Bitcoin as a Communications Channel & Universal Language: Advancing Research in Computer-Mediated Communication

Ella R. Hough

College of Arts & Sciences, Cornell University

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Human communication arose out of the need to trade, to exchange. Fittingly, the majority of humanity's 7,000 languages are found in tropical zones with plentiful food resources whereas in cold zones, where there was more to be gained from a shared language to establish trade, there is less language diversity (Christiansen & Chater, 2022, pp.182-183). Human communication in the form of language was an evolutionary adaptation influenced by biological and cultural evolution. Further, influencing the evolution of writing and programming languages as society progressively moves to the digital realm, trade continues to be a catalyst for the evolution of human communication.

Trade evolves our society, but the medium by which it occurs has not been allowed to properly evolve. As communication moves into the digital realm, on what rails will it be most effective to pass through? The most recent and consequential evolution in human communication protocols began in 2008. This paper will consider Bitcoin, as the first (verifiable) language all 8+ billion people can speak, as a form of nonverbal computer-mediated communication to serve the future rails of trade and exchange of value.

Concerning Bitcoin in the realm of language and technology, there are a multitude of relevant topics to be focused on such as the evolution of communication theories like Speech Act Theory, Intergroup Relations & Communication, Nonverbal Communication (NVC), Linguistic Intergroup Bias, Human-Computer Interaction (HCI), Computer-Mediated Communication, Values-Centered Design, and Computer-Supported Cooperative Work (CSCW). However, this paper will explore the impact of bitcoin as a communications channel (protocol) in regards to progressing the literature on Computer-Mediated Communication, specifically regarding

Nonverbal Communication and Human-Computer Interaction. Prior to doing so, to establish common ground, this paper will provide a contextual literature review on mobile money and Fintech, bitcoin vs. blockchain, and bitcoin use cases. Providing this background will lay the groundwork for the arguments presented in the NVC and HCI sections. Finally, the paper will conclude with the importance and implications of decentralized and open-source protocols as a whole for future research on design principles for the 21st century.

Background Literature Review

1. Mobile Money & Fintech

While bitcoin is the best money and has already evolved money and trade in many places around the world, it is not the first "mobile money" or "financial technology." The first stage of evolution occurred between 1866 - 1967 (Barroso et al., 2022, p.2). In 1866 and 1918, respectively, the first transatlantic cable and Fedwire, combined with the telegraph and morse code created the first electronic fund transfer system (The Payments Association, 2020). In 1967, the first ATM was invented, marking the first integration of finance and technology (Barroso et al., 2022, p.2).

1967 - 2008 marked the second stage of evolution when in the 1970s, another communications protocol evolved for cross-border payments, SWIFT (Society For Worldwide Interbank Financial Telecommunications), credit cards appeared, and in 1998, PayPal was born (Barroso et al., 2022, p.2; The Payments Association, 2020). 10 years after PayPal was born, in 2008, amidst a background of mounting distrust in the banking system and the 2008 financial crisis, a third evolution came at the advent of a communications protocol to "make payments over a communications channel without a trusted party" (Nakamoto, 2008). The Bitcoin timechain is a communications channel "based on cryptographic proof instead of trust, allowing

any two willing parties to transact directly with each other without the need for a trusted third party" (Nakamoto, 2008).

In a 2016 literature review of "digital financial services" and "mobile financial applications for the developing world" to remedy financial exclusion, 46 computer science papers were analyzed (Castle et al., 2016). Critically, they filtered to begin in 2007 as that was the year M-Pesa, a widely used Kenyan mobile money protocol, launched. Researchers Castle et al. found that most of the academic literature was centered on "user interfaces" and "secure authentication" despite on-the-ground feedback of the "importance of robust and reliable agent networks" (Castle et al., 2016). Interestingly, in this paper's literature review of "bitcoin," "blockchain," and "communication," these remain in the top topics as well. Further, they note a lack of cellular infrastructure as a roadblock and an overall lack of quantitative data (Castle et al., 2016). In a more recent literature review from 2022, researchers Barroso et al. analyzed 193 papers to garner trends in financial technologies from 2008 - 2019. Notably, they found most literature concerns "regulation" followed by "challenges"and "opportunities for collaboration;" Interestingly, papers on these topics were first published in 2010, 2008, and 2016, respectively (Barroso et al., 2022, pp.11 & 7). They also share that the "main drivers of Fintech success [are] development of technology, customer experience, organization culture, funding and government regulations" (Barroso et al., 2022, p.11). Finally, regarding "digital money," specifically, they note "the focus is mainly on bitcoin as it represents the most important cryptocurrency in existence" while also acknowledging "further research on other cryptocurrencies or the interrelation of them could be a potential point of future analysis" (Barroso et al., 2022, p.14).

2. Bitcoin vs. Blockchain & Bitcoin vs. Cryptocurrencies (Crypto)

The first evolution of the "Digital Finance" field lasted 101 years. The second 41 years. We are 16 years into the third. The second evolution occurred 59% faster than the first. Perhaps Moore's Law, which states that the capability of computers could double every two years has played a part. Regardless, if the third evolution were to occur 59% faster than the second, it would call for an evolution today, as 16-17 years marks a 58.5-60% increase. Academic literature might lead one to believe that "blockchain" will lead this evolution. For instance, a 2022 literature review and research agenda of blockchain and HCI analyzed 99 papers and concluded that:

> Bitcoin has laid the foundation for cryptocurrency and blockchain adoption, so it is not surprising that the majority of existing research focuses on the use of Bitcoin. However, the cryptocurrency and blockchain space is diversifying with new generations of blockchain platforms, which are being increasingly adopted by users, developers, and the market. This can also be seen in the gradual decline of Bitcoin's dominance (Fröhlich et al., 2022, p.170).

Further, the literature has also supplied terminology for this evolution: "Web 1.0 allowed users on the internet the possibility to read content. Web 2.0 introduced the option to write, and thus enabled rich interactive internet applications. Powered by blockchain, web3…adds the possibility to own, create, and distribute digital assets" (Fröhlich et al., 2022, p.169). Expanded:

> Blockchain 1.0 describes cryptocurrencies like Bitcoin, affording the transaction of digital property. Blockchain 2.0 describes…the creation of new decentralized economies and financial instruments, based upon 'smart contracts' – code which is written into and executed on the ledger….Blockchain 3.0 imagines the diffusion of blockchain

> technology, and decentralized principles of governance and justice throughout society (Elsden et al., 2018, p.2).

However, the author begs to differ. To begin, there is a website that tracks how many times bitcoin has been proclaimed "dead," and as of December 18th, 2024, the number is 477 (Bitcoin Obituaries Archives, 2024). Further, according to a dashboard tracking the perception of bitcoin, the majority of news reports about bitcoin are now leaning positive (Wüstenfeld, 2024). At its core, academic and mainstream narrative seem to have lost sight of the fundamentals. At its core, a blockchain, "distributed ledger technology," is a way of storing (most commonly financial) information. It is digital, decentralized, immutable, ordered, append-only, verifiable ledger (more correctly, an ordered data structure) of information. Bitcoin was the first "blockchain," but "Bitcoiners" often refer to the bitcoin blockchain instead as the bitcoin "timechain." For an analogy describing blockchain's features, the longest running "blockchain" is the New York Times (1851). In its printed form, it is decentralized (every person could own every issue), immutable (can't be edited), ordered (by publication date), append-only (can only have successive issues printed), and verifiable (can compare issues against each other). Upon creation, all blockchains must solve "The Blockchain Trilemma." They must choose two out of three aspects (security, decentralization, scalability) to "optimize" for. Security and decentralization must be optimized on the first layer (Layer 1) to build a blockchain with a foundation that lasts (like steel for a building vs. a sand castle) to serve its stated purpose. The bitcoin timechain is the only "blockchain" that successfully optimizes for security and decentralization on Layer 1, addressing "scalability" on Layer 2.

"Cryptocurrency" refers to a digital currency that is designed to record and process transactions in a decentralized manner as it is secured by cryptography rather than trust in a third party. As Parker Lewis and Jimmy Song, respectively, eloquently put it:

> monetary systems converge on one medium because their utility is liquidity[, which] consolidates around the most secure, long-term store of value & what altcoin founders inevitably discover is that decentralized blockchains don't scale well for applications other than money. This leads to decisions made by the altcoin teams to sacrifice decentralization for efficiency so that they can deliver on their promises of decentralized apps, NFTs, and fast transaction times. They sacrifice the most important traits — security and decentralization — for increased functionality and efficiency (Callahan, 2022b; Lewis, 2019).

These statements are seen in practice. In a 2013 - 2021 study by Jump Crypto of 3,759 tokens vs. bitcoin, after one year, 84% were under water and had a -78% median annual return (Callahan, 2022a). Further, highlighted in a May 2022 report by Sam Callahan, the median performance of 161 cryptocurrencies after a median of 274 days since their listing on Coinbase was - 67.3% (Callahan, 2022a). Further, on November 21st, the ratio of Ethereum, which has the second largest market cap after bitcoin, to bitcoin fell to "0.032, marking its lowest point since March 2021" (Yahoo Finance, 2024). The perception is bitcoin is a subset of broader "blockchain" or "crypto," but it is not, it is one of one.

When thinking about the future of digital communication protocols for trade, it is beneficial to reflect on history. Communication protocols evolved from gestures → writing → printing press → programming languages → internet. Academic literature might equate bitcoin to the printing press and blockchain to the internet, the foundation where many applications can

be built, but in reality, bitcoin is closer to the internet and blockchain technologies are closer to the apps built on the internet. In each of these evolutions, the ability to preserve information (at scale) increased as energy expended increased. Energy is required for preservation. The bitcoin timechain maintains its steel-like foundation of decentralization and security because its Proof of Work consensus mechanism is intricately tied to time and energy, the scarcest resources. Blockchains have opted for "energy efficient" consensus mechanisms, reducing whatever decentralization, security, and preservation abilities they had in the interest of scalability on the base layer. Distrust ensued in the banking system, evolving communication protocols to where they are now, because of fractional reserve banking and the energy efficient ability to increase the money supply at will. Energy consumption is vital for the transmission and preservation of information, of meaning, and an energy-consuming communication protocol (just like humans breath to speak or write), will be and is the future rails of monetary communication.

3. Who Uses Bitcoin

Having established that bitcoin is one of one and the only "blockchain" with the structural integrity to be a communication protocol sturdy enough to be the rails on which all 8+ billion people could transact and exchange, to best understand bitcoin's role in the literature of NVC and HCI, it is prudent to first understand its current user demographic.

From 2013 - 2015, interviews of 16 early Bitcoin participants were conducted across Hong Kong, Singapore, and Baltimore. The researchers note that bitcoin has gone through two stages of appropriation. The first stage from 2009 - 2012 contained libertarians, Silk Road users, and supporters of the Occupy Wall Street movement who talked through bitcointalk.org, internet relay chat channels, and other social media. The second stage from 2012 - current (at the time of publication), added bankers, entrepreneurs, and technology hobbyists who began gathering

through 594 bitcoin-related Facebook and Meetup groups across 71 countries (Kow & Ding, 2016). Of the 16 study participants, most "had at least one intellectual or technical interest (i.e., libertarianism, finance and money, or software), and most…were also male (15 out of 16)" (Kow & Ding, 2016). Next, a 2021 study done by Abramova et al. surveyed in a novel way 395 crypto-asset users and came up with three categorizations: "cypherpunks" (experienced crypto-asset advocates and enthusiasts), "hodlers" (security-concerned and profit-oriented traders and investors), and "rookies" (inexperienced users motivated by fear of missing out)" related to security behaviors (Abramova et al., 2021, 2). Notably, these categorizations stemmed from the Protection Motivation Theory and the Theory of Planned Behavior, which have influenced the Technology Acceptance Model often used in HCI literature (Abramova et al., 2021, p.2). More recently, preliminary results from the forthcoming study done by Professor Sarah Kreps and Ella Hough in the Cornell Brooks Tech Policy Institute, gathering qualitative and quantitative data from 25,000 persons across 25 countries, studying the relationship between Bitcoin and adoption and financial freedom, showed that in the US, bitcoin ownership is highest among men that have high income and are in the Millennial age range (Kreps & Hough, 2026). Notably, this aligns with the results found earlier this year in a Nakamoto Project Report (Cross & Perkins, 2024). Di Domenico et al. have also pre-registered their hypotheses for a study evaluating the personality and motivational characteristics of Bitcoiners (Di Domenico et al., 2023).

Nonverbal Communication in Use Cases

As ownership is varied, so is use. However, all of bitcoin's use could be categorized under the realm of "nonverbal communication." In their review of Nonverbal Communication for the Annual Review of Psychology, researchers Hall et al. describe NVC as "the common denominator in social life" and choose to focus on behavior that is encoded and decoded by

perceivers, commenting on its vast interdisciplinary nature (Hall et al., 2019, p.272). Further, they regard that "technology has always been crucial to the development of the NVC field" and share an urge for studying how NVC cues "operate in concert and over time, reflect meaning and intention, and exert their impact," mentioning that while "study of the impact of social media and digital devices on people's NVC skills is in its infancy[,] questions about how technology might affect rising generations could have profound implications for the…NVC field as a whole" (Hall et al., 2019, pp.286-287). Hall et al. probably didn't consider communication channels such as bitcoin impacting the NVC field, yet human exchange through money is another "common denominator in social life" and bitcoin is an avenue for solving discrepancies between encoding and decoding messages and understanding how NVC cues "reflect meaning and intention" and exert impact.

Published in 2022, a 2020 study of bitcoin used around the world sent 14 surveys out to 1,200,000 users of LocalBitcoins, the largest peer-to-peer bitcoin marketplace, across 25 countries and received 66,000 responses, finding predominant use-cases (from largest to smallest) include: trading, investing, payments, store of value, remittances, learning, salary, other (Andreianova et al., 2021). A more recent scoping review from 2024, analyzed 17 articles from 10 countries to find investment and savings most common followed by payments and international transfers. While the literature acknowledges use-case at the national level in terms of legal tender in El Salvador, Apatu and Goudar note the literature is likely failing to capture individual-level societal use cases such as in circular economies (Apatu & Goudar, 2024).

More broadly, in their 2017 paper, Suzuki & Murai "propos[e] using blockchain transactions as an audi-table communication channel…run[ning] on top of the Bitcoin test network" despite failing to realize the criticality of PoW (Suzuki & Murai, 2021). Similarity,

Sharma et al. propose “a blockchain based secure communication framework for community interaction” and Khacef and Pujolle “propose a secure messaging solution based on the blockchain technology” (Sharma et al., 2021, Khacef & Pujolle, 2019). Further, other researchers describe “blockchain [as] an essential part of private, public and global communications[, that] it may just be seen as a particular tool that will win the future in every order,” that it has “emerged as a disruptive force in communication[, and that] the potential applications of blockchain in communication are vast and diverse” (Baker El-Ebiary, 2021, p.132; Sfetcu, 2024, p.6). Further, in their paper for the Yale Journal of Law & Technology, Shackelford and Myers shared that the “U.S. Defense Advanced Research Projects Agency (DARPA) is investigating blockchain technology to “create an unhackable messaging system” and showcase their belief in blockchain to be a tool to build trust and promote “cyber peace” (Shackelford & Myers, 2016).

Unfortunately, as viewable, there is immense drift in the academic literature on what a blockchain came into being to do. Blockchains are only good for money, money converges to one medium, and money will converge on the medium that is the most secure and the most decentralized, which has been stated is bitcoin. Regarding, “cyber peace,” while controversial to some, Major Jason P. Lowery wrote *Softwar: A Novel Theory on Power Projection and the National Strategic Significance of Bitcoin* for his thesis at MIT in 2023. Regarding semantic communication protocols, there does exist literature looking at secure and auditable communication outside of a blockchain. For instance, in 2023, Ehud Shapiro wrote *Grassroots Social Networking: Serverless, Permissionless Protocols for Twitter/LinkedIn/WhatsApp,* to present an architecture for the “open challenge” of “offering a viable alternative architecture to centrally-controlled global digital platforms for social networking” (Shapiro, 2023, p.14). While Shapiro acknowledges alternatives such as Mastodon and Scuttlebutt, he does not yet appear to

have considered Nostr (Notes and Other Stuff Transmitted by Relays), which is “the simplest open protocol that is able to create a censorship-resistant global “social” network once and for all” and was created by Fiatjaf in 2019 (Fiatjaf, 2020). Further, “social networking” is likely only the beginning for Nostr and many other apps are viewable on nostrapps.com. While blockchains will build their decentralized apps (dApps) in silos, Nostr, non-siloed, allows the creativity and ingenuity of every developer and participant to flow to every other participant.

Worldwide, bitcoin as a communications protocol is a tool used in nonverbal communication and it’s because bitcoin is decentralized, secure, and energy backed money, not because it’s just another “blockchain” or “cryptocurrency.” While it can be lost in the space that bitcoin fundamentally came into existence as a communications channel to facilitate peer-to-peer exchange, organizations such as Btrust Builders, Vinteum, Librería de Satoshi, Area Bitcoin, and Chaincode Labs are bringing developer education to those who will continue to build this tool. With use cases from daily payments to investing to national security, bitcoin as a tool (in human exchange such as trade) opens the floodgates of research considerations for the NVC field. And, as “nonverbal” might imply, non-human agents such as computers are and will be involved, underlying the additional need for bitcoin as a monetary communications protocol to be considered in the literature of human-computer interaction.

HCI & Future Implications

Now would be an opportune time to mention that lowercase (b) bitcoin represents the asset and uppercase (B) Bitcoin represents the encompassing network. For an analogy you could think of dollars as “fiatcoin” and the societal structures around us as being influenced by the “Fiat Network” (h/t Saifedean Ammous). Interestingly, the word “bitcoin” is mentioned twice in the white paper. The word “network” is mentioned twenty-one times in the white paper

(twenty-one is a recurring number in Bitcoin). With the addition of a second person, a network emerges. When there are two people instead of one, communication emerges as a necessity. The Bitcoin network holds immense power to foster connections worldwide. Through Bitcoin, we can communicate with people worldwide whom we've never even met and whose language we don't speak. With 40 years of prehistory, it was a network that brought us Bitcoin, and it's a network who are and will continue the mission to protect freedom, human flourishing, property rights, privacy, energy, agency, critical thinking, community, _____. But, they must be able to properly interact with it.

To further contextualize the importance of HCI for monetary communication, in their 2015 paper, Ferreira et al. share there is a "rapidly growing momentum driving…faster, simpler, effortless and secure transactions, yet…[this] may ignore other important features around making payments" such as "making connections, to other people, to their communities, to the places they move through, to their environment, and to what they consume" (Ferreira et al., 2015, p.1222). As a call to action, Ferreira et al. "challeng[e] designers of payment systems to view monetary transactions as achievements between collaborating agents and as opportunities for rich social interactions" (Ferreira et al., 2015, p.1232). Notably, Ferreira et al. discount bitcoin as being a good means of payment given its slow speed. In their defense, the whitepaper for bitcoin's Lightning network addressing this problem had only been published a few weeks prior on February 28, 2015 and did not go live until March 15, 2018 (Comte; Poon & Dryja, 2015). As the network component highlights, bitcoin is "rich for social interactions."

Two papers have done a good job presenting literature reviews on the topic of blockchain and HCI. The first, in 2018, Elsden et al. "set out to produce the first detailed mapping and examination of applications of blockchain technologies to chart the space for HCI and raise

implications, issues and challenges for future research," surveying and evaluating 203 blockchain applications (Elsden et al., 2018). Elsden et al. came up with a typology for seven classes of blockchain applications, which are viewed in the table below for ease. Then, Elsden et al. identified five realms of challenges from these blockchain applications for humans that HCI should consider: 1) transactions, tokens and financialization, 2) procedural trust between new actors, 3) federated and interoperable data, 4) harnessing crowds and publics, and 5) gateway services as mediators. Finally, they recommend researchers: 1) hold blockchain applications to account, 2) engage participants with blockchain, 3) prepare guidance on designing with blockchain, and 4) expand the imagination of blockchain applications (Elsden et al., 2018).

Table 1

Application	**Description**
Underlying Infrastructure	Underlying protocols Decentralized application ecosystems IoT Architecture
Currency	Payment services Internal currencies Utility tokens
Financial Services	Asset Management Investment Trading Crowdfunding
Proof-as-a-Service	Notaries Registers and attestation Supply-chain management
Property and Ownership	Digital rights management Copyright Ticketing services
Identity management	Self-sovereign digital identity Authentication
Governance	Voting services Distributed autonomous organizations (DAOs)

4 years later, a second paper by Fröhlich et al., improved upon Elsden et al.'s lack of a systematic method and expanded the literature to include data past 2018, so from 2014 - 2021. Through their methodology, they distill 99 papers into six major themes: 1) role of trust, 2) understanding motivation, risk, and perception of cryptocurrencies, 3) cryptocurrency wallets, 4) engaging users with blockchain, 5) using blockchain for application-specific use cases, and 6) supporting tools for blockchain (Fröhlich et al., 2022, p.155). Interestingly, just as this paper has made a distinction, they noted the "publications in [their] sample adopted one of two perspectives. Either they framed their research investigating *blockchain technology* [60%] or *cryptocurrency* [40%]," and 32 of the 40 papers on *cryptocurrency* mentioned Bitcoin (the other 8 were unspecified) and only 13 of the 58 papers on *blockchain* mentioned Bitcoin (Fröhlich et al., 2022, p.157). Aligning with the user groups previously mentioned, they show "users, merchants, miners, exchanges, and governments as relevant stakeholder groups for Bitcoin" while also explicitly adding a lack of trust was a common theme among users (Fröhlich et al., 2022, 159). Finally, they recommend researchers similarly 1) better understand blockchain users, 2) take an active approach to designing wallets, 3) move beyond bitcoin and adopt new blockchains as designs materials, 4) engage with web3 and decentralized applications, and 5) explore digital identity (Fröhlich et al., 2022, p.169-170).

Other HCI considerations include "trust" and "confidence" (De Filippi et al., 2020), early-stage user appropriation rather than post-development practice of user appropriation (Kow & Ding, 2016, p.214), and 1) "tracking" via transparency vs. privacy, 2) "managing" via economic values vs. social value, quantified vs. qualified values, incentivisation vs. manipulation, and private vs. collective interests, and 3) "negotiating" via human vs. algorithmic governance (Cila et al., 2020, p.5). Because humans are involved there is much to consider, and

despite academia not quite finding "the signal in the noise" (h/t Knut Svanholm), great work is being done by organizations like the Bitcoin Design Foundation to progress HCI research in Bitcoin.

Conclusion

"Language can also be viewed as a tool…to perform…a meaningful action, with consequences for the speaker, the hearer, and the conversation of which it is a part (Holtgraves, 2001, p.5).

You experience advantages and disadvantages in the world depending on what (non-monetary) language (protocol) you speak. Today, around 7,000 languages are spoken on Earth and 44% of all the information in the world is produced in English, followed by 7.6% in German (BBC). Despite Mandarin Chinese having more than 918 million native speakers, English, with around 375 million native speakers, is the dominant language (Middlebury College, 2023). For instance, nineteen out of the twenty top universities in the world are in English-speaking countries (US News). If you speak English, you can unlock unparalleled opportunities.

Similarly, you experience advantages and disadvantages in the world depending on what (monetary) language (protocol) you speak. If you grow up in the West, you likely often take your monetary communication tools for granted. Today, there are about 180 currencies on earth; however, the current global reserve currency is the US dollar, more specifically, US Treasury Bills, cemented at Bretton Woods after World War II (Itskhoki, 2022; Siripurapu & Berman, 2023). Yet, the US dollar is the native currency for only 4.18% of the global population (Census.gov). This dollar dominance provides Americans with a huge advantage. Why so? The "Cantillon Effect." This effect describes that "the closer you are to the source of money creation, the more you benefit" (River). For instance, you are able to receive your salary in the most

dominant/demanded currency and you have direct exposure/access to participating in the world economy. Similarly, the further you are from the source of money creation, the more "pain" you feel. One of the United States' largest exports is inflation.

In his book *Parallel: The Bitcoin Social Layer*, Brian E. De Mint explains that "there have been thousands of currencies throughout history," but "the average lifespan of a fiat currency is 27 years…[and] the upper limit for fiat currencies is about 48 years" (De Mint). The reasoning is simply that governments spend more than they make. They print money to make up for the deficit, decreasing its value and breaking their money in the process. Historically, global reserve currencies have lasted, on average, 100 years (Mesirow). While history cannot predict the future, following the pattern since the Florentine Florin in 1250, it could be assumed the world will transition to a new reserve currency around the year 2044. Furthermore, it's been 53 years since the US dollar was backed by gold (past the upper limit of 48 years), the Petrodollar agreement expired this past June, and the US finds itself in a debt spiral, which, as the name suggests, is impossible to exit from.

> ***"Language is one of those things that we often take for granted.*** *It's almost like breathing - necessary for life but not something we pay much attention to* ***unless problems develop****. But unlike breathing,* ***language has profound implications for our social existence****…Understanding what we are doing when we use language can aid our understanding of what it means to be a social being"* (Holtgraves, 2001, p.8).

Imagine if every 27- 48 years, you had to learn a new (non-monetary) language. Imagine the societal dysfunction that would ensue. This paper considered bitcoin, as the first (verifiable) language all 8+ billion people could speak, as a form of nonverbal computer-mediated communication to serve the future rails of trade and our societal existence. Further, this paper

explored bitcoin's impact on progressing the literature of nonverbal communication and human-computer interaction in computer-mediated communication. Today, "the large majority of publications focus on Bitcoin and generalizes to cryptocurrencies" (Fröhlich et al., 2022, p.160). However, hopefully, by also clarifying a brief history of (mobile) money evolution, what makes b(B)itcoin unique, and who uses bitcoin and why, researchers will be able to better understand the distinction, adjust their perception, and see bitcoin as the greatest noise remover and a guide to find intellectual signal.

A blockchain is digital ledger technology. It's simply a protocol for transferring information packets like Claude Elwood Shannon's "transmission model of communication." On its own, it's not speech and it doesn't convey true meaning. The only blockchain defined as a "communications channel," with the ability to be owned in your head (aligning to language's unique attribution to humans) in an immutable, permissionless, and censorship resistant manner, with the best network and distribution effects, is bitcoin. Bitcoin is how you speak into the world to be heard. Just as it takes energy to breathe, to formulate words, to speak, bitcoin is the only blockchain which preserves value and integrity through rational alignment of economic incentives and energy. A blockchain must be decentralized and secure to preserve values of permissionless, immutability, incorruptibility, trustlessness, transparency, auditability, censorship-resistance necessary for meaningful communication. Bitcoin bridges technology and communication theories, and looking to the future, the implications on nonverbal communication and human computer interaction and other similar fields are even greater than just from the presumed impact of bitcoin. A BLEND of tools (Bitcoin, Lightning/Liquid, Ecash, Nostr, and other Decentralized technologies) (h/t Obi Nwosu) will be revolutionary for our reality and social existence.

In a 2021 updated version to Mark Weiser's *The computer for the 21st century,* which is often required reading for computer science students, Daphne Muller writes, "the privacy of personal data is a human right that is systematically violated in the computing industry" (Muller, 2021, 1). Yet, she concludes that:

> technology without tracking, personal data collection, or personal data analysis, may gradually emerge as the dominant mode of innovation and computing over the next 30 years…Open-source projects, consumer-activism, and collaboration will make privacy the central pillar of innovation, and cause a technology industry where creative ideas from small market players can flourish (Muller, 2021, p.8).

Decentralized protocols mean participants are no longer the product as they are today. The model of profit through exploitation will break. The 21st century will be a century of innovation from open-source protocols, and we're just at the beginning. Design principles will have to innovate new ways of building computer-mediated communication systems for this new age. Future work would do well to give greater attention to decentralized, permissionless, borderless, and open-source protocols that put humans at the center just like language itself.

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