103]

Further, by literally building a corporation out of code, as a DAO or DO, the corporations of tomorrow can be built according to specifications of anyone brave enough to take on the challenge.[104] Because behaviors are now more quantifiable, through the vast expanse of metadata that is produced daily through the apps we use, it is now possible to measure the degree to which the indirect

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[102] "At the most basic level a corporate governance problem arises whenever an outside investor wishes to exercise control differently from the manager in charge of the firm. Dispersed ownership magnifies the problem by giving rise to conflicts of interest between the various corporate claimholders and by creating a collective action problem among investors. Most research on corporate governance has been concerned with the resolution of this collective action problem. Five alternative mechanisms may mitigate it: i) partial concentration of ownership and control in the hands of one or a few large investors; ii) hostile takeovers and proxy voting contests, which concentrate ownership and/or voting power temporarily when needed; iii) delegation and concentration of control in the board of directors; iv) alignment of managerial interests with investors through executive compensation contracts; and v) clearly defined fiduciary duties for CEOs together with class-action suits that either block corporate decisions that go against investors' interests, or seek compensation for   past   actions   that   have   harmed   their   interests." https://papers.ssrn.com/sol3/papers.cfm?abstract_id=343461.

[103] Lafarre, Anne and Van der Elst, Christoph, Blockchain Technology for Corporate Governance and Shareholder Activism (March 2018). European Corporate Governance Institute (ECGI) - Law Working Paper No. 390/2018; Tilburg Law School Research Paper No. 2018-7. Available at SSRN: https://ssrn.com/abstract=3135209 or http://dx.doi.org/10.2139/ssrn.3135209.

[104] For further reading about the way blockchain deals with governance, read Vlad Zamfir's article on Blockchain Governance 101: https://blog.goodaudience.com/blockchain-governance-101-eea5201d7992.

forms of regulation effectively prevent or incentivize certain behaviors. This allows for building more dynamic regulatory frameworks that are capable of being tested and audited in ways that were previously not practical.

At a broader level, this can be understood by evaluating the architecture that is actually used by popular cryptocurrencies like Bitcoin and Ethereum.[105]

Moving forward, programmatic ownership of rights and responsibilities has the potential to allow for more creative ownership rights at a number of levels, from the use of federations and coops to corporate formation and traditional state-level governance. This sort of innovation has already enabled more creative solutions in how people are able to interact with one another. Through crowdfunding, large groups are able to coordinate better for specific causes at a community level.[106] Through micropayments, people are able to pay for vital services when they need them most, on an as-needed basis.[107] Through Social Benefit organizations, entities are able to designated a purpose, other than strictly for a profit, that their company will be held to. And together, paint a bright picture of what things *can* be like. There are, however, some obstacles that will need to be addressed before the full potential of blockchain can be realized.

D. Concerns

The unique abilities of the internet inherently bring about two types of concerns that are common to all technological advances—theoretical concerns and practical concerns. The theoretical concerns address the reasons why a technology should or should not be adopted. These concerns look at the design of a technology, including specification. Practical concerns, on the other hand, look at the challenges that are associated with actually using a technology. And these concerns are certainly valid.

On the theoretical side of things, there is a concern with the immutable and irreversible nature of blockchains. This feature of blockchain raises the stakes for what it means to programmatically transfer money back and forth. A couple years ago, a kid altered the code of a smart contract that had the effect of restricting the ability of people who own currency subject to the smart contract, effectively deleting that currency from circulation.[108]

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[105] Notes 109 - 116, *Infra.*

[106] *See e.g.,* Belleflamme, Paul and Lambert, Thomas and Schwienbacher, Armin, Crowdfunding: Tapping the Right Crowd (July 9, 2013). Journal of Business Venturing, 2014, 29(5), 585-609; CORE Discussion Paper No. 2011/32. Available at SSRN: https://ssrn.com/abstract=1578175 or http://dx.doi.org/10.2139/ssrn.1578175.

[107] *See e.g.,* Mas, Ignacio and Radcliffe, Daniel, Mobile Payments Go Viral: M-PESA in Kenya (March 1, 2010). Capco Institute's Journal of Financial Transformation, No. 32, p. 169, August 2011; YES AFRICA CAN: SUCCESS STORIES FROM A DYNAMIC CONTINENT, P. Chuhan-Pole and M. Angwafo, eds., World Bank, August 2011. Available at SSRN: https://ssrn.com/abstract=1593388.

[108] Thijs Maas "Yes, this kid really just deleted $300 MILLION bymessing around with Ethereum's smart contracts" Medium, November 8, 2017. (Available at https://hackernoon.com/yes-this-kid-really-just-deleted-150-million-dollar-by-messing-around-with-ethereums-smart-2d6bb6750bb9).

Because they are effectively a series of protocols, and because those protocols can be set up to exploit individuals, there is a concern with the code in a blockchain—or the governance of that blockchain. Blockchains rely on the collective decision-making ability of nodes within the network, if one person or group secures a majority of the decision-making ability then they have the ability to alter the ledger of transactions. This is often referred to as the 51% problem and is 100% the case for blockchains governed using Proof-of-Work systems to confirm transactions on a ledger.[109] In a Proof-of-Work system, transactions are bundled together into what we call a block; miners verify that the transactions within a block are legitimate by solving a mathematical puzzle known as a proof-of-work problem; a reward is given to the first miner who solves each block problem; and the transactions that have been verified as a block are stored on the blockchain.[110]

However, there is a growing rise in popularity of an alternative model called Proof-of-Stake. In a Proof-of-Stake system, such as the CASPER protocol that is being implemented on the Ethereum blockchain, validators of a transaction must stake a certain amount of their own funds before they can start confirming transactions.[111] The principal architect of Ethereum, Vitalik Buterin, suggests that this system accomplishes economic finality in a more trustworthy manner by requiring validators to submit deposits to participate, and taking away their deposits if the protocol determines that they acted in some way that violates a previously agreed upon set of rules.[112]

Another benefit to moving in the direction of Proof-of-Stake is toward a more sustainable protocol, which has turned into an additional reason for caution when dealing with these systems at scale. One side effect of blockchain governance is that the structure of a blockchain will dictate how much computing power is required in order to verify transactions. Certain designs are more energy efficient than others. Some designs are so energy intensive, however, they may prove to cost more than they are worth.[113]
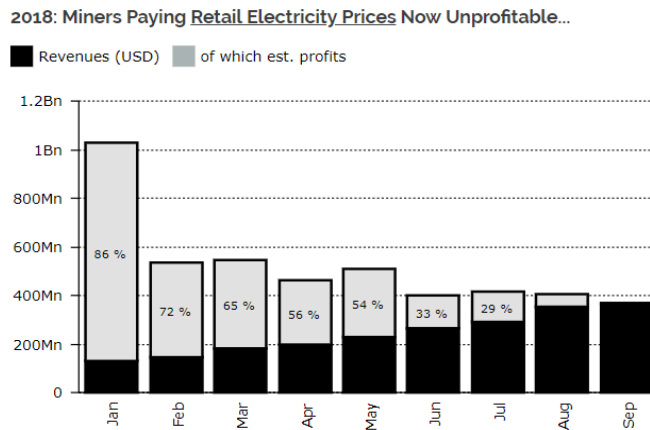
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[109] The age of cryptocurrency.

[110] https://blockgeeks.com/guides/proof-of-work-vs-proof-of-stake/.

[111] https://arxiv.org/abs/1710.09437.

[112] https://blockgeeks.com/guides/proof-of-work-vs-proof-of-stake/.

[113]   https://www.marketwatch.com/story/if-youre-mining-bitcoin-from-home-youre-now-losing-money-2018-10-12.

Exhibit 15[114]

2018: Miners Paying Retail Electricity Prices Now Unprofitable...

Sustainability in the blockchain is accomplished by reducing the amount of computing energy that is required in order to confirm a transaction happens. Off-chain forms of governance such as layer two protocols, popularized by the Lightning Network, also help achieve this same goal and further reduce the ability to alter the information stored in a blockchain.[115]

On the practical side of things, there are a different set of concerns. Two main concerns when it comes to leveraging the potential of blockchain in the legal context are with the how to implement are incompatibility with existing regulatory frameworks and difficulty implementing such frameworks.

One such example of a practical incompatibility with existing regulatory frameworks would, somewhat ironically, be the General Data Privacy Regulation (GDPR) in the European Union. From the outset, it would be difficult to say which transactions recorded on a blockchain would fall under the jurisdictional requirement of the GDPR because, by design, popular blockchains do not record this information.[116] The European Union Blockchain Observatory and Form noted that in blockchain networks, information does not flow linearly from users to providers and back in the way the GDPR was meant to govern.[117] On top of this, the immutable nature of blockchains make it practically impossible to abide with

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[114] *Id.*

[115] "What Is Lightning Network and How It Works" Coin Telegraph https://cointelegraph.com/lightning-network-101/what-is-lightning-network-and-how-it-works.

[116] Andries Van Humbeeck "The Blockchain GDPR Paradox" Medium, November 21, 2017 (Available at: https://medium.com/wearetheledger/the-blockchain-gdpr-paradox-fc51e663d047).

[117] "Blockchain and the GDPR" The European Union Blockchain Observatory and Forum" October 16, 2018 https://www.eublockchainforum.eu/sites/default/files/reports/20181016_report_gdpr.pdf p.4.

the so-called Right to be Forgotten.[118]

Further, as a general matter there are also concerns about the ethical considerations of implementing something legal that is designed by someone who is not a legal professional. The Model Rules of Professional Conduct have a general ban on profit sharing between attorneys and non-attorneys. The result of this prohibition is an insulatory effect on the business of law.

Finally, there is the matter of successfully implementing a blockchain system. While there is plenty of incentive to move toward more efficient systems, legacy institutions such as law firms and government offices are incredibly risk averse and are hesitant to move toward an operating system that can programmatically delete money or sensitive information. Similar to the concept of sunk cost, there is a stickiness factor that keeps firms, especially large enterprise institutions like banks and law firms, from moving toward more efficient solutions. Santander has even suggested that the legacy infrastructure of banking institutions could see costs reduced by between $15 billion and $20 billion per year in 2022, completely changing the cost dynamics of the way banks are set up.[119] However, the fact that most blockchain applications, even those pilots by IBM and others, are in their infancy means that they are going to remain somewhat expensive and experimental for some time to come.

IV. CONCLUSION

Living in an experimental and inexpensive world is one of the primary reasons that Cryptokitties is such a breath of fresh air—it allows us to enjoy blockchain for what it is, right now, instead of trying to change our economic operating system overnight. There are not the same risks that are posed with financial systems that are meant to upend the way the economy works, or the potential for disaster that can often be associated with sensitive data. The Law of the Cat and the meteoric rise of Cryptokitties allows us to take a moment to reflect on what our values as a society are while still optimizing for data collection in ways that empower people. This period of reflection allows time to understand what a possible digital future can offer, measure the ways that such a future could be optimized, and directly embed our digital values into an infrastructure that is better for society at a broader level.

Just in the same way that the laws of physics can be used to measure the way objects in the real world interact with one another, constructions like the Law of the Horse, the Pathetic Dot Model, and the Law of the Cat can be used to measure the way objects interact using data and social physics. In the timeline of understanding new technologies, each of these constructions is helpful at

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[118] See GDPR (https://gdpr-info.eu/); although, it should be worth noting that when a hard drive is deleted, information stored on that hard drive is technically written on top of and not deleted, thus the waters here are not quite as clean as they might appear for even existing technologies.

[119] Jason Bloomberg "Don't Let the Blockchain Cost Savings Hype Fool You" Forbes, February 24, 2018 (Available at: https://www.forbes.com/sites/jasonbloomberg/2018/02/24/dont-let-blockchain-cost-savings-hype-fool-you/#6d693f215811).

understanding how law, as a social science, might better be understood. The Law of the Horse is applied as a way to generally understand regulations. The Pathetic Dot Model can be used to better understand the different features that regulate a specific behavior. And then social physics can be applied through the Law of the Cat as a way to continue building out regulations that are continuously serving their purpose in low cost, low risk environments, and that incentivize positive collaboration between those that would be regulated by a particular law.