State of
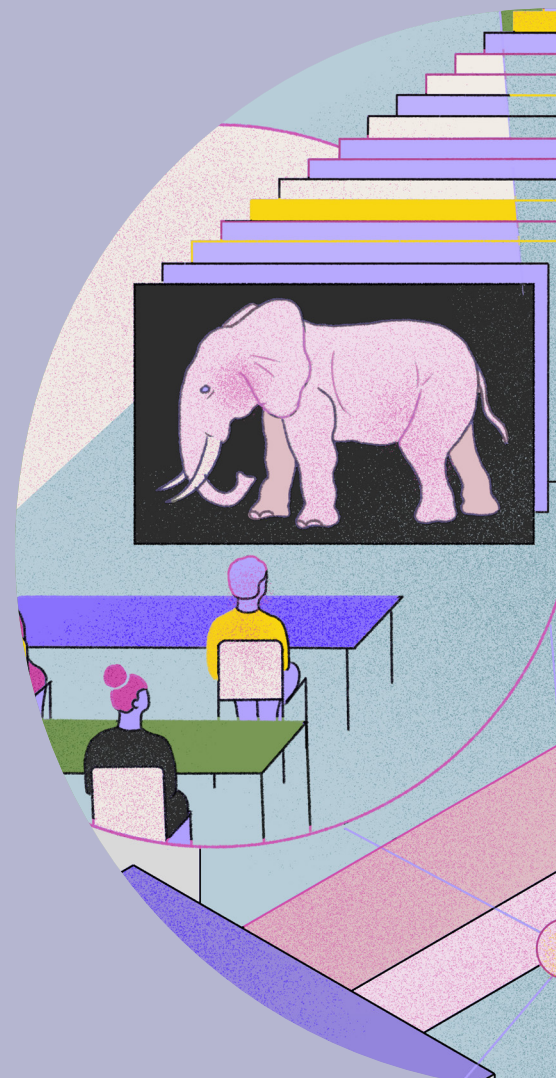# Zero Knowledge
Report 2022

Discover the crypto
industry's views on
zero knowledge and
what this means for
the future.

Mina Foundation

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Contents—

—About this report

I believe we will look back upon the industrialization of ZKPs* as a key milestone in the wide enterprise migration from private to public blockchains.

—Paul Brody
EY Global
Blockchain Leader

If I were to predict 5, 6, 7, 8, 9, 10 years from now, I think that we'll be talking about zero knowledge proofs and … all of these privacy technologies and implementations the same way that people were talking about the blockchain 3, 4, 5 years ago.
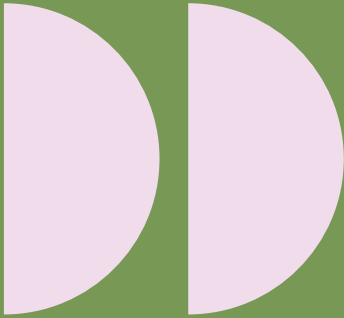
—Jill Gunter
Principal of Slow Ventures

The field of zero knowledge proofs—that powers a number of the cryptocurrencies in protecting privacy while running a decentralized system, I think that's going to be the backbone of a large part of the next century in technology.

—Tim Sweeney
Epic Games CEO

Perhaps the most powerful cryptographic technology to come out of the last decade is general-purpose succinct zero knowledge proofs.

—Vitalik Buterin
Co-Founder of Ethereum

The two most powerful applications of Zero Knowledge Proofs (ZKPs) are scalability and privacy:

Scalability

ZKPs allow for many data points to be encapsulated in a single, lightweight proof, which greatly enhances efficiency and scalability. Because many blockchains require heavy computing, blockchain technology remains constricted to such infrastructure, limiting its ability to scale. By leveraging ZKPs, developers can design lightweight dapps that can run on more common hardware such as mobile, ushering in the possible future of a more accessible and scalable Web3.

Privacy

ZKPs allow users to securely share necessary information to gain access to goods or services without revealing personal details that could make a user vulnerable to a hack, exploit, or identity theft. ZKPs' data privacy capabilities are particularly important to the safety and security of Web3, including DeFi, DAOs, and the metaverse. As the digital and physical realms become increasingly intertwined, ZKPs will be that much more essential for a private, user-controlled Web3.

In light of the clear and growing interest in ZKPs to enable a private, secure, user-controlled Web3, the Mina Foundation conducted a survey to better understand the perspectives around ZKPs in 2022.

Methodology

This report is based on a survey created, distributed, and analyzed by members of the Mina Foundation. Mina Foundation created questions designed to encapsulate the industry's overarching sentiment pertaining to zero knowledge (ZK).

The survey was distributed across social media and community channels run by members of the Mina Ecosystem as well as key opinion leaders in the industry that have demonstrated an ongoing interest in exploring ZK with their audiences. The survey was open to responses for 3 weeks, during which time 1,978 people participated*.

*Mina Foundation estimates that this sample captured sentiments from over 1% of total Web3 developers in the space. This is in accordance to Electric Capital's 2021 report showing 18,416 total Web3 developers worldwide and this report capturing ~218 developers.

Survey Participants

Participants were asked three questions to asses diversity in the sample.

How do you identify?

Survey participants were asked to choose which best described them amongst Crypto Community Member, Crypto Trader, and Developer.

67% of the respondents identified as crypto traders, while 22% identified as crypto community members and 11% identified as developers.

What is your age?

86% of respondents were between the ages of 19 and 45 years.

Are you familiar with ZKP technology?

75.8% of respondents have at least heard of ZKPs and know what they mean, while 24.2% do not know what they mean.

Additionally, 80% of developers expressed familiarity with ZKP technology, illustrating a drive from developers to build with them.

Based on the demographics of the participants in the survey, the results encapsulated in this report convey the overarching sentiment toward ZKPs from a general crypto trader and community perspective during Q1 of 2022.
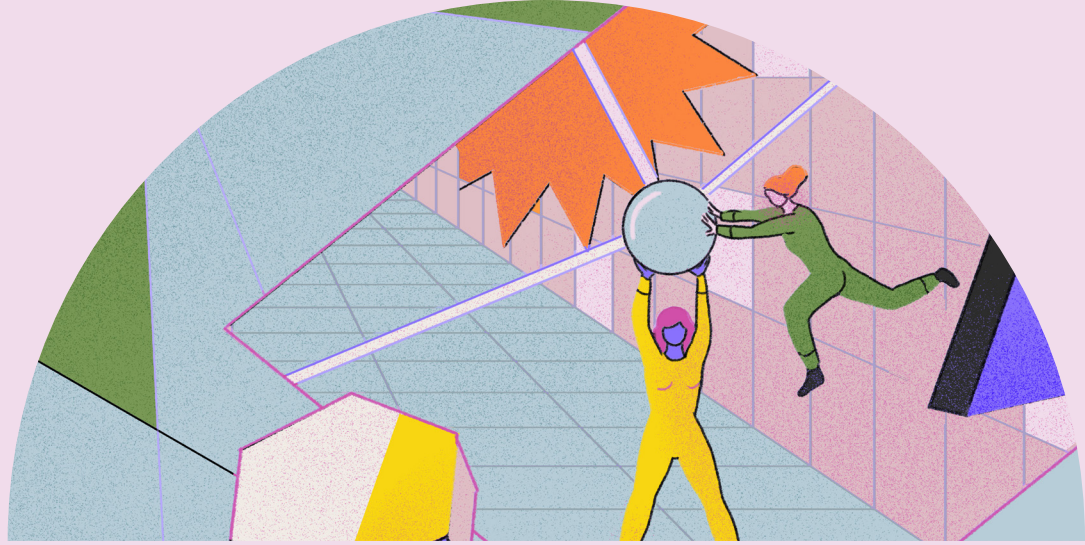
—Key findings

ZKPs
are the key to:

the metaverse and Web3

42.2% of respondents see ZKPs as important to the future of the metaverse & Web3.
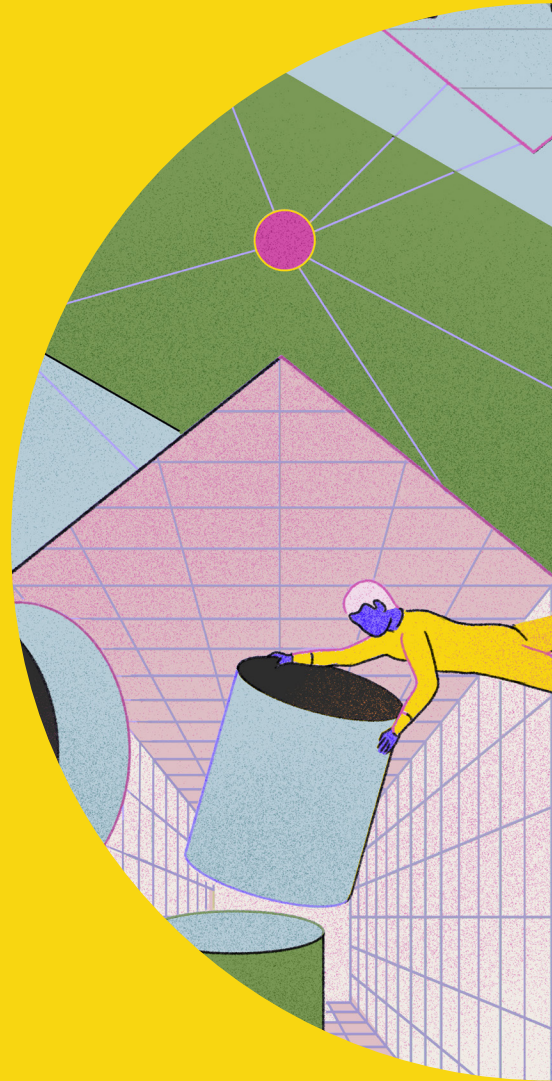
choosing cryptocurrencies

90.1% of respondents felt that cryptocurrencies utilizing ZKPs are more attractive.

the finance industry

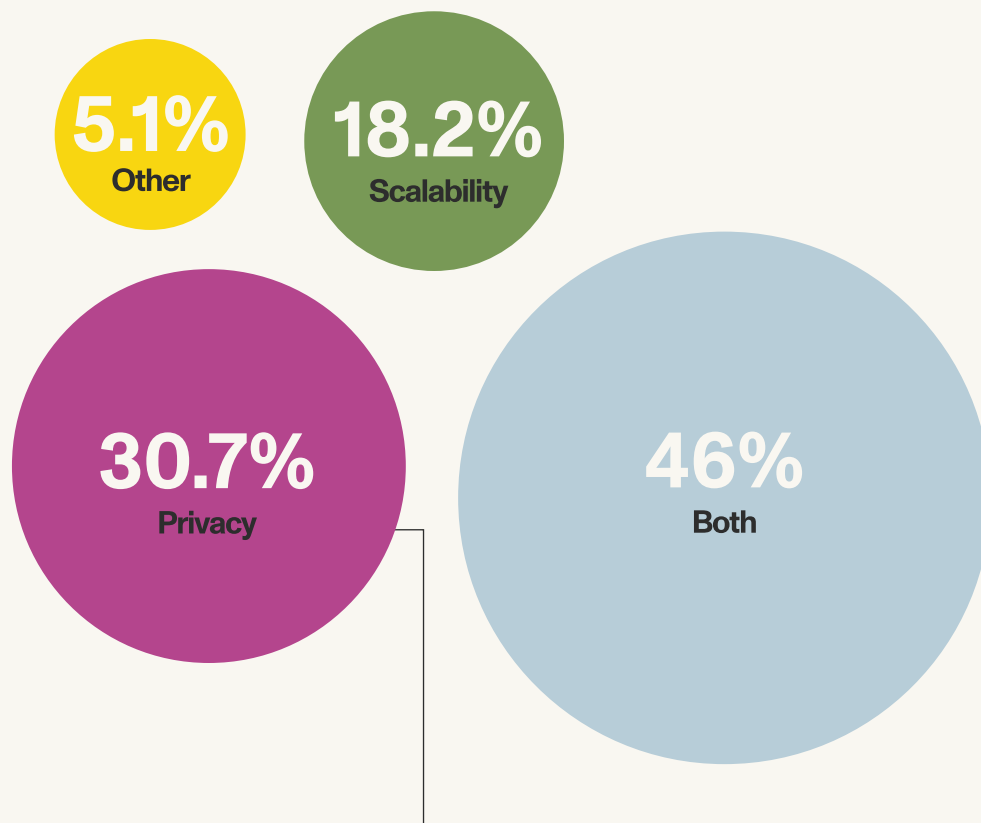40.6% of respondents see Finance as the industry most in need of ZKPs.

privacy protection

30.7% of respondents see privacy as a main advantage of ZKPs.

—Results

WHAT IS THE MAIN ADVANTAGE OF
ZERO KNOWLEDGE PROOFS IN YOUR
OPINION?

5.1%
Other

18.2%
Scalability

30.7%
Privacy

46%
Both

Privacy Concerns

When asked what the primary advantage of ZKPs are for applications, 46% of respondents answered both privacy and scalability; however, between privacy and scalability, privacy earned slightly more responses at 30.7% as opposed to scalability's 18.2%. **This slight preference for privacy over scalability could reflect the cryptocurrency industry's increasing attention paid to privacy, potentially motivated by growing concerns over centralized, corporate involvement in the metaverse.** In fact, a recent survey by NordVPN[1] stated that 87% of respondents were concerned about their privacy in the metaverse. Interestingly, most other ZK-based solutions to date have focused on scalability over privacy.

[1] *https://nordvpn.com/blog/metaverse-survey/*

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## ARE CRYPTOCURRENCIES UTILIZING ZKPS MORE ATTRACTIVE?

YES

90.1%

NO

9.9%

An overwhelming 90% of survey participants felt that cryptocurrencies utilizing ZKPs are more attractive than those that do not. This could be a reflection of increasing privacy concerns, especially around the rise of the metaverse (as mentioned on pages 12 & 13). Similarly, **the 2022 Messari Crypto Thesis Report**[2] **predicted that "On a long-enough timeline, all crypto will converge to zero knowledge crypto".**

WOULD YOU BE MORE WILLING TO USE A DAPP IF YOU KNEW IT OFFERED ZKP BENEFITS LIKE PRIVACY OR SCALABILITY?
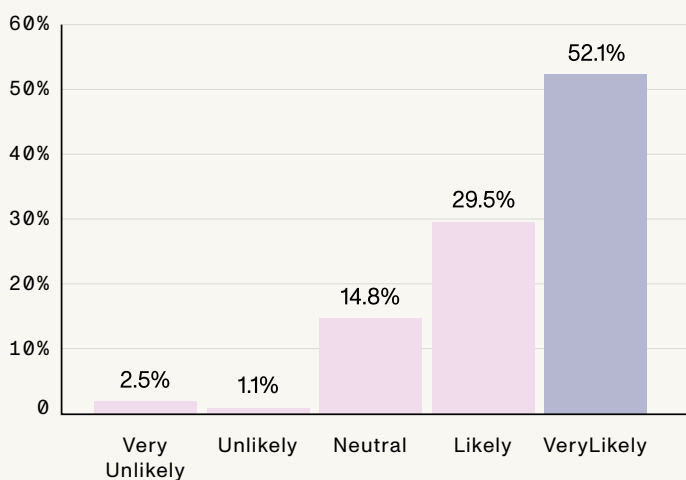
When respondents were asked about their willingness to use dapps with ZKP benefits, **52.1% of respondents expressed they would be more willing to use a dapp if it had ZKP benefits. This can suggest that crypto community members trust in ZKPs privacy and security benefits**, especially in light of recent blockchain security breaches, with $1.2B being stolen in Q1 2022 alone[3].

Bar chart: Very Unlikely 2.5%, Unlikely 1.1%, Neutral 14.8%, Likely 29.5%, VeryLikely 52.1%

[2] *https://messari.io/pdf/ messari-report-crypto-the- ses-for-2022.pdf (Page 145)*

[3] *https://dappradar.com/ blog/dapp-industry- report-q1-2022-overview*

HOW IMPORTANT WILL ZKPS BE IN
WEB 3.O AND THE METAVERSE?

PERCENT OF RESPONDENTS

50%

40%

42.2%

30%

20%

21.9%

13.7%

10%

8.7%

5.7%
4.1%

1.2%
0.3%
1.1%
1.1%

0

0 1 2 3 4 5 6 7 8 9 10

NOT IMPORTANT → OF HIGHEST IMPORTANCE
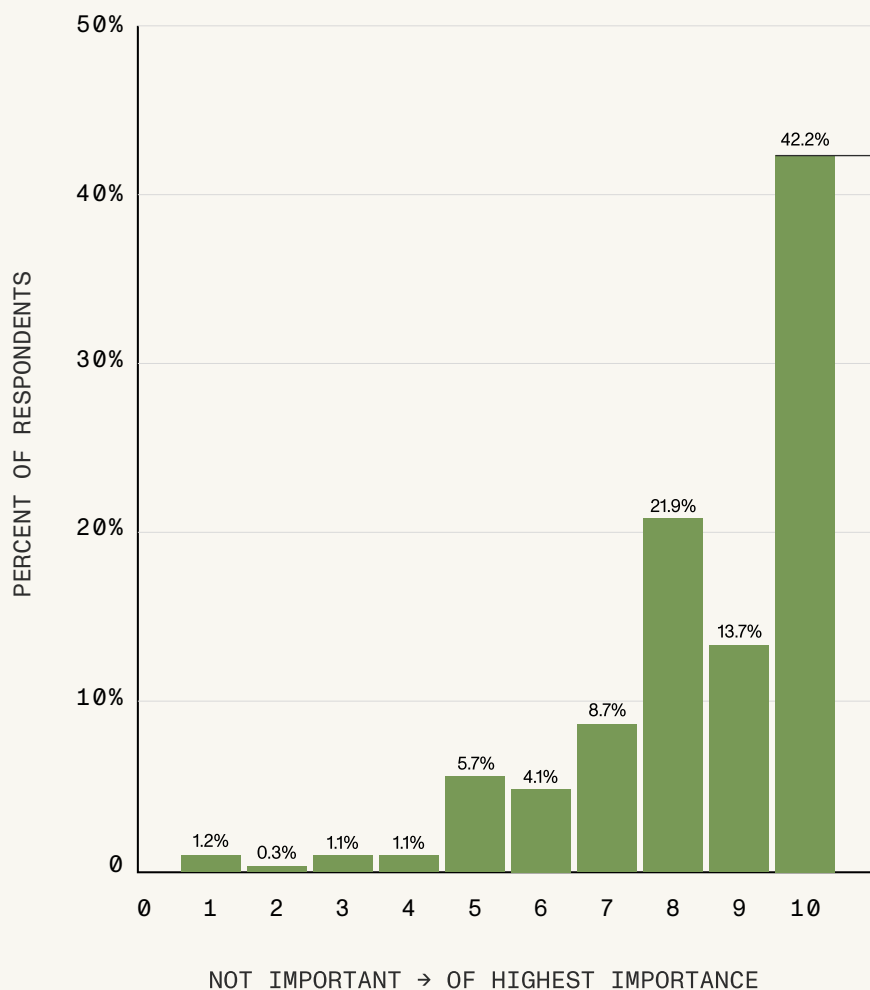
42.2% of respondents indicated that ZKPs will be of the highest importance in the metaverse and Web3, with **77.7%** of respondents scoring it an 8 or above in importance. In light of the attention being paid to the metaverse by large companies like Epic, Roblox, Microsoft, and Meta (formerly Facebook) **this data supports the growing concerns that the crypto community has about the corporate control of the metaverse.** A recent study by NordVPN[4] shows that 47% of internet users do not trust their identities will be protected. Without the ability for users to control their own identities and data in the metaverse, user data would be vulnerable to exploitation— further indicating hesitation in adoption of the metaverse by more users.

[4] https://nordvpn.com/
blog/metaverse-survey/

"I think ZKPs are what's
missing from most
blockchains today"

—survey participant

WHAT INDUSTRY COULD BE BEST SERVED BY THE INCORPORATION OF ZERO KNOWLEDGE PROOFS?

40.6%

Finance

34.9%

All of the above

11.7%

Health Care

5.0%

Social Media

2.9%

E-commerce

2.3%

Gaming & Entertainment

2.0%

Collectibles, such as NFTs

0.5%

Other
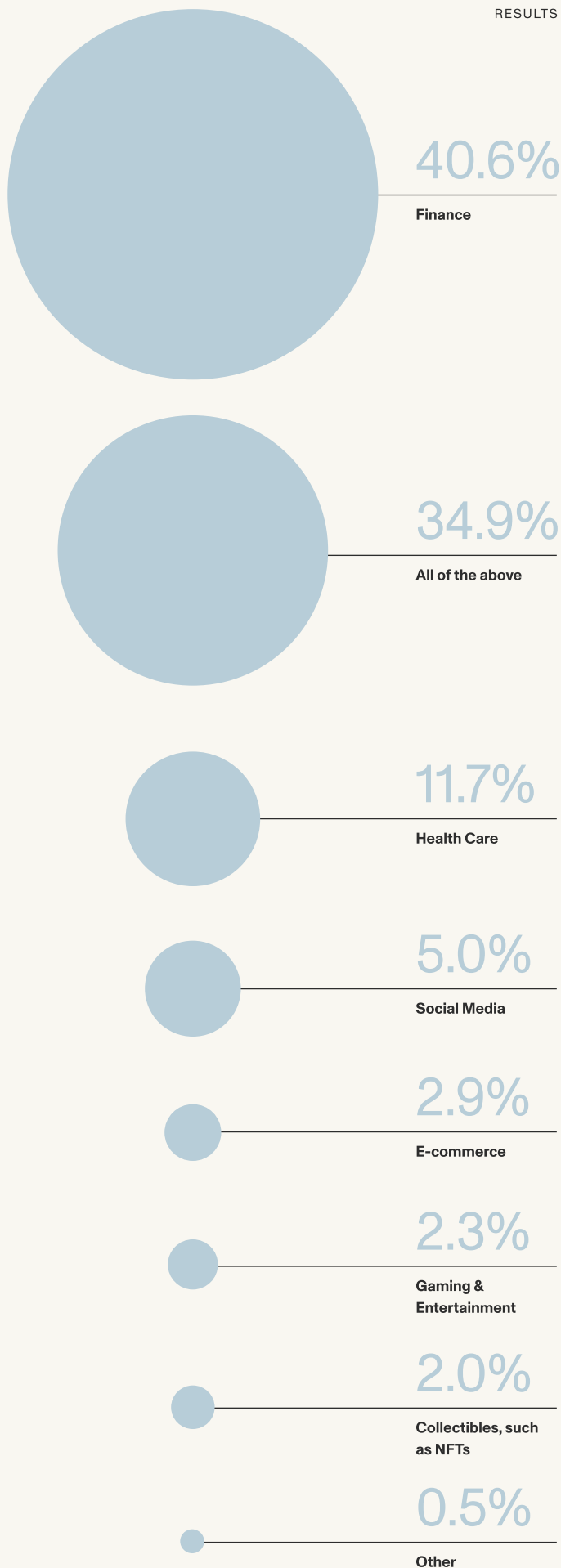
Ultimately, survey participants felt all industries, including Finance, Health Care, Social Media, E-Commerce, Gaming & Entertainment, as well as Collectibles could benefit from ZKPs, but respondents were most interested in leveraging ZKPs as a solution for Finance.

With the number of Decentralized Finance (DeFi) usage on the rise[5], **zero knowledge applications with scalability and privacy benefits have an increased opportunity to help improve the industry's wider adoption.**

[5]https://www.statista.com/statistics/1272181/defi-tvl-in-multiple-blockchains/

WHAT TYPE OF DATA DO YOU MOST
WANT TO KEEP PRIVATE?

54.5%
Financial

48.6%
Any personally identifiable information

46.7%
I want to be as anonymous as possible

26.7%
Location

25.8%
Health

13.3%
Name

10.9%
Credit Score

*Note: Respondents were
asked to pick up to 3
categories for this question.*

Financial Privacy

Many participants similarly expressed it was important to keep all personally identifiable information private, but there was a greater emphasis on financial data, which could include a user's social security number, crypto balance, net worth, credit score, etc.

As an example, ZKPs could be leveraged to create a dapp that enables users to simply share a proof that their credit score is over 700 in order to receive a loan, instead of all of their private information. **The importance of keeping financial data private implies ZKPs will play a pivotal role in the future of Web3 and DeFi.**

HOW WORRIED ARE YOU ABOUT THE
FOLLOWING ACCESSING YOUR DATA?

Not at all worried | Very worried

6.3%   Crypto Wallets   35.7%

Not at all worried | Very worried

3.5%   Banks   39.9%

Not at all worried | Very worried

3.1%   Social Media Platforms   41.3%

Not at all worried | Very worried

2.5%   Third-Party Companies   44.0%

Not at all worried | Very worried
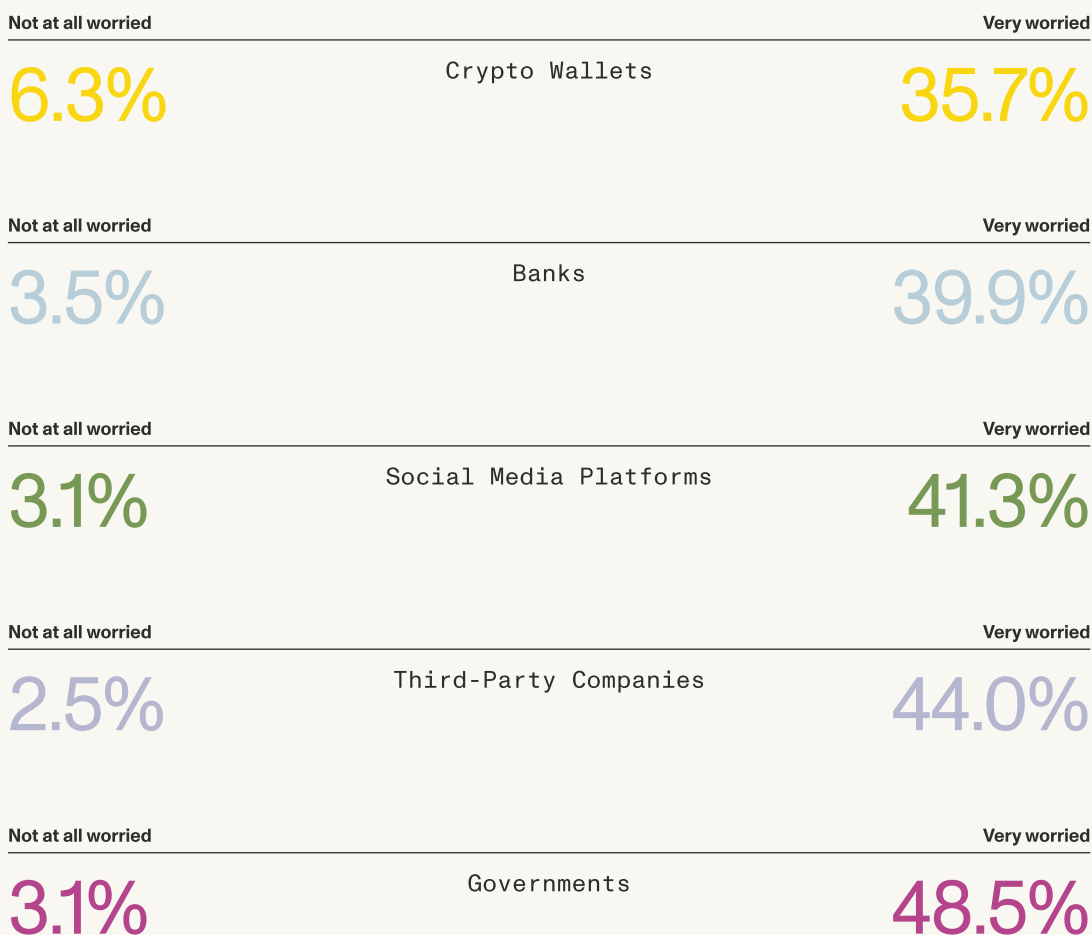
3.1%   Governments   48.5%

Respondents are most concerned about governments accessing their data over any other over any other entity. Interestingly, respondents expressed fairly high concern across all entity types, though wallets garnered the least amount of concern compared to banks[6], social media platforms[7], and third-party companies[8].

This is revealing in light of the various data hacks and breaches that have occurred at the hands of DeFi[9], financial institutions, social media platforms[10], and governments[11].

[6] https://carnegieendowment.org/specialprojects/rotectingfinancialstability/timeline

[7] https://human-id.org/blog/biggest_social_media_breach_history/

[8] https://www.techradar.com/features/top-data-breaches-and-cyber-attacks-of-2022

[9] https://blog.chainalysis.com/reports/2022-defi-hacks/

[10] https://firewalltimes.com/facebook-data-breach-timeline/

[11] https://www.comparitech.com/blog/vpn-privacy/us-government-breaches/
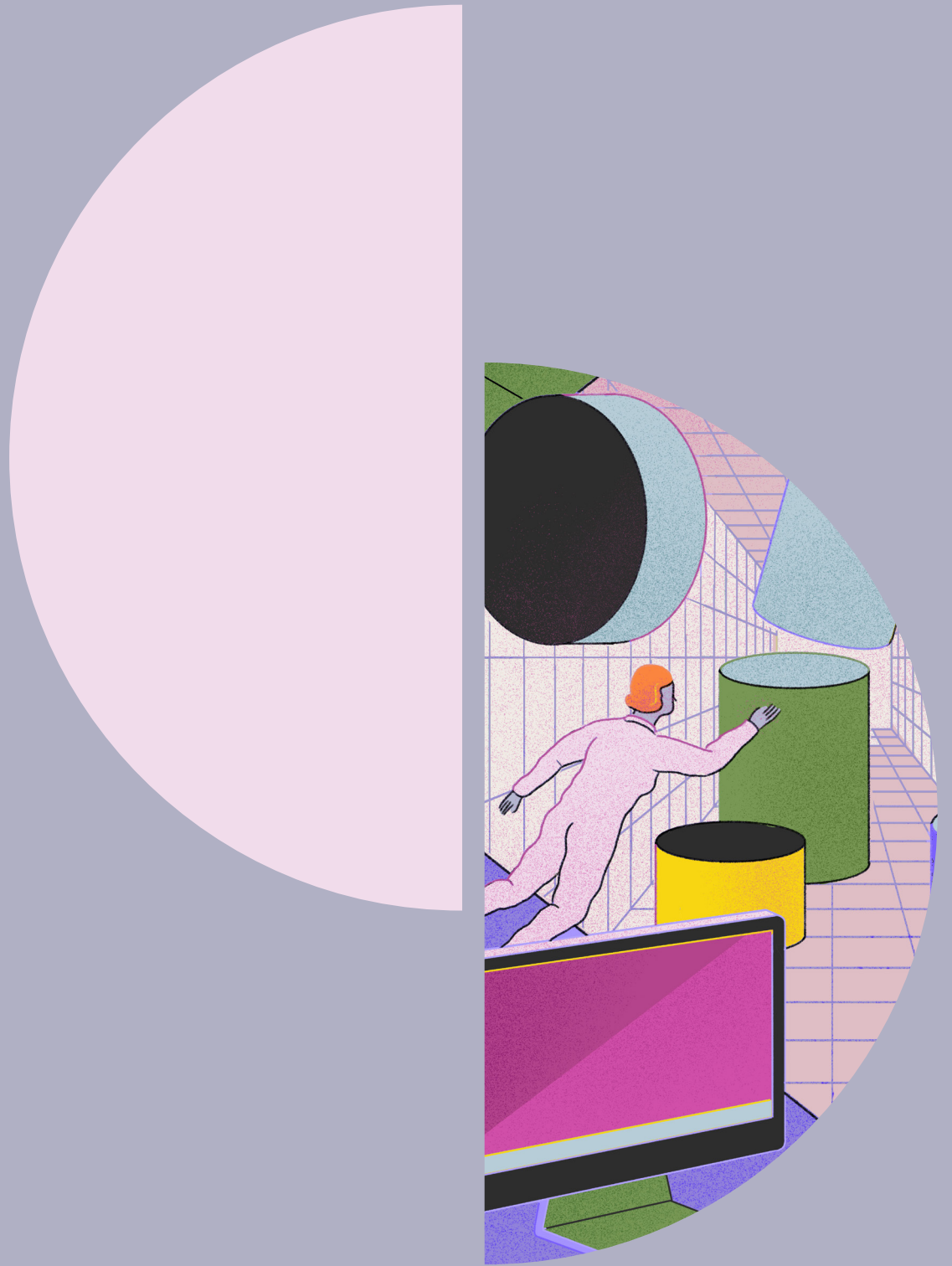
—Conclusions

The sentiments captured in this report show that the broader crypto community is looking towards zero knowledge to solve some of blockchains biggest dilemmas: privacy and scalability.

The findings particularly reinforce the growing importance of privacy in light of the great potential for user data exploitation should we fail to implement a secure and user-controlled Web3. The Online Privacy Worldwide Report by Joseph Johnson[12] found that 53% of internet users were more concerned about their online privacy than a year ago. As concerns continue to increase and Web3 continues to develop, privacy benefits given by ZKPs will become ever so important for wider users.

[12] *https://www.statista.com/statistics/1272181/defi-tvl-in-multiple-blockchains/*

More developers and crypto users are also paying attention to ZKPs from a building and trading point of view now than ever before. This focus will likely manifest in the launch of many more dapps utilizing ZKP technology to enable privacy, scalability, or both in the near-term. In fact, in his 2022 predictions article[13], Surojit Chatterjee, Chief Product Officer at Coinbase, predicted that "zero knowledge proof technology will get increased traction" for scaling and privacy-centric use cases this year.

> More developers and crypto users are also paying attention to ZKPs from a building and trading point of view now than ever before.

[13] *https://blog.coinbase.com/10-predictions-for-web3-and-the-cryptoeconomy-for-2022-745a20a60cd0*

> DeFi needs the secure, private data sharing made feasible by ZKPs

Decentralized Finance (DeFi) proves to be an imminent ZKP use case after findings from this report showed that over 54% of crypto users find it most important to have financial privacy (Page 16). This is especially important given the rise in DeFi hacks as shown in a recent report by Chainanalysis[14]. If DeFi is to make good on its promise of empowering users with control over their own value, DeFi needs the secure, private data sharing made feasible by ZKPs. We can also expect increasing involvement from Traditional Finance in DeFi once ZKP implementation becomes the norm, as the private finance enabled by ZKPs is more attractive to traditional corporate finance.

[14] *https://blog.chainalysis.com/reports/2022-defi-hacks/*

Overall, crypto community members conveyed the sentiment that ZKPs will play a major part in securing the future of DeFi, Web3, and the metaverse. We look forward to following the general advancements of zero knowledge in the industry to enable a secure and private Web3 that everyone can use.

This report was facilitated
by Mina Foundation by
surveying individuals within
the crypto community

The Mina Foundation is a public benefit corporation serving the Mina Protocol, the world's lightest blockchain. The Foundation supports the protocol and its community by issuing grants to third parties that make significant contributions and by maintaining & managing community and network health.

About Mina

Rather than apply brute computing force, Mina uses advanced cryptography and recursive zk-SNARKs to design an entire blockchain that is about 22kb, the size of a couple of tweets. It is the first layer-1 to enable efficient implementation and easy programmability of zero knowledge smart contracts (zkApps). With its unique privacy features and ability to connect to any website, Mina is building a private gateway between the real world and crypto—and the secure, democratic future we all deserve.

Mina is stewarded by the Mina Foundation, a public benefit corporation headquartered in the United States.

To learn more about Mina and stay up to date on the latest advancements in zero knowledge:

Website:
https://minaprotocol.com/

Twitter:
https://twitter.com/minaprotocol

Citations

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in order of appearance*

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