

Decentralised Finance

Usecases & Risks for Mass Adoption



dGen

AAVE

Decentralised Finance: Usecases & Risks for Mass Adoption

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dGen is a not-for-profit think tank based in Berlin, Germany. We focus on how blockchain technology can contribute to a decentralized future in Europe and what this might mean for people, society, private entities, and the public sector over the coming decades.

We're working with a team of researchers exploring how decentralisation will shape our future. Our insight reports focus on specific topics and industries to drive ideas for adoption in Europe. To find out more, please visit us at dgen.org.

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Foreword

Over the last twelve years, since the beginning of the financial crisis, many legacy systems and practices have been called into question. It impacted every demographic of society - from people with lower incomes finding it harder to obtain credit, people earning middle incomes seeing their savings and pensions eroding away, and people with the highest incomes facing much higher regulations.

At the same time, we saw the birth and rise of cryptocurrencies, programmable money, and, now, the evolution of Decentralised Finance (DeFi). Our latest report looks at DeFi - the hottest topic in the blockchain industry today - focusing on major usecases currently enabled, and taking some time to look at the risks involved.

As with everything we do at dGen, we really focus on looking ahead, to the impact of Decentralised Finance over the next decade. This nascent sub-industry is barely two years old, but has already garnered a market capitalisation of over €2 billion. At such an extreme growth rate, this is the time to take stock and look at what needs to come next for DeFi.

Many of the top voices in the DeFi space have weighed in. Their perspectives are extremely interesting on what's around the corner and wider adoption might come about, as many of the people driving these changes.

Europe has some of the most developed and adopted FinTech ecosystems anywhere in the world. With the rise of Challenger Banks and Open Banking, many European citizens are already familiarised with a new wave of financial products and services. Many speculate that DeFi is the next step in FinTech, and Europe's current position could mean that Europe may be one of the first places with mass DeFi adoption. The potential to open up financial products and services to the many millions who are inevitably left out of the current financial system remains extremely interesting. We look forward to seeing how this develops in Europe.

We would like to say a huge 'thank you' to Joel John for putting the majority of this report together, to our sponsor Aave, and all of our other contributors for giving their time.

Jake Stott & Nick Dijkstra

Founding Board, dGen

Interview with Marc Zeller of Aave

Aave is a decentralised, non-custodial money market protocol where users can participate as depositors or borrowers. Depositors provide liquidity to the market to earn a passive income, while borrowers are able to borrow in an overcollateralized (perpetually) or undercollateralized (Flashloans or Credit Delegation) fashion.

dGen Co-Founder, Jake Stott, spoke to Marc Zeller, the Integrations Lead of Aave to get a more in-depth view of the current state of DeFi and predictions for the future. Zeller has been involved in the Ethereum community since 2015 and co-founded the education non-profit, Ethereum France. At Aave, his job is to make life easier for third-party developers building on Aave.

Thanks for taking the time to talk to me. So to start with, for the wider world out there, could you explain Decentralised Finance in simple terms - layman terms - and what Aave does in this space?

Well, there's two ways to approach Decentralised Finance because there's two growth audiences to it - the wider audience that might appeal more to the general public, is what we like to call decentralised savings accounts. So, Decentralised Finance is a bunch of applications running inside the blockchain ecosystem. You can deposit some value, so assets or currency - on Ethereum you have currency by the proxy of stablecoins, which are cryptographic tokens that are pegged to the USD. Basically you can provide liquidity to those protocols and will be rewarded with an interest rate. That money doesn't come from nowhere. It's created by the second audience of Decentralised Finance, who are the borrowers and the traders.



In the financial worlds inside Decentralised Finance, there are those who borrow some asset from the protocol in order to trade or of an asset in the future of the decrease; it can work both ways. Basically they borrow some assets in order to increase their position, and they are ready to pay you an interest rate for it. And that interest rate goes directly to the depositor. What is brand new, is that it's completely transparent. Although you cannot directly identify users, you can identify the accounts. You know that if a platform is sustainable, if a platform does really have the funds they say they have. Interest rates are the same for everyone. If you bring \$100 or you bring \$1 million, you will get exactly the same deal. And that's kind of brand new as well.

One of the last things we can say is that you remain in full control of your money. So all of these platforms are non-custodial. So if you want to withdraw, you can do it without cost. The only cost you have to pay is for the securitisation of the Ethereum network, it's a few dollars at most, and you can deposit whenever you want. If you are within a platform, and you find a better deal on another platform, you're always 15 seconds away from a switch to get the better deal. There's no middleman. Most of the time there's no commission, so that's why you get better deals on average in DeFi than in traditional finance.

That's very exciting!

Onto the next question. The last few months have seemed to have gone really well for Aave. Can you share with us some of your top achievements?

We launched Aave six months ago, in early January 2020, and now we have ... I don't remember exactly because it changes every day. But, we went from \$0 in the protocol to, today, around \$186 million. So that's a good start and that would be one of the first big achievements.

We didn't create, but we expanded on and made accessible a new feature called Flash Loans. This is the ability to borrow without any kind of collateral, in the context of a single transaction, any amount of money you want in order to do things on Ethereum.

If I had to take a layman, or a traditional world, example, let's say you find a property on the real estate market for 100K. You don't have 100K on your wallet right now - I am ready to bet on that. So you find this property, listed at 100K, but you don't have the money. You can borrow the 100K, then, let's say, you have another buyer willing to buy it for 120K. So you buy the property, you sell it on, you pay back the 100K, and keep the difference of 20K. All of that in one transaction. Obviously in traditional finance, it doesn't work like that, but in DeFi you can do these kinds of things, and the gamechanging aspect is this is now open to anyone.

Can you share with us any exciting news coming up for Aave? Maybe there's something you can talk about.

Next week...I can talk about a few things then, so you have the exclusivity on that. We just released the credit delegation explanation. For the first time we're going to open to anyone the ability to have uncollateralised loans. Right now you can have an uncollateralised loan, so you can

borrow some assets without any collateral, but only in the context of a single transaction inside of flash loans. We are going to expand that to regular loans, so for these fixed term loans that are a bit longer than a single transaction.

Our way to do that is in the upcoming version of the protocol you will be able to delegate your credit line. So if I deposit, for example, 100 DAI to Aave, I've got the ability to borrow \$75 worth of tokens. And if I don't want to borrow, because I don't want to pay the interest rate, or I'm not a trader and that's not my thing, or any reason, that credit line is not used. I'm just earning the interest rate as a supply provider on Aave, which is right now 6 or 7%. What you will be able to do very soon is to say, okay, you are a transactor, you are in need of liquidity, but you don't have enough capital to do another collateralisation. Let's sign a real contract, our partner for that is OpenLaw, which is a ConsenSys project. You will be able to do a legal agreement with a third party in order to delegate to them your borrowing capacity. Obviously, with this, the third party will pay more than the actual interest rate into Aave. So basically you will earn the supply interest rate plus the spread on the borrowing interest rate.

It's a huge innovation because DeFi is a \$2 billion market right now, but in terms of volume, \$1 billion of that market is the margin funding. The centralised exchanges, Binance, Kraken, or whatever. The way they make money is by lending some liquidity to margin traders to make leverage trades. And they have a lot of difficulty finding liquidity. They're always short on liquidity to actually provide some liquidity for the trader. There's a lot of demand from the centralised actors to access the Decentralised Finance liquidity. We are going to have deals with some very big actors in the ecosystem to make this happen.

At dGen, we're really focused on the next generation, looking a decade ahead, when things maybe have true mass adoption. If at

all possible, how can you imagine Aave looking over the next decade?

This is going to be a bit counter intuitive, but I do believe that in five years, 90% of the users of Aave will never use Aave. I think Aave, as a financial protocol, will specialise more and more in user experience for the financial part of this protocol. And what we are seeing right now is that if you don't know anything about DeFi, but you want to take part in it, the best way to do that is not to go on aave.com, but actually download the Argent mobile wallet on your mobile, because the user experience there is so much better. Everything is simplified, and you just have to click one button and you start earning money on Aave.

And I think that in five years, 90% of the users, in terms of individuals, will be liquidity providers looking for a safe haven for their savings. They will use these kinds of third party applications, super easy to use. The actual users of the aave.com, or the main application, will be more focused on the financial path, like borrowing, credit delegation, these kinds of things.

We think DeFi will increase exponentially, and we will offer services to a lot of people, but I don't believe everybody will be a margin trader. And I'm not sure I want that. I think it's really possible that a lot of people will be attracted by the opportunity to earn a passive income in a decentralised and safe way, but not through margin trading.

Agreed, I think there has to be more than margin traders. So other than what you're working on with lending, where do you believe the biggest opportunities lie in DeFi right now? What are the big opportunities that other people are working on?

Yep. I think the biggest opportunity right now is to build and attract layer 2. We already talked about it, but right now, the gas price on Ethereum - so every action on Ethereum needs to be paid for to pay the people who

are securing the network, who are the Ethereum miners, and it's all fine. If you want to move \$1 million, paying a \$3 transaction fee, you don't really care, because you will make more than that in a few hours when you supply liquidity on Aave. But if you supply \$100 and the rate is 6%, which it is right now on the DAI stablecoin, you need to wait six months to actually cover your transaction fee for your deposit.

So it's really hard for small actors right now to get into DeFi, because if you don't have a critical mass to pay the transaction fee, it's just not worth it. One of the solutions for that is to migrate, not all Decentralised Finance, maybe keep on the main network the Aave value transfer, but have a smaller version of the protocol on the second layer of Ethereum. If you set that up with a payment network, you have something that is really interesting, not only for the high net worth individuals.

In our dGen report, we're also looking at the risks of DeFi. Where do you think the DeFi space needs to improve before mass adoption?

Right now the biggest issue with all DeFi protocols - all users are at the same risk - is that if you list a very bad token, there are some flows in the lending pool architecture, that means you will drain all the liquidity. Obviously we do a lot of due diligence before adding a new token to our platform, and the others do the same thing. That's why you don't have major flaws and hacks within the main protocols. You've never seen hacks on Compound or on Aave, as an example. And right now there's some mechanisms to mitigate those risks, some kind of insurance firms, but that's not good enough. That's why with Aave, we are going to launch staking very soon, and put the risk into the end of the LEND token holder. So basically as a LEND token holder, you will be able - and it's a voluntary process - to stake your LEND token. That means that you will collect all the protocol fees.

Every time someone performs a borrow event, then, every time there's a flash loan, you will make money. But in the event of a critical failure, you will have to pay the bill. I think it's a huge improvement, because as a liquidity provider, as just someone with a small portfolio, who wants to earn a passive income, you will have this insurance that, worst case scenario, you will see your money back. I think that's what was missing in DeFi, because obviously there's third party insurers who are doing a very good job, like Nexus Mutual for example, but it's always a voluntary and paid process, currently 1.3%. With this new version, you will not have to pay anything.

That's quite a big innovation on some of the other options out there!

Yeah, because I think what prevents a lot of people from getting into DeFi is that they say, 'Yeah, I only make 0.5% a year in my traditional saving accounts, but I know that in case of failure, the bank will give me my money back'. That is not happening right now in DeFi, because, worst case scenario, with Compound, my money's gone forever. I think it will be a game changer to have this kind of insurance scheme to say okay, worst case scenario, your money's back. So why stay at 0.5% interest per year?

Yes, that's a very good point! For the final part, what are you most excited about in the DeFi space over the next few years?

There are several things. First, I think the credit delegation market is much bigger than people think, because it's already 50 times bigger than the whole DeFi ecosystem. Like the actual need for liquidity, for margin trading, for centralised finance is huge, and we will be able to be very competitive towards what is happening right now in today's finance. I think it's going to help DeFi to grow a lot, because that's a lot of demand, meaning the supply rate will increase, and it will be more attractive to newcomers. It's a

positive feedback loop.

The second thing is actually synthetic assets. We will see more and more tokenization. I think DeFi has reached the traction and critical mass to be a liquidity black hole for a lot of assets, so we will see more real estate tokenization, we will see more traditional finance tokenization. It's already happening, take for example Bitcoin. There's more and more Bitcoin on Ethereum, thanks to the hard work of Ren. The Ren audience that is doing RenBTC, but also working to give a better experience with WBTC, which is a huge success.

Right now it doesn't make sense to only have Bitcoin sitting there on the ledger producing nothing when you can earn 6 to 8% on your Bitcoin, just because you tokenize it and deposit it as a liquidity provider on Curve. I think more blockchain assets will be tokenized and brought onto Ethereum. I really do believe Ethereum will be a liquidity black hole.

That's interesting. How big do you think the DeFi space can become? I guess in terms of locked assets in the next few years. Do you have a number in mind?

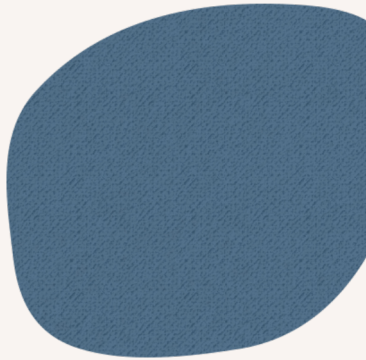
To me, if we don't reach a trillion dollar market in the next 15 years, it's a failure.

That's a big aim, and with that I would say let's leave it there. Thank you Marc for your time and insights! I look forward to what's next for Aave and DeFi as a whole!



Executive Summary

APIs have replaced entire divisions in banking with algorithms, making it possible for startups to offer banking experiences that rival traditional alternatives.



In the past two decades, the banking ecosystem has undergone rapid changes: all of the traditional elements have been unbundled. Application Programme Interfaces (APIs) have replaced entire divisions in banking with algorithms, making it possible for startups to offer banking experiences that rival traditional alternatives.

Despite the enormous potential and benefits of API-based financial businesses, there are still blockers holding back how inclusive and efficient they can be. These include:

- State regulations hampering innovation
- Geopolitical events influencing the value of currencies and leading to capital flight, and further governmental restrictions
- Lack of integration between unbundled systems
- Algorithms and friction between platforms used to discriminate against user-subgroups.

Over the past years, programmable money emerged in the token economy and enabled the shift to fully digitised and better streamlined financial services. To do this, stable units of value had to be developed that could be programmed to imitate traditional banking for the token ecosystem, without the volatility of some cryptocurrencies.

The Rising Alternative of Decentralised Finance

Decentralised Finance (DeFi), a stack of applications run primarily on blockchains, are emerging as an alternative to the traditional banking ecosystem. The core tenants can be summarised as:

- 1. Permissionless** - Individuals do not need bank or state permissions to participate, although KYC/AML checks can be required.
- 2. Censorship Resistant** - DeFi applications were conceived as being outside of state-issued sanctions, enabling individuals who are excluded from the current banking ecosystem to freely use them.
- 3. Finality and Fluidity** - DeFi transactions cannot be reversed once they are confirmed, unlike traditional alternatives.

Decentralised Finance (DeFi), a stack of applications run primarily on blockchains, are emerging as an alternative to the traditional banking ecosystem.



Moreover, they take place quickly and move through applications of different natures with ease.

4. Programmable - Unlike bank balances, DeFi applications today can be programmed to do extremely complex functions through external data providers, like Chainlink, and be customised to represent a wide variety of assets using synthetic assets.

DeFi Markets Structure and Emerging Applications

Much like how legos fit with one another to give structure, applications in DeFi can be plugged into one another, giving them the moniker of 'Money Legos'.

Much like how legos fit with one another to give structure, applications in DeFi can be plugged into one another, giving them the moniker of 'Money Legos'. This enables them to provide unique experiences and solve problems that each constituent application may not efficiently solve on its own.

It is possible to take out a loan on one platform, perform a leveraged trade on another, and exchange it back to the base asset through a decentralised exchange without any banking restrictions or nation-state regulations. Some usecases where DeFi out-performs its traditional counterparts are:

- International Remittance
- Trading
- Lending and Borrowing
- Provenance and Ownership.

The size of the target market for DeFi can be envisioned in a hierarchical stack, that starts from the bottom as follows:

1. The User Experience Layer (applications for storage, transfer, tracking of digital assets, portfolio tracking instruments)

2. The Asset Layer (stablecoins, NFTs, digital assets)

3. The Investment Infrastructure (Decentralised exchange and Lending)

4. Asset Issuance and Synthetic Assets



The Potential Role of Europe



The Euro may be the first large-scale attempt at a truly global currency involving coordination from multiple nations. Since Europe has a greater financial integration, DeFi applications could play heavily off Europe's existing FinTech ecosystem, and offer greater changes that simplify cross-border transactions. Based on this, some of the usecases that could emerge are:

- **International Transfers and SME Payments** - Stablecoins enable faster payment transfers that incur almost no fees. In the future, it is likely that we will see an alternative to SEPA and SWIFT based banking infrastructure.
- **Increasing Yield** - DeFi offers retail customers access to alternative regions with higher interest rates and lower costs of recollection and settlement compared to current banking infrastructure.
- **Infrastructure for the Future of Finance** - Blockchain can be used to verify the provenance of documents for insurance claims thereby reducing processing time or to improve cross-border shipping.
- **Standardisation at Scale** - By reducing the number of middlemen and accelerating the speed of transactions, DeFi based services promise to outstrip traditional services in efficiency.

Many countries are already dipping a toe into the space. Europe stands to benefit heavily from an ecosystem that is friendly to this nascent sector, as it could power the new generation of FinTech platforms.

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Issues and Possible Fixes

The losses in Decentralised Finance are not unique to it, as with credit cards and digital banking, the early days are marked by a high number of hacks. The industry remains well aware of this, and is working to mitigate some security challenges with different solutions :

- 1. Improvements in Data Availability** to enable users to make more informed investments.
- 2. Evolution of the User Experience (UX Layer)** to avoid the risk of sending money to the wrong wallet.
- 3. Rising Institutionalisation** to have one click solutions that

take care of concerns from regulatory bodies.

4. Financialisation of Risk through the possibility to buy insurance against the risk of the price of digital assets collapsing for a small premium.

5. Role of Regulators And Exchanges to have sandboxes and clear frameworks for dispute resolution and arbitration.

6. Data Availability and Smart Contract Audits that will enable developers to detect and resolve bugs in their system or “oracles” before weaknesses are exploited by hackers.

Decentralised Finance in its final form may not be the DeFi promoted by early adopters, but will still bring sweeping changes in how finance works in the years to come.

All in all, Decentralised Finance in its final form may not be the DeFi promoted by early adopters, but will still bring sweeping changes in how finance works in the years to come. Currently, DeFi applications may be susceptible to hacks, but the frequency and amount of loss have been declining. As with any new industry, in order to increase benefits, regulators and corporate partners need to join the ecosystem and contribute as it evolves. Several countries are taking the first step toward this world, by recognising that DeFi will last into the future.

In the coming decade, we predict that:

- **Stablecoins will become a critical component of international payments.**
- **The Big Four will be a crucial part of the DeFi ecosystem in the years to come.**
- **Effective insurance will make DeFi a trillion dollar industry.**
- **Traditional financial institutions in Europe will offer their first DeFi-enabled savings and pension accounts.**
- **DeFi will provide income for thousands of gamers, streamers, and influencers.**
- **There will be pain before we grow.**

While still a nascent industry, the benefits of DeFi could leapfrog the current FinTech industry, providing a new structure of financial services. Early investments in this, will help countries remain at the forefront of innovation and financial services.

1

Introduction to DeFi - A Native Currency for the Internet



Introduction to DeFi

A Native Currency For The Internet

The internet removed state and regional monopolies' control on expression.⁶⁶ In a matter of years, it became possible for individuals from extreme ends of the world to share ideas, collaborate, and work together without the intervention of state regulations. This in turn created entirely new economies. Roles like social media managers, community moderators, and influencers did not exist a mere 15 years back, but are crucial in driving our perception of reality today.

While global economies have become closer, our currencies have remained state monopolies. We're subject to the monetary policies and systems of the countries we live in.

While global economies have become closer, with more interpersonal interactions - in thought, expression, research, and collaboration - our currencies have remained state monopolies. We're subject to the monetary policies and systems of the countries we live in, with very little choice in the matter. For global payments, the US Dollar established itself as the global reserve currency, riding on its use in the petroleum industry.¹ However, in terms of alternatives, there have not been many options, until Bitcoin.

Bitcoin represents a transition of our perception of what money can be, from state-issued and regulated to digital, algorithmically-issued, and regulated by consensus on different levels.² Although there have been multiple variations of digital currencies, many with origins in the 1990s, sufficiently decentralised, open-source alternatives for individual use were not previously available.³

Bitcoin stood in as a perfect, or perhaps the only, alternative that could provide sovereignty, mobility across borders, and easy liquidity. However, Bitcoin alone is not equipped to replace current financial systems.

In the post-crisis economy of 2008, Bitcoin gained interest as an alternative for individuals looking to exit state-issued currencies or hedge themselves against these systems. Riding the rise of internet adoption, niche communities that were excluded from traditional banking and alternatives (eg: Wikileaks) and changing geopolitical trends (Turkey, Iran, Venezuela, and India), forced many to seek an alternative.⁴ Bitcoin stood in as a perfect, or perhaps the only, alternative that could provide sovereignty over one's currency, mobility across state borders, and easy liquidity for conversion into regional currencies. However, Bitcoin alone is not equipped to replace current financial systems. Blockchain technology laid the groundwork for the necessary developments.

Emergence of Programmable Money

The banking ecosystem has undergone its own evolution in the past two decades. Elements of what were considered banking

APIs have replaced entire divisions in banking with algorithms, making it possible for startups to offer banking experiences that rival traditional alternatives.

in the traditional sense - such as money withdrawal, transfer, customer identity verification, and remittance - have all been unbundled and turned into startups of their own.⁵ Application Programme Interfaces (APIs) have replaced entire divisions in banking with algorithms, making it possible for startups to offer banking experiences that rival traditional alternatives. The rise of N26, Monzo, Transferwise, and Stripe are all examples of how functions banks historically served have unbundled to become unique product lines of their own. Together, they can be referred to as the “open-finance” stack - permissioned layers that focus on a specific function working within state regulations.⁶

API-based businesses in the realm of finance tend to scale quickly, provide better user-experiences than traditional counterparts,⁷ and benefit from the regulatory environment they are based in.

API-based businesses in the realm of finance tend to scale quickly, provide better user-experiences than traditional counterparts,⁷ and benefit from the regulatory environment they are based in. However, state interference on innovation, lagging regulatory frameworks, and restrictions on international trade, limit how inclusive these platforms can be, both across borders and platforms. While regulations are there to provide safeguards for users, often in emerging fields, those tasked with creating regulations do not always fully understand new technologies and the trajectory of development. Therefore, many regulations that are put in place hamper innovation, rather than efficiently protecting users.⁸

This is especially difficult as people attempt to use financial services across borders, especially in reaction to geopolitical events that destabilise or devalue their currencies. For instance, acquiring large amounts of foreign currency in regions like Venezuela or India can be a pain-point due to concerns about capital flight, and have led these governments to limit access to services that facilitate this, such as many FinTech services.⁹

As a result, it is essentially impossible for money to move quickly between each constituent platform in FinTech.

Additionally, many of the different unbundled systems haven't been integrated yet. This can create a high degree of friction in the movement of money between various platforms. As a result, it is essentially impossible for money to move quickly between each constituent platform. Unnecessary or unaccounted for friction can occur even in instances where the provenance of the money is established and Anti-Money Laundering (AML) and Know Your Customer (KYC) checks are done, and leads to subpar user-experiences.¹⁰ This is a major sticking-point for FinTech, which has largely built its customer-base on the premise of better user-experience and control.

More importantly, though, the algorithms and friction can be used to discriminate against user-subgroups by holding

The algorithms and friction can be used to discriminate against user-subgroups by holding account balances unnecessarily or, even worse, refusing services altogether in moments of crisis.¹¹



The late 2010s were about finding stable units of value that could be programmed to imitate traditional banking for the future token economy powered by blockchain.

account balances unnecessarily or, even worse, refusing services altogether in moments of crisis.¹¹ One way this has emerged is in the case of lending. There have been multiple instances where algorithms have denied women loans despite them having the same socio-economic backgrounds and the same or higher credit scores than their male counterparts. This is clear in the case of Apple Card, where gender-based bias was revealed in 2019.¹²

Over the past five years, programmable money emerged in the blockchain space, as an advancement on Bitcoin, and the complexity of applications that could be built with programmable money has evolved. Essentially, while many FinTech startups still operate in the framework of fiat money and traditional financial services, and subsequently, continue to see many of the same issues, programmable money enables the shift to fully digitised and better streamlined financial services.

This timeline of development imitates the growth of the internet, too. Between 1990 and the early 2000s, we went from text-heavy, forum-like niche communities on the internet to search engines powered by algorithms and semantic tagging.¹³ Mobile phones transformed from basic devices to touch-screen machines with massive adoption between 2000 and 2010. Similarly, smart contracts on Ethereum have paved the way for new digital abstractions of money, or new ways to theorise about the use of money. Programmable money allows for financial services that are digital natives - and may well be the future of financial services for the digital native generation.

To create these new services, means to regulate the value of cryptocurrencies had to be established. A stable currency is not only useful for operating financial services, but also what the majority of people expect from their money. Some so-called 'Stablecoins' use other cryptocurrencies (Like Bitcoin or Ether) as collateral to issue stable currencies (DAI, Synthetix), and attempts have been made towards algorithmic pegs (Reserve, Ampleforth). Of all these variations on money, stablecoins, backed by dollar reserves in bank accounts, have seen the greatest amount of growth in terms of supply. As of writing this, Tether (USDT) has a market-supply of close to \$10 billion¹⁴ and over 75,000 active users¹⁵ transacting on its network. More regulated variants like USDC (USD-Circle), issued by Circle Exchange, are at a distant supply of north of \$900 million.¹⁶ The late 2010s were about finding stable units of value that could be programmed to imitate traditional banking for the future token economy powered by blockchain.



The Rising Alternative

DeFi, or Decentralised Finance, is a term used to refer to a stack of applications run primarily on blockchains that are emerging as an alternative to the traditional banking ecosystem. Instead of bank deposits, they rely on stable currencies (like DAI, USDC, USDT) and digital assets (like Ethereum) to remit, pay, lend, or borrow and trade against one another. The core tenets of Decentralised Finance can be summarised as being:

1. **Permissionless** - Individuals using or building DeFi applications require no state-issued licenses or bank permissions. Anyone, from any corner of the world can build on it, although increasingly to participate in buying or exchanging back to fiat currencies, KYC/AML checks are required.

2. **Censorship Resistant** - DeFi applications were initially conceived as being outside of state sanctions in order to be used by individuals who are excluded from the current banking ecosystem.

3. **Finality and Fluidity** - DeFi transactions cannot be reversed once they are confirmed, unlike traditional alternatives. Monetary value in DeFi can also transition between applications of different natures in very short periods of time, balance confirmation and money provenance are established very quickly, especially in comparison to traditional alternatives.

4. **Programmable** - Unlike bank balances, which cannot be pre-programmed to perform highly complex interactions depending on third-party occurrences (e.g.: changing weather, movement of a stock's price), DeFi applications today can be programmed to do extremely complex functions through external data providers, like Chainlink, and be customised to represent a wide variety of assets using synthetic assets.

Increasingly, the services offered by DeFi address different sectors in traditional finance.

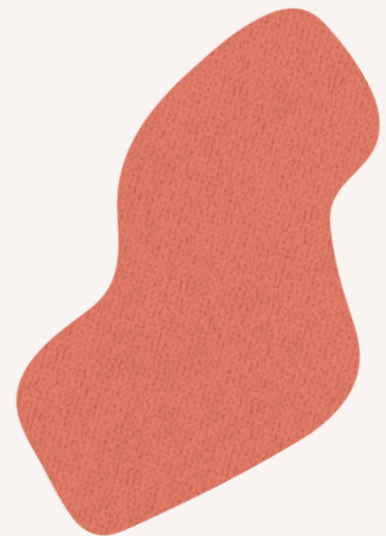
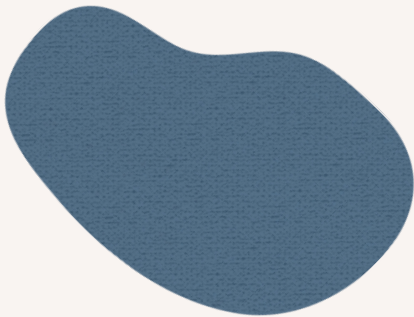
DeFi is a microcosm of the traditional financial ecosystem. Increasingly, the services offered by DeFi address different sectors in traditional finance. There are also a rising number of individuals looking towards Decentralised Finance for better interest rates, faster remittance, and a wide variety of applications that they are otherwise restricted from.¹⁷

It is likely that this space will evolve into something much larger. Much like e-mail, e-commerce, and mobile applications, DeFi applications will likely start small - both in terms of users and variety of applications - but see a boom in adoption. As

As institutions enter the arena and regulators wake up to these new alternatives,¹⁸ we will see an increasingly complex suite that can eventually rival, and potentially replace, existing banks.

institutions enter the arena to provide liquidity for markets and regulators wake up to these new alternatives,¹⁸ we will see an increasingly complex suite that can eventually rival, and potentially replace, existing banks.

At the time of publishing, there is currently around \$2 billion worth of assets being put to work in Decentralised Finance applications, for lending, borrowing, trading, collectibles, governance, and remittance. While minuscule compared to the current financial system, this area is a mere 18 months old. As highlighted in our interview with Marc Zeller of Aave, he hopes DeFi can reach \$1 trillion worth of assets by 2035 and this is why we believe it could be important to the next, Decentralised Generation (dGen).



2

Money Legos & Emerging Applications

Money Legos & Emerging Applications

What Are Money Legos & Why Do They Matter?

Much like legos, different DeFi applications can be plugged into one another to solve problems that each application may not efficiently solve on its own.

Money legos refer to the concept that applications in Decentralised Finance can communicate with one another to provide unique experiences. Much like how legos fit with one another to give structure, different applications can be plugged into one another to solve problems that each constituent application may not efficiently solve on its own. How does this work in web 2.0? Consider Uber. It uses third party payment providers, GoogleMaps, and login systems that are not self-hosted.¹⁹ Yet, the app combines all of these different services to offer a streamlined ride-hailing system. Similarly, Apple's login system and payment methods are available on different applications, enabling users to securely pay for products without divulging their personal information.

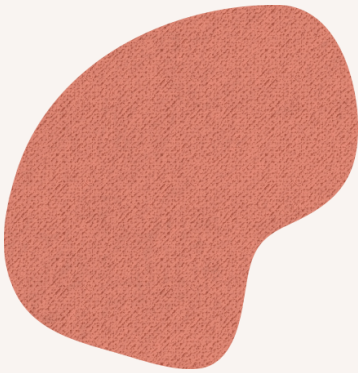
DeFi makes it possible to take out a loan on one platform, perform a leveraged trade on another, and exchange it back to the base asset through a decentralised exchange.

Decentralised Finance brings the same concept to financial applications. DeFi makes it possible to take out a loan on one platform, perform a leveraged trade on another, and exchange it back to the base asset through a decentralised exchange. Individuals hold the power to move their assets with the click of a button, all without reliance on banking hours or nation-state regulations, at least until they move it to fiat currencies.

Further, the speed of transfers in DeFi makes it possible to create a more efficient, laissez-faire market, compared to traditional markets, where state interventions routinely slow proper functioning. However, the slew of hacks and Ponzi schemes that have hit this sector prove that this is a trade-off compared to traditional systems, which although clearly not immune to these same issues, have a few more safeguards built-in for users who may not be experts.

Composability enables this stacked functioning, and refers to the ability to restructure and re-connect different applications built on blockchains, like Ethereum. There are a number of usecases where DeFi could outperform its traditional counterparts, but here are just a few.

1. International Remittance - So far in 2020, stablecoin-based payments have been able to handle over \$220 billion worth of assets on the blockchain.²⁰ According to the world bank, global remittance volume for 2018 was around 620 billion,²¹ for a sense of scale. But not only is it possible, it can be done at the fraction of the cost. For example, you can transfer \$1 million



Orders are settled directly between wallets in a matter of minutes, which means the traded cryptocurrency will be in the user's wallet without the need to first transfer the assets to the exchange.

DeFi enables users to lend and borrow directly, removing a banking intermediary from the entire process.



dollars anywhere in the world for X price. The payment rails that enable businesses and individuals to send money around the world with the click of a button are already here. Better platforms for people to convert money to digital tokens and store them securely are necessary for this to scale. Stablecoin-based payment adoption will enable businesses and individuals alike to receive money from anywhere in the world in under ten minutes for a fraction of the cost of traditional payment relays.²²

2. Trading - Decentralised exchanges are variations of traditional exchanges, like NYSE, London Stock Exchange, or even Coinbase. The key difference is that decentralised exchanges do not require complete custody of an asset - the original owner can maintain custody.²³ Orders are settled directly between wallets in a matter of minutes, which means the traded cryptocurrency will be in the user's wallet without the need to first transfer the assets to the exchange. The upside of this is that unlike certain centralised exchanges, decentralised exchange users are less vulnerable to losing their funds due to a hack or the exchange vanishing with their money. However, that does not mean they are entirely fool-proof, as faulty pricing data have caused losses for users.

3. Lending and Borrowing - DeFi enables users to lend and borrow directly, removing a banking intermediary from the entire process. Balance verifications are based on a blockchain, assets are transferred to a smart contract, and interest rates are deducted without human intervention once the conditions are set.²⁴ Loans in DeFi are typically used by margin traders, who give their cryptocurrencies as a collateral, through platforms such as Aave. As long as they are able to pay the interest rate and maintain the collateral requirements of a loan, they do not have to rely on a third party to have access to a lending facility.

However, through collaborations with wallet providers, non-custodial lending has been made available to a much wider market. Using Argent, you can now invest your crypto assets directly to earn a passive income. Over time, other digital assets, like IP rights or digital art, could also be used as a lending instrument. In the future, lenders, like Aave, are working on ways to make lending more profitable and less risky for lenders with smaller portfolios. The high amount of demand for digital lending today makes the yield - or return on investment for individuals leaving their deposits in DeFi platforms - considerably higher than the interest offered by traditional banks, but not without some extra risks.²⁴

Individuals can then trade the fractional tokens with one another as the perceived value of the asset changes.

4. Provenance and Ownership - Verifying the source of a document or ensuring a claim of ownership over a digital asset is hard in legacy markets, largely due to their centralised systems.²⁵ The mutable nature, which means they can be retrospectively changed, of traditional documents, make them easy to forge and, more importantly, difficult to verify. Blockchains offer an alternative to this with Non-Fungible Tokens (NFT) and fractional ownership. Non-Fungible Tokens are tokens that cannot be divided into smaller fractions or reproduced.²⁶ They are used to represent tickets, gaming passes, or even in-game art. The token itself represents ownership of the asset. Fractional ownership makes it possible for individuals to own a smaller portion of very costly assets.²⁶ This is common in the case of vintage cars, highly prized real estate, and artwork. Individuals or agencies who are the custodians of the asset prove ownership through regional attestation bodies, then issue tokens that represent part-ownership of the asset. Individuals can then trade the fractional tokens with one another as the perceived value of the asset changes. Regulations around this are not entirely clear yet.

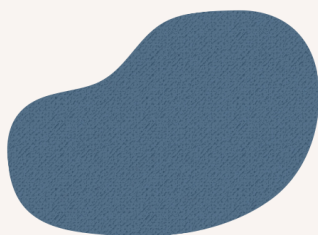
Decentralised Finance is often seen as a foundational layer, empowering users and developers to bypass high entry barriers or inefficiencies in traditional finance.

Decentralised Finance is often seen as a foundational layer to empowering users and developers to create experiences that would otherwise have high entry barriers or be inefficient in traditional finance. However, upholding these goals is contingent on not requiring permissions for the purpose of innovation. This makes it possible for individuals from around the world to collaborate on building, maintaining, and using financial instruments - an occurrence that rarely happens in finance due to the nature of stringent regulations and high entry barriers. Obviously, while DeFi has been promoted as the means of removing the potentially discriminatory barriers that traditional finance operates under, this is only possible at the expense of safeguards for users, that are enforced by those very same regulations.

What Is DeFi Used For Today?

Applications in Decentralised Finance largely imitate the traditional banking stack. With wider adoption, people may be able to handle their financial lives solely through blockchain-enabled DeFi applications.

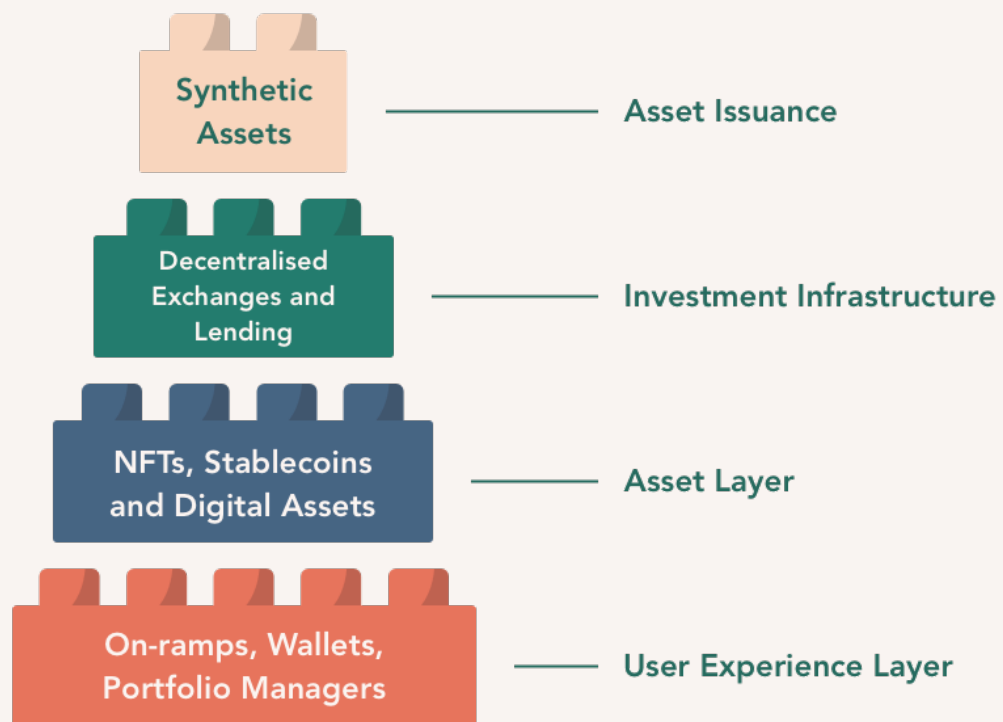
The size of the target market for DeFi today broadly follows the hierarchical order shown below, Fig. 1. Applications at the bottom of the pyramid have less go-to-market barriers, but are often met with a high number of competitors and a crowded market place. At the top of the pyramid, though, there are fewer individuals using the products and heavy barriers



involved in go-to-market. However, this reduces the number of peers a startup has to compete against. We look at each layer below.

Figure 1: The hierarchy of DeFi applications

The hierarchy of DeFi applications in terms of captive user-base



1. The User Experience (UX) Layer

They allow individuals to exchange their tokens directly from within their wallets (by connecting to decentralised exchanges) or receive interest by offering assets to lend on digital platforms.

This primary layer involves projects involved in onboarding individuals to the DeFi stack, such as applications for storage, transfer, and tracking of digital assets, as well as portfolio tracking instruments. On-ramps, like LocalEthereum, work in a peer-to-peer fashion to connect users around the world. There are no liquidity provisions run by single firms. Instead, individuals in different countries create their own listings on the market and use smart-contract based escrow systems. Tokens are held by smart contracts and released only when a seller receives payment for the asset. A slew of new wallets, like Argent, Fortmatic, and Frontier, are paving the way for individuals to better engage with the DeFi ecosystem. They allow individuals to exchange their tokens directly from within their wallets (by connecting to decentralised exchanges) or

receive interest by offering assets to lend on digital platforms. Portfolio management and tracking applications, like Zerion and SafeKeep, are used to check balances, changes in portfolio value, and interest received from different DeFi applications. These tools make up the foundational layer of DeFi.

2. The Asset Layer

Stablecoins, NFTs, and digital assets fall into this category. Individuals who hold some form of token to represent ownership on a blockchain or incentive rewards, engage with this layer. Stablecoins are dollar-pegged digital assets that can be moved anywhere in the world without banking intermediaries.²⁷ They are used for trading, remittance, and payments. As of writing this, the market-cap for stablecoins in the DeFi ecosystem has crossed over \$10 billion²⁸ and enabled close to \$250 billion in transfers.

NFTs are used to represent assets on blockchain-based networks. Their primary use today is in gaming and arts to represent collectibles. We are beginning to see them being used to represent a wider range of instruments, such as real estate shares²⁵ or income share agreements.²⁹ In the not so distant future, securitised tokens and equity will likely come to the DeFi ecosystem.

3. The Investment Infrastructure

Investment infrastructure refers to a class of applications used primarily for trading assets from one to another or staking assets behind the issuance of loans. Decentralised exchanges have emerged as a strong alternative to centralised counterparts in light of potential hacks and privacy concerns of centralised data storage. Decentralised exchange's API offerings also make it possible for third-party applications, like a wallet, to simply convert one digital asset to another without switching between mobile apps.

DeFi lending applications have attracted a lot of attention due to high interest rates, often around 6 - 8%³⁰ compared to traditional rates, which currently average between 0.5 - 1.5%.³¹ However, some regions, like Switzerland, even have interest rates in the negatives.³² Stablecoin-based lending markets offer an alternative that mitigates the risk of currency volatility while offering attractive interest rates.

DeFi is able to offer higher interest rates due to the active leverage trading markets. When there is a high number of individuals looking to buy an asset, interest rates to borrow

When there is a high number of individuals looking to buy an asset, interest rates to borrow that asset are higher due to demand.³⁰



that asset are higher due to demand.³⁰ The asset itself is secured by smart contracts, and automatically liquidated with no manual intervention, if the collateral offered is found to be insufficient.

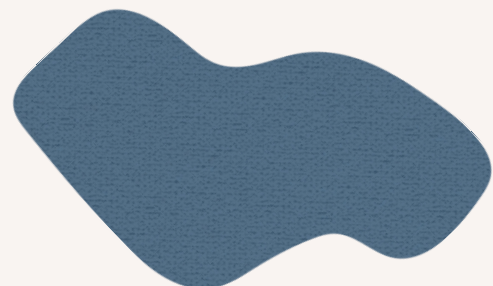
4. Asset Issuance and Synthetic Assets

Asset issuance platforms are used to track the price of certain goods or the possibility of events happening. They can be used to track Forex markets, the price of equity, or create prediction markets for certain events. While a large number of individuals may trade these instruments, given the complexity of designing new financial instruments, there will be very few people who interact directly with the asset issuance layer.

They are usually used for creating indices (like on Synthetix)³³ or large derivatives markets (as supported by UMA_Protocol).³⁴ The core value of asset issuance platforms is that they remove regional and state barriers for individuals to access certain financial instruments.³⁵ Additionally, they remove intermediaries, cutting out potential exploitation or fees that may be prohibitive. It also means that people with large amounts of cryptocurrency holdings can diversify their holdings without going through the banks. However, it remains to be seen whether or not strictly peer-to-peer transactions will remain the norm with greater adoption.

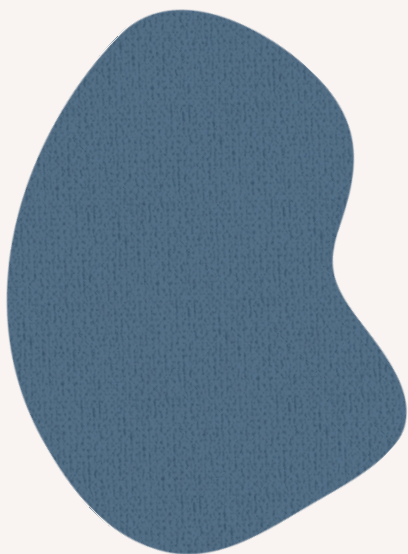
DeFi markets are speedier and operate round-the-clock, providing the opportunity for much greater individual engagement in the ecosystem.³⁵

The spectrum of applications on DeFi today makes it possible for individuals to access a wider variety of services at a fraction of the cost of traditional services and drastically reduced paperwork.³⁵ DeFi markets are speedier and operate round-the-clock, providing the opportunity for much greater individual engagement in the ecosystem.³⁵ As of writing this, there is around \$2 billion locked up in different DeFi products.³⁶ This comes with its own share of risks. While there are tools to mitigate the loss of funds, it will take a maturing ecosystem, stakeholder alignment, and proactive founders educating users about the risks for the industry to evolve. We take a look at some of these challenges and possibilities in the upcoming sections.



3

Macro-Economic Landscape in Europe



Macro-Economic Landscape in Europe

The finance industry can feel like one of the least personable industries in existence. Much of modern day finance is abstract, seeming like nothing more than numbers on a screen. At a high level, the world of reserve currencies, institutional lending, financial derivatives, and government borrowing is not fully understood by the vast majority of society, never mind a clear part of their day-to-day.

At its root, though, the world of finance evolved from and for the average person in society. Modern banking began in Venice in the 1400s for merchants to store money.⁶⁷ Lending and borrowing have been around since ancient times, and were once administered on stone tablets.⁶⁸ Cross-border trade, or trade of any kind, has been facilitated by various global or regional currencies over the last millennium. In some cultures, even items such as shells were used as currency for centuries.⁶⁹ Stock markets were created for adventurers on seafaring ships to raise capital and fund their journeys.⁶⁷ Insurance was also developed as a way to mitigate the risk of an investment in said ships. Interest rates began around this time, with Genoa at the heart, backing Spanish ships.⁷⁰

Even if the greater finance industry is incomprehensible to most people today, it began with the need to solve people's problems.

Even if the greater finance industry is incomprehensible to most people today, it began with the need to solve people's problems. In Europe, in the last decade since the financial crisis has torn up the rulebook, and many assumed certainties are now no longer certain. Many savers no longer receive interest on their savings, large swathes of the population face uncertain futures regarding their pensions, people are more likely to have to migrate for work opportunities, and financial institutions are more risk-averse, ostracising some sections of society. For many, the financial industry no longer meets their needs.

FinTech has evolved over the last decade, as part of Web 2.0, aimed at improving financial services for people. Now, Decentralised Finance (DeFi) offers further evolution, and a look at how financial services might operate for the Europeans of the next generation, over the next decade. At its root, DeFi is simply designed to address some of the problems faced by the people of today and tomorrow. We take a look at some of the usecases that could emerge.



Fintech in Europe

The Euro may be the first large-scale attempt at a truly global currency involving coordination from multiple nations. The European Union is also home to the second-highest number of FinTech related startups⁷³ (over 7,000), lagging behind the United States' 8,775 in 2020.⁷¹ As of 2018, some 51% of individuals globally with banking access have engaged in some form of internet-banking.³⁷ However, variable regulations in each member nation create certain challenges for the shared currency, such as limitations on which countries a bank or investment platform can be used in.²²

Greater financial integration, wide adoption of "neobanks", and the evolution of Open Banking infrastructure across the continent, sets Europe up to potentially pioneer adoption of a fully integrated financial system.

DeFi's contribution to the European FinTech ecosystem will largely be the same as for the rest of the world. However, Europe's greater financial integration, wide adoption of "neobanks" (or challenger banks), and the evolution of Open Banking infrastructure across the continent, sets Europe up to potentially pioneer adoption of a fully integrated financial system. All-in-all, the improved movement of assets between DeFi applications could play heavily off Europe's existing FinTech ecosystem, and further bolster this sector. DeFi has already been theorised as the next evolution in FinTech, and the truly shared infrastructure that can act as a single source of truth, with no regional intermediaries would certainly streamline this. Let's dive into the use cases.

International Transfers & SME Payments

Stablecoin enabled payment transfers take a fraction of the time traditional banking takes and incur almost no fees.³⁵ They can be processed during holidays and weekends, and provide a ready receipt for third-party payment verification. In their current form, blockchains are not ready yet for large-scale retail payments, though. A network like Ethereum has an upper bound for the number of payments that can be processed in a day. Much of today's Ethereum transactions are accounted for by stablecoins.³⁸ However, there are many other newer blockchain networks with higher capacity starting to gain popularity, and with the rollout of Ethereum 2.0 starting in 2020, the upper bound of transactions will increase dramatically.

In the future, it is likely that we see an alternative to SEPA and SWIFT based banking infrastructure.

The UK's financial regulatory body, the Financial Conduct Authority (FCA), explored the role stablecoins can play in the region when it considered setting up a regulatory sandbox for Facebook's Libra Initiative.⁷² Many other Central Banks across Europe are also looking at similar stablecoin or Central Bank Digital Currency (CDBC) initiatives. In the future, it is likely that

we see an alternative to SEPA and SWIFT based banking infrastructure. JP Morgan's Interbank Information Network (IIN)³⁹ is one global example of this, and more grass-roots level services, like Bitwage,⁴⁰ are already enabling organisations to pay employees around the world in stablecoins.

Increasing Yield

With interest rates plummeting towards, or below, zero in certain parts of Europe, DeFi offers retail customers access to alternative options with higher interest rates. DeFi yields are earned through on-chain lending, primarily for margin traders and institutional funds looking for leverage on their investments. Since the cost of recollection and settlement is considerably lower than under banking infrastructure, the interest paid by those borrowing is almost directly distributed to lending parties. The absence of a middleman and the associated fees makes interest rates higher.⁴¹ DeFi projects also don't have employee counts that run into the tens of thousands. Instead, they rely on smart contracts to distribute interest and the blockchain itself for the transfer of settlements.⁴¹ This efficiency is part of what helps provide better yields in DeFi platforms. However, the yield in DeFi comes at a heavy risk, and may not be suitable for mass-markets yet.⁴²

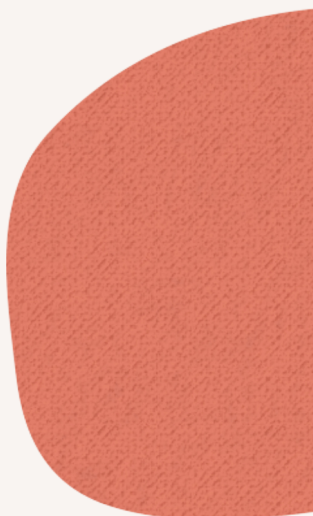
Infrastructure for the Future of Finance

Insurance claims and fractional art ownership can greatly benefit from blockchain use. For one, using a blockchain to verify the provenance of documents for insurance claims can decrease processing time, as the source, time of issuance, and accuracy of documents can all be verified by systems fundamental to the blockchain.⁴³

Similarly, a blockchain-based system can massively improve cross-border shipping. For instance, the bill of lading system, which provides a list of goods transported by ships, stands to be improved for more efficient payments by SMEs.^{44 74} This is one example, but can be applied to the transfer of goods across borders via many different transit systems.

Similarly, the rise of income share agreements and digital art foreshadow the need for regulations as they come to scale.²⁹ Blockchain already provides the required architecture, though, with some of the necessary safeguards built-in. Markets like Opensea⁴⁵ and SuperRare⁴⁶ are leading the way into the future of alternative financial instruments.

Since the cost of recollection and settlement is considerably lower than under banking infrastructure, the interest paid by those borrowing is almost directly distributed to lending parties.





Standardisation at Scale

The introduction of the GDPR and AMLD5 increased the amount and types of information a business needs to hold on individuals using FinTech applications in Europe. The legal risks associated with not doing so properly deter founders from offering services that could be highly relevant for their average user. On the other hand, banks, using legacy infrastructure, may not be able to offer the level of customisation developer's strive for and users increasingly expect.

Unlike banking API related FinTech platforms, DeFi requires little paperwork and licensing, especially when combining applications.

Decentralised Finance does not require permissions to combine a mix of tools that offer unique experiences. Unlike banking API related FinTech platforms, DeFi requires little paperwork and licensing, especially when combining applications, thereby vastly reducing the entry barrier for new founders. Blockchains, such as Corda from R3 or Shyft Network, can be used to create user experiences using a digital currency that are AML/KYC compliant. The reduced amount of red tape vastly increases the number and variety of products that founders can build for users. Similarly, any data that is required by regulations can be captured with relative ease alongside the necessary time-stamps. Since each of these datasets are verified on a global ledger (like Bitcoin or Ethereum) and completely immutable, they are more trustworthy than records held by central banking entities.

DeFi in its current form may be nascent, but it is sowing the seeds for sweeping changes at the infrastructure level.

DeFi in its current form may be nascent, but it is sowing the seeds for sweeping changes at the infrastructure level. By reducing the number of middlemen and accelerating the speed of transactions, DeFi based services promise to outstrip traditional services in efficiency. The European Union, which has already made moves to unify payments through a shared currency, stands to benefit heavily from even greater changes that simplify cross-border transactions.

With the rise of Central Bank Digital Currencies (CBDCs), like the ones in development in the United States and China, it is of the utmost importance that Europe keeps pace.

A complete upheaval of banking and trading infrastructure could open these markets up to far beyond member-state borders. With the rise of Central Bank Digital Currencies (CBDCs), like the ones in development in the United States and China, it is of the utmost importance that Europe keeps pace. A shift to state-sanctioned digital currencies will make mainstream DeFi adoption far easier and more likely. Waking up to the massive benefits the Decentralised Finance ecosystem can offer, Europe stands not only to keep pace with other regions, but outstrip them, especially playing off the already integrated laws and currency that the EU already shares to implement a fully digital system.

4

Issues, Potential Fixes, and Alternatives

Issues, Potential Fixes, and Alternatives

Observing the crypto industry over the past few years reveals that not only has the user-base increased, but the number of mishaps have also reduced. As with any industry, the early days are marked by a high number of hacks as early adopters experiment with the product and discover any potential flaws prior to high amounts of standardised testing or knowledge.

The industry remains well aware of the issues, and is working to mitigate these risks.

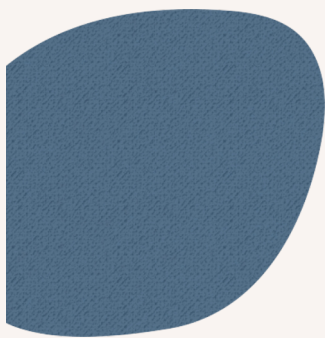
In the case of financial applications, hackers have an extremely high motivation given the lure of direct access to capital. What is becoming clear, though, is that the losses in Decentralised Finance are not unique to it, but a natural part of products slowly but surely finding their footing before going mainstream. Similarly, there was a great deal of loss when money became digital using credit cards and digital banking, and there will be high amounts of losses in the initial days of Decentralised Finance. The industry remains well aware of this, and is working to mitigate these risks. The greatest security challenges that DeFi faces are discussed below.

Data Availability

As a nascent industry, data collection in DeFi is still being developed. However, the nature and complexity of data available around DeFi transactions has increased markedly over the course of the past year.

Financial services are highly dependent on real-time data to make informed investments. As a nascent industry, data collection in DeFi is still being developed. However, the nature and complexity of data available around DeFi transactions has increased markedly over the course of the past year. APIs, like those provided by CovalentHQ, now enable individuals to track price and position of related data that is not otherwise conventionally possible.⁴⁷ Similarly, services like Nansen make it possible to find labels and analyse data for over 50 million different Ethereum wallets.⁴⁸ When paired with block-level data providers, like Blocknative, developers are able to monitor the legitimacy of transactions and track them in real-time.⁴⁹

In the near future, a walled environment of trusted parties may arise, composed of parties who know one another (and have done AML/KYC) through on-chain verifications and transactions in DeFi. This increases monitoring of capital markets in Decentralised Finance. Individuals will have checks before they are able to withdraw money. In these instances, the service may not be entirely 'decentralised' or anonymous, but rather be permissioned. Blockchains will primarily be used as an infrastructure layer, and may not live up to the decentralised and democratic ideal it has been held up as, although this may prove a necessary step for safe investment and mass adoption.



Evolution of the User Experience (UX Layer)



While increased labeling from service providers, like Nansen, can temper some of the benefits of DeFi, they also come with benefits. For instance, they can be used to provide more comprehensive checks. Wallet services can use this data to verify that transactions in fact go to the right address. This is similar to steps that browsers like Chrome and Safari have taken to drastically improve phishing detection.⁵⁰ The identification of the right wallet will make it possible for users to ensure transfers to the wrong addresses are not initiated, which is currently a major user experience flaw.

An early version of this already exists. Etherscan.io tags known scam or Ponzi-scheme related addresses,⁵¹ reducing the chances of continued success for these scams. More importantly, wallets, like those offered by Argent or FIO, now provide human-readable wallet addresses.⁵² This makes transfers as easy as remembering an email address. Such wallets also make it possible for secure and private storage of private keys - a primary cause for individuals losing access to their digital assets.⁵² However, according to Jordan Lyall, Head of DeFi for ConsenSys:

'DeFi products can't just be "as-good" or even "slightly better" than their traditional counterparts. We're in the age of Uber. A user needs a 10x improvement to their current Web 2 workflow, all while utilizing the benefits of a blockchain'.

Redefining the user experience will be essential, to the point that 'most users of popular fintech apps won't know they're using a product that's powered by a blockchain,' as Lyall continues.

Rising Institutionalisation

The presence of larger organisations in the industry will soon make it easier to develop and deploy apps providing greater support in regards to the likelihood of events like price slippages or regulatory scrutiny. Chicago DeFi Alliance is one instance of this,⁵³ though more are expected to follow. This organisation is a collaboration between TD Ameritrade, Cumberland, and Jump Capital, focused on providing better liquidity for DeFi oriented startups. The developers that work with them have more opportunity to create markets for specialised or novel instruments, and the support of a group of market-makers to support their initiatives from inception. In addition, ConsenSys launched an initiative that makes it





possible for Decentralised Finance oriented applications to have plug and play compliance solutions.⁵⁴ As larger organisations enter the industry, it will become easier for developers to have one click solutions that take care of concerns from regulatory bodies.

Financialisation of Risk

The ability to hedge against likely failure has been a cornerstone in the evolution of agriculture, shipping, and commodities related businesses over the past few centuries. Complex instruments like put and call options, gives investors the right to buy or sell stocks,⁵⁵ and alongside insurance services, make it possible for businesses to evolve without uncertainty in the face of a system crash.

A similar trend is now emerging in the DeFi ecosystem. Users can buy insurance against the risk of the price of digital assets collapsing for a small premium. Services like Hegic.co make it possible to do this without engaging with any centralised third party.⁵⁶ Similarly, Nexus Mutual allows individuals to buy insurance for their participation in services offered by Decentralised Finance products.⁵⁷

'Insurance on DeFi is still extremely limited[...] but as protocols mature, costs should come down[...] allowing for simpler and more useful insurance to emerge'.

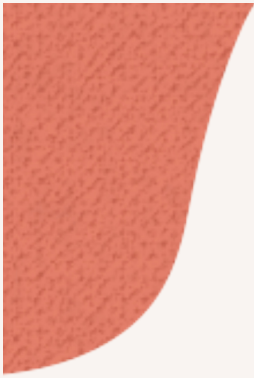
- Kain Warwick, Synthetix Founder

More extensive services that couple insurance with audits are also seeing a rise. Quantstamp - one of the industry's leading smart contract audit services - offers expertise in verifying the security of smart contracts.⁵⁸ They also provide custom smart contract deposit insurance services based on their understanding of the ecosystem.⁵⁸ As the Decentralised Finance sector matures, more solutions and supports are being developed so Founders and users can increasingly rely on the space for all of their financial needs.

Knowledge and security risks will continue to reduce, on top of a growing number of securities in the event of a hack. It appears the solutions the industry needs to scale will come from within the industry itself. According to Kain Warwick, Founder of Synthetix:

'Insurance on DeFi is still extremely limited[...] DeFi still has significant tail risk, so insurance is likely to remain very costly in the short term, but as protocols mature, costs should come down[...] allowing for simpler and more useful insurance to emerge'.

The need for community-developed solutions will continue as the knowledge gap between existing insurers and DeFi continues to grow. Why is this the case? Traditional insurance



models rely on actuarial models that are perfected over decades and banking relationships that have been long entrenched. That approach may not function for Decentralised Finance today, especially as new usecases continue to emerge.

Role of Regulators And Exchanges

Many DeFi projects rely on exchange rate data, but these have proven to be successful hacking targets. Some notable hacks have routed the exchanges to alternatives (like Fiat or other digital assets). Therefore, exchanges play a key role in tracking and locking down assets that may have originated from hacked sources.⁵⁹ In one recent occurrence, \$25 million worth of assets were returned by the hackers of dForce when the individual's IP was believed to be traced through the exchange used.⁶⁰

As the industry evolves, it will become crucial for regulators to offer sandboxes (for experimentation) and clear frameworks (to scale) for dispute resolution and arbitration in the event that a hack does occur. Unfortunately, technology tends to move faster than regulators, as Piers Ridyard, CEO of Radix, put it, 'we cannot wholly protect people from the risks as the technology is new and we don't yet know where the potholes are'. This is clear in the case of Decentralised Finance and cryptocurrencies. However, developing regulations from within the community that will protect participants, but not hinder future developments is an essential part of any industry. Ridyard continues:

'The best we can do is act with integrity and respond positively to bad news as learning experiences to improve the ways we work'.

Data Availability and Smart Contract Audits

The DeFi ecosystem relies on "oracles" for asset pricing information. In March 2020, a temporary failure to relay data accurately led to a loss of over \$5 million. This is a recurring issue as user-bases scale faster than the infrastructure powering these services. However, there are a high number of alternatives coming to the market that should alleviate pain-points around this over the course of the next year.⁵⁹ Similarly, in the past few years, there were very few services that could efficiently check the code of a smart contract to audit them for bugs. For example, projects like Compound and Aave have now received multiple smart contract audits, which in the past was not possible. Jordan Lyall, Head of DeFi at ConsenSys, expects:

Developing regulations from within the community that will protect participants, but not hinder future developments is an essential part of any industry.

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- Piers Ridyard, Radix CEO

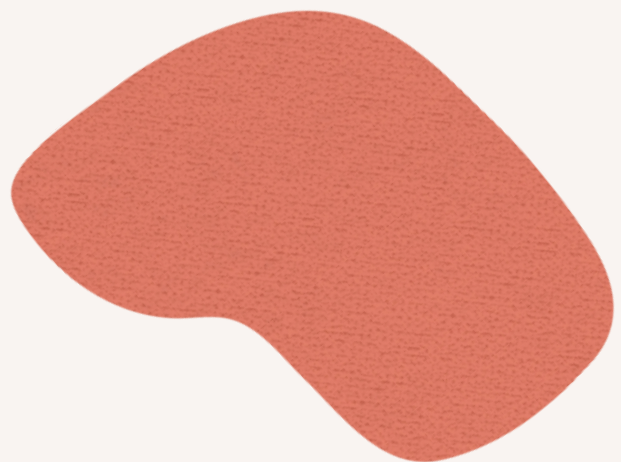
'We'll start to see cheaper and more automated options around obtaining an audit. As well as additional security practices and standards'.

'We'll start to see cheaper and more automated options around obtaining an audit'.

Jordan Lyall, ConsenSys Head of DeFi

As learnings from the past few years compound and the number of firms auditing smart contracts increase, developers will be able to detect and resolve bugs in their system before these weaknesses are exploited.

The slew of hacks and losses in Decentralised Finance pale in comparison to the amount of money lost in traditional financial ecosystems through fraud and errors. There is no official record of the amount lost in the traditional stock market, although the US Federal Trade Commission estimated that in the US alone there are around US \$10-40 billion worth of fraudulent losses per year.⁶¹ This being said, early adopters in DeFi today are rightfully concerned about the possibility of the industry scaling before mechanisms to detect, trace, and resolve potential errors are adequately developed. Many of the problems developers face are being addressed, albeit slowly. It may not be too long before we see Decentralised Finance becoming an additional foundational layer for global financial inclusion.



5

Conclusion

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However, in order to scale, it may require buy-ins from governments and corporations alike.

Decentralised Finance represents a monumental leap that could benefit the average member of society in the years to come. However, in order to scale, it may require buy-ins from governments and corporations alike. In its current state, DeFi applications may be susceptible to hacks, but the frequency and amount of losses have been declining. More importantly, as services like smart contract insurance and audits come of age, the risks involved for businesses to enter the system will decline massively.

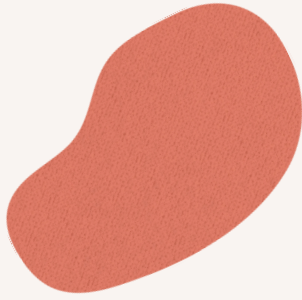
Decentralised Finance, in its final form, may not exactly be in line with the anti-establishment rhetoric of many of the early proponents. However, if seen solely as an infrastructure layer to build the future of finance, it could open up new ways of conducting business that may build on the initial vision for the movement. The better efficiency and composability alone, stand to improve financial services, even with more state-mandated regulations and red tape.

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To alleviate the 'high level of personal responsibility' currently necessary for DeFi investing, Hugh Karp, Founder of Nexus Mutual, expects that 'many people will end up relying on centralised custodians, which is not truly what [early DeFi proponents were] aiming for, but will be a reasonable bridge until new solutions become established and trusted'. To set DeFi products apart from the pitfalls of the current financial system while keeping them safe for users, he continues that 'we need real live experimentation, which is what's happening now' in the growing DeFi communities.

As with any new industry, if it takes off - which cryptocurrencies and DeFi have already shown some staying power - regions that embrace the new norm sooner rather than later will have an edge over peers that do not. We are already seeing an early version of this with China's launch of its own digital currency trying to compete against the dominance of the US dollar in global markets today.⁶²

The shared currency, the Euro, already paves the way for a more integrated financial system. However, this has also led to some of the lowest interest rates in decades for this region, as very different economic zones are tied together with monetary policy. Furthermore, stringent regulations on financial services by each member-state still make it difficult or impossible to integrate different services, especially APIs. While the Euro is



the currency of 19 different nations, there is still a relatively high degree of friction moving money across these borders.

DeFi has the potential to address these issues, providing financial services designed to solve the very real problems individuals in Europe currently face. Whether it be with savings rates, credit facilities, or, in the near future, pensions, we believe we will see sweeping changes in how finance works in the years to come.

Here are our predictions on how that will unfold over the next decade:

1. Stablecoins will become a critical component of international payments.

Paypal's rumored entry into offering its users cryptocurrency in the months to come is only the beginning of how the payments landscape is going to change.⁶³ We believe the integration of traditional FinTech players with crypto-native projects will accelerate the pace at which retail adoption happens. Once the on-ramps are built, it will be inevitable that individuals begin using stablecoin-based payments and remittance systems for long-distance transfers. As of June 2020, some \$220 billion²⁰ has been moved on blockchains. Once the regulatory environment around blockchain payments clears, this figure will massively rally, as individuals transition to on-chain transfers, instead of waiting on banks and their typical payment relays. As Charlie Smith, Head of Business Development at Reserve, sees it:

'The big stablecoin opportunity in the next five years is to present international cash USD holders with a sovereign, digital alternative and a suite of DeFi tools with which to leverage those holdings'.

2. The Big Four will be a crucial part of the DeFi ecosystem in the years to come.

As the amount of money in the DeFi ecosystem today increases, large audit firms such as KPMG and Deloitte, will have increasing incentives to help clients interface with the network. We are already seeing their involvement with blockchain-based projects with legal advice. Tom Howard, Chief Strategy Officer at Mosendo, told us:

'Over time, traditional financial institutions will have no choice but to interact with decentralized finance tools, slowly disintermediating the industry from the inside out'.

We believe the integration of traditional FinTech players with crypto-native projects will accelerate the pace at which retail adoption happens.

'The big stablecoin opportunity in the next five years is to present international cash USD holders with a sovereign, digital alternative and a suite of DeFi tools with which to leverage those holdings'.

- Charlie Smith, Reserve Head of Business Development



Functions like verifying the authenticity of an invoice, tracking payment settlements, and insurance claims could occur faster with the help of a blockchain. Their role will be to act as an intermediary between DeFi and traditional finance.

3. Effective insurance will make DeFi a trillion dollar industry.

Safety nets are expected, especially when it comes to investing life savings. As insurance becomes more widespread, affordable, and usable in DeFi, it will enable this sector to reach a trillion dollars in assets. The high interest rates and lower entry barriers will attract many millennials and GenZ users trying to increase their returns and build savings against dwindling state pensions.

4. Traditional financial institutions in Europe will offer their first DeFi-enabled savings and pension accounts.

As more and more people realise that their money sat in traditional bank and savings accounts can be better allocated elsewhere, there will be a major upheaval in capital allocation. To compete, traditional institutions will have to offer user-friendly, DeFi-enabled accounts that tap into the best interest rates for their client base. Over the coming years these financial products may become government backed or have a lower risk profile than many current investment options.

5. DeFi will provide income for thousands of gamers, streamers, and influencers.

According to Hugh Karp, Founder of Nexus Mutual, 'people are going to start getting exposed through games or other communities first'. Earning tokens for participation will encourage these users to explore blockchain enabled earning, and perhaps even 'lead [these users] to exchange them for digital USD'. Eventually, '[s]ome kids making real money playing games will go viral', Karp expects, garnering much wider interest. The gaming communities invested in DeFi will be the entry point for the youngest generations.

6. There will be pain before we grow.

Much like the DAO hack of 2016, it is likely that a major hack will occur in DeFi again. The rapid surge in money being locked in smart contracts today is similar to when DAO outperformed expectations, leaving it open to the hack.⁶⁴ Developers may struggle to do the necessary audits prior to scaling, and in the race to capture the most value, security may not remain the key priority. More mature projects should hopefully become safer

To compete, traditional institutions will have to offer user-friendly, DeFi-enabled accounts that tap into the best interest rates for their client base.

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over time. As with many past hacks, the likely source for such an event could be a faulty source for price related information on-chain.⁶⁵ However, Piers Ridyard, CEO of Radix expects that 'there will be repercussions, and a tightening of process and best practice[s]', but will eventually lead to more complex projects, and a continued dance with risk and return.

Decentralised Finance, while in its nascent stages today, represents a new paradigm. It will likely vastly diverge from the ethos that surrounds it today, much like how the internet went from a collection of forums for academia to mainstream entertainment platforms over the years.

As with all innovations, while early adopters face certain risks, those who remain on the sidelines for too long could face major disadvantages if we see widespread adoption.

In order to increase the benefits, regulators and corporate partners need to join the ecosystem and contribute as it evolves. As with all innovations, while early adopters face certain risks, those who remain on the sidelines for too long could face major disadvantages if we see widespread adoption. Many countries are already dipping a toe into the space. The Bank of England, Bank of France, and ECB (among others) have already expressed interest in stablecoins and Central Bank Digital Currencies. The Chair of the Federal Reserve in the United States, Jerome Powell, has spoken about using an Ethereum based solution for inter-bank exchange rates. Similarly, China has already launched multiple pivots of its regional digital bank currency.

A greater understanding and acceptance of stablecoins, paves the way for many of the other more complex financial products in the DeFi space over the next few years.

We may even see Decentralised Finance leapfrog legacy infrastructure to provide tools and opportunities necessary for today.

Major global financial powers have already taken note, foreshadowing that DeFi will last into the future. As such, Europe stands to benefit heavily from an ecosystem that is friendly to this nascent sector, as it could power the next generation of FinTech platforms and greatly improve the availability of financial services for all European citizens. In many ways, we may even see Decentralised Finance leapfrog legacy infrastructure to provide tools and opportunities necessary for today.



About dGen

After Gen X, characterised by big societal shifts, Gen Y, better known as millennials, and the digital native Gen Z, the decentralised generation will grow up in a future shaped by different dynamics and technological developments. AI, blockchain technology, and IoT will individually bring disruption to many industries, but it's at the crossroads where we expect our whole socio-economic fabric to change.

dGen is a not-for-profit think tank based in Berlin, Germany. We focus on how blockchain technology can contribute to a decentralized future in Europe and what this might mean for people, society, private entities, and the public sector over the coming decades.

Emerging technology focused on decentralising society will shape the next part of the twenty-first century; The dGen will grow up with opportunities for borders to fade and traditional networks to dissipate. Meanwhile, most blockchain developments are still in the early stages; focusing on building solid products and exploring regulatory requirements to create a fertile yet safe environment for companies and investors. The industry is focused on solving the big topics right now, while we encounter a lot of great ideas in the blockchain community about adoption. It's time for those ideas to find a purpose and for the real decision-makers in the world to learn what decentralisation will mean for them.

We're working with a team of researchers exploring how decentralisation will shape our future. Our insight reports focus on specific topics and industries to drive ideas for adoption in Europe. If you're researching how decentralisation is shaping our future, and would like to get involved, please get in touch at dgen.org. dGen is part of Beyond, a venture studio exploring a new world. For more information, go to beyond.ventures.



BEYOND

Author

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Joel John is an independent blockchain analyst from India. He is engaged with Metacartel Ventures, Incrypt, and Alkemi.network in an advisory capacity. He is also pursuing a research fellowship exploring the use of a blockchain based identity network for the gig economy in India. He was formerly involved with UK based Outlier Ventures and Rebright Partners from Tokyo.



Contributors

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Before founding dGen, Jake was originally a partner at Signal Ventures, investing in blockchain tech. In late 2017 he founded hype partners to help build and nurture ecosystems for blockchain projects and has worked with many top 100 projects. With these combined experiences he is able to distinguish legitimacy, necessity, and nonsense in this space. Jake is one of the founding partners of Beyond, a venture studio exploring a new world.

Nick Dijkstra



One of the founders of dGen and with a rich background in tech, Nick knows how to build organisations from scratch and can transform ideas to great tech products. As a former Product Manager at LiveIntent and Director of Customer Success at Avari he shipped software to a user base over 15% of the US population and has organised 200+ events in Berlin. As the COO at hype partners he is currently helping top-tier blockchain firms strategise their market approach. Nick is one of the founding partners of Beyond, a venture studio exploring a new world.

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Maggie is a writer, researcher, and editor. Trained in literature, critical theory, and gender studies, they are now exploring the ways that technology is changing the landscape of human interaction.

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Akash has a background in digital marketing and works on UX and UI design. His passion is technological development, and he is currently exploring where emerging technologies will take society.



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Evelyne has recently graduated in International Politics and Diplomacy at the University of Padua. She has a background in awareness campaigns and is working with the dGen team as Marketing & Content Writer Intern.

Interested in Partnering on Our Next Report?

We're looking for partners operating in blockchain ecosystems, corporates, universities, the public sector, and other stakeholders to engage in conversations about how blockchain and emerging tech is shaping the decentralised generation.

We're open for any collaboration on this topic and the broader study of decentralisation in Europe.

You can reach us at partners@dgen.org for more information.

Research Agenda

Privacy in Intelligent Drug Discovery

Scheduled
Q3 2020

References

1. Beaubouef, Bruce A. (2007). *The Strategic Petroleum Reserve: U.S. Energy Security and Oil Politics, 1975-2005*. Texas A&M University Press. Retrieved from: https://books.google.de/books?hl=en&lr=&id=tBpiORfCFs0C&oi=fnd&pg=PR13&dq=us+reserve+currency+petroleum&ots=KLe353pP1g&sig=mCEmOu5Uoi5GfKczrL_hA63z5KE&redir_esc=y#v=onepage&q=us%20reserve%20currency%20petroleum&f=false
2. Antonopoulos, Andreas M. (2015). *Mastering Bitcoin: Unlocking Digital Cryptocurrencies*. O'Reilly. Retrieved from: https://books.google.de/books?hl=en&lr=&id=IXmrBQAAQBAJ&oi=fnd&pg=PR4&dq=bitcoin+issuance+rules&ots=9BgVluKpQU&sig=jrR0eo_mUP17mvKfrg7kT9GLtZ8&redir_esc=y#v=onepage&q&f=false
3. Ali, Robleh, Barrdear, J., Clews, R., and Southgate, J. (2014). "Innovations in Payment Technologies and the Emergence of Digital Currencies." *Bank of England Quarterly Bulletin*. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2499397
4. Taskinsoy, John. (2019, October 30). "Bitcoin and Turkey: A Good Match or a Perfect Storm?" *University Malaysia Sarawak*. Retrieved from: https://papers.ssrn.com/sol3/papers.cfm?abstract_id=3477849
5. Ferrari, Roberto. (2016, March 18). "FinTech Impact on Retail Banking - From a Universal Banking Model to Banking Verticalization". *The FinTech Book: The Financial Technology Handbook for Investors, Entrepreneurs and Visionaries*. Retrieved from: <https://onlinelibrary.wiley.com/doi/abs/10.1002/9781119218906.ch65>
6. Espitia, German. (2018, August 3). "The Emerging Financial Stack: An overview of the technologies that are shaping the future of finance on the blockchain". *Medium*. Retrieved from: <https://medium.com/@espitia7/the-emerging-financial-stack-3d80a278bd94>
7. Gulamhuseinwala, Imran, Bull, T., and Lewis, S. (2015). "FinTech is Gaining Traction and Young, High-Income users are the Early Adopters". *The Journal of Financial Perspectives: FinTech*, Vol. 3, Issue 3. Retrieved from: [https://www.ey.com/Publication/vwLUAssets/ey-fintech-is-gaining-traction-and-young-high-income-users-are-the-early-adopters/\\$FILE/ey-fintech-is-gaining-traction-and-young-high-income-users-are-](https://www.ey.com/Publication/vwLUAssets/ey-fintech-is-gaining-traction-and-young-high-income-users-are-the-early-adopters/$FILE/ey-fintech-is-gaining-traction-and-young-high-income-users-are-)

the-early-adopters.pdf

8. Sharma, Rakesh. (2018, January 23). "Bitcoin Has a Regulation Problem". *Investopedia*. Retrieved from: <https://www.investopedia.com/news/bitcoin-has-regulation-problem/>

9. Morgan, Jeremy. (n.d.). "Capital Flight Takes Off in Venezuela". *Latin American Herald Tribune*. Retrieved from: <http://www.laht.com/article.asp?ArticleId=320607&CategoryId=10717>

10. Dooley, Roger. (2020, June 1). "Fintech Firms Fight Friction to Disrupt Banks". *Forbes*. Retrieved from: <https://www.forbes.com/sites/rogerdooley/2020/06/01/fintech-friction/>

11. Zou, James. (2018, July 18). "AI Can be Sexist and Racist - It's Time to Make it Fair". *Nature*. Retrieved from: https://www.nature.com/articles/d41586-018-05707-8?source=post_page-----817fa60d75e9-----&fbclid=IwAR0iajZ2WRp7mlrW4gy10X1jsmJLvRH-8blaSI0vGO_OMK05yJBW2X2Fevl

12. Bowden, Olivia. (2019, November 30). "Are Bank Algorithms Sexist? How Tech Might be Working Against Women". *Global News*. Retrieved from: <https://globalnews.ca/news/6235330/sexist-banking/>

13. Leiner, Barry M., Cerf, V., Clark, D., Khan, R., Kleinrock, L., Lynch, D., ... Wolff, S. (2009, October). "A Brief History of the Internet". *ASM SIGCOMM Computer Communication Review*, Vol. 3, No. 5. Retrieved from: <https://dl.acm.org/doi/epdf/10.1145/1629607.1629613>

14. CoinGecko (2020). "Tether (USDT)". *CoinGecko*. Retrieved from: <https://www.coingecko.com/en/coins/tether>

15. Cuen, Leigh. (2019, August 30). "Why Tether Volume Is at All-Time Highs". *Coindesk*. Retrieved from: <https://www.coindesk.com/why-tether-volume-surged-to-all-time-highs-in-august>

16. Circle. (2020, June 19). "USD Coin: The Fastest Growing, Fully Reserved Digital Dollar Stablecoin". *Circle*. Retrieved from: <https://www.circle.com/en/usdc>

17. Won, Daniel. (2019, December 22). "The Definitive Guide to DeFi (Decentralized Finance)". *Exodus*. Retrieved from: <https://www.exodus.io/blog/what-is-defi/>

August). "In Search of Stability in Crypto-Assets: Are Stablecoins the Solution?" *European Central Bank*. Retrieved from: <https://poseidon01.ssrn.com/delivery.php?ID=051126078111096016125121081071110014088023010055065000089023010116099040040010029038058017006071041038023010095031041117118078085114081066081008006054044101119085085118007118094096067125011081023004029096065117065077097066031122122&EXT=pdf>

28. Faridi, Omar. (2020, May 13). "Total Stablecoin Market cap Surpasses \$10 Billion for First time, Ethereum Network Activity Spikes Due to New Coins". *Crowdfund Insider*. Retrieved from: <https://www.crowdfundinsider.com/2020/05/161394-total-stablecoin-market-cap-surpasses-10-billion-for-first-time-ethereum-network-activity-spikes-due-to-new-coins/#:~:text=The%20total%20or%20combined%20stablecoin,stands%20at%20about%20%249%20billion.>

29. Judd, J. David. (2018, November 27). "CryptoCollege: How Blockchain can Reimagine Higher Education". *International Journal of Innovations in Online Education*. Retrieved from: http://onlineinnovationsjournal.com/streams/futures-in-online-education/5837229c33c1f140.html?source=post_page-----

30. Crowell, Benjamin. (2020, March 11). "Crypto Lending, Explained". *CoinTelegraph*. Retrieved from: <https://cointelegraph.com/explained/crypto-lending-explained>

31. FDIC. (2020, June 22). "Weekly National Rates and Rate Caps - Weekly Update". *FDIC*. Retrieved from: <https://www.fdic.gov/regulations/resources/rates/>

32. Swiss National Bank. (2020). "Current Interest Rates and Exchange Rates". *Swiss National Bank*. Retrieved from: https://www.snb.ch/en/iabout/stat/statrep/id/current_interest_exchange_rates#t2

33. Synthetix. (2020, March). "Litepaper". *Synthetix*. Retrieved from: <https://docs.synthetix.io/litepaper/>

34. UMA Project. (n.d.). "A Protocol for Building Synthetic Assets". *UMA Project*. Retrieved from: <https://umaproject.org>

35. Laurent, Patrick, Chollet, T., Burke, M., and Seers, T. (2018, November). "The Tokenization of Assets is Disrupting the Financial Industry. Are You Ready?" *Deloitte*. Retrieved from:

<https://www2.deloitte.com/content/dam/Deloitte/lu/Documents/financial-services/lu-tokenization-of-assets-disrupting-financial-industry.pdf>

36. DeFi Pulse. (2020). "Total Value Locked (USD) in DeFi". *DeFi Pulse*. Retrieved from: <https://defipulse.com/>

37. Milenkovic, Jovan. (2020, February 20). "43 Useful Online Banking Statistics - All About Mobile Money!" *Kommando Tech*. Retrieved from: <https://kommandotech.com/statistics/online-banking-statistics/#:~:text=However%2C%20based%20on%20a%20Global,50%25%20of%20adults%20bank%20online.>

38. Redman, Jamie. (2020, January 31). "Ethereum's Value Transfer is Now Dominated by Stablecoins". *Bitcoin.com*. Retrieved from: <https://news.bitcoin.com/ethereums-value-transfer/>

39. JP Morgan. (2020, May 22). "Largest Number of Banks to Join Live Application of Blockchain Technology". *JP Morgan*. Retrieved from: <https://www.jpmorgan.com/global/treasury-services/IIN#:~:text=Having%20launched%20as%20a%20pilot,network%20powered%20by%20blockchain%20technology>

40. Bitwage. "Payroll and HR Services for the New Digital Era". *Bitwage*. Retrieved from: <https://www.bitwage.com/>

41. Binance Academy. (n.d.). "The Complete Beginner's Guide to Decentralized Finance (DeFi)". *Binance Academy*. Retrieved from: <https://academy.binance.com/blockchain/the-complete-beginners-guide-to-decentralized-finance-defi#what-are-the-main-advantages-of-defi>

42. Kruppa, Miles and Murphy, Hannah. (2019, December 30). "'DeFi' Movement Promises High Interest but High Risk". *Financial Times*. Retrieved from: <https://www.ft.com/content/16db565a-25a1-11ea-9305-4234e74b0ef3>

43. Gatteschi, Valentina, Lamberti, F., Demartini, C., Pranteda, C., Santamaria, V. (2018, February 14). "Blockchain and Smart Contracts for Insurance: Is the Technology Mature Enough?" *Future Internet*. Retrieved from: <https://www.mdpi.com/1999-5903/10/2/20/htm#sec5-futureinternet-10-00020>

44. Takahashi, Koji. (2016). "Blockchain Technology and Electronic Bills of Lading". *JIML*. Retrieved from: <https://italab.doshisha.ac.jp/~tradelaw/PublishedWorks/>

BlockchainTechnologyElectronicBL.pdf

45. OpenSea. (n.d.). "The Largest Marketplace for Rare Digital Goods". *OpenSea*. Retrieved from: <https://opensea.io>

46. SuperRare. (n.d.). "Collect SuperRare Digital Artworks". *SuperRare*. Retrieved from: <https://superrare.co>

47. Covalent. (n.d.). "Insights for a Decentralized World". *Covalent*. Retrieved from: <https://www.covalenthq.com>

48. Nansen. (n.d.). "Surface the Signal in Blockchain Data". *Nansen*. Retrieved from: <https://nansen.ai>

49. BlockNative. (n.d.). "Master the Mempool. Master Value in Motion". *BlockNative*. Retrieved from: <https://www.blocknative.com>

50. Google. (2012). "Google Safe Browsing". *Google*. Retrieved from: <https://www.google.com/safebrowsing/static/faq.html>

51. Etherscan. (n.d.). "Home". *Etherscan*. Retrieved from: <https://etherscan.io>

52. Argent. (n.d.). "The Most Simple and Secure Smart Wallet for Crypto". *Argent*. Retrieved from: <https://www.argent.xyz>

53. Cuen Leigh. (2020, April 8). "Chicago's Trading Firms Look to DeFi With New 'Alliance'". *Coindesk*. Retrieved from: <https://www.coindesk.com/chicagos-trading-firms-look-to-defi-with-new-alliance>

54. Kharif, Olga. (2020, June 8). "Ethereum Co-Founder's Firm Starts Compliance service for Tokens". *Bloomberg*. Retrieved from: <https://www.bloomberg.com/news/articles/2020-06-08/ethereum-co-founder-s-firm-starts-compliance-service-for-tokens?sref=3NfVQwMF>

55. Downey, Lucas. (2020, March 16). "Essential Options Trading Guide". *Investopedia*. Retrieved from: <https://www.investopedia.com/options-basics-tutorial-4583012>

56. Hegic. (n.d.). "The Simplest Options Trading Experience". *Hegic*. Retrieved from: <https://www.hegic.co>

57. Nexus Mutual. (n.d.). "Get Covered Against Smart Contract Failure". *Nexus Mutual*. Retrieved from: <https://nexusmutual.io>

58. Quantstamp. (n.d.). "Leaders in Blockchain Security". *Quantstamp*. Retrieved from: <https://quantstamp.com>
59. Anisimov, Andrei and Youngblood, L. (2020, April 23). "Introducing the Coinbase Price Oracle". *The Coinbase Blog*. Retrieved from: <https://blog.coinbase.com/introducing-the-coinbase-price-oracle-6d1ee22c7068>
60. Sinclair, Sebastian. (2020, April 28). "DeFi Project dForce Refunds All Affected Users After \$25M Hack". *Coindesk*. Retrieved from: <https://www.coindesk.com/defi-dforce-refund-users-after-25m-hack>
61. Aarhus University. (2019, September 3). "Danish Researchers to Develop Artificial Intelligence Exposing Stock-Market Fraud". *EurekaAlert!* Retrieved from: https://www.eurekaalert.org/pub_releases/2019-09/au-drt090219.php
62. Bansal, Rajesh. (2020, June 4). "China's Central Bank Unveils Digital Currency, in Challenge to U.S. Dollar". *Carnegie India*. Retrieved from: <https://carnegieindia.org/2020/06/04/china-s-central-bank-unveils-digital-currency-in-challenge-to-u.s.-dollar-pub-81969#:~:text=As%20the%20first%20entrant%20in,the%20world%27s%20primary%20reserve%20currency.>
63. O'Neal, Stephen. (2020, July 1). "PayPal Dabbling in Crypto Could Make BTC a Mainstream Payment Option". *CoinTelegraph*. Retrieved from: <https://cointelegraph.com/news/paypal-dabbling-in-crypto-could-make-btc-a-mainstream-payment-option>
64. Siegel, David. (2016, June 25). "Understanding the DAO Attack". *Coindesk*. Retrieved from: <https://www.coindesk.com/understanding-dao-hack-journalists>
65. Russo, Camila. (2019, September 11). "A Faulty Oracle Will be Behind the Next Big Crypto Hack". *The Defiant*. Retrieved from: <https://thedefiant.substack.com/p/a-faulty-oracle-will-be-behind-the>
66. Jørgensen, Rikke Frank. (2001). "Internet and Freedom of Expression". Raoul Wallenberg Institute. Retrieved from: <https://www.ifla.org/files/assets/faife/publications/ife03.pdf>
67. Beattie, Andrew. (2020, April 5). "The Birth of Stock Exchanges". *Investopedia*. Retrieved from: <https://www.investopedia.com/articles/07/stock-exchange-history.asp>

68. Cashill, Jack. (2010). "The Seventh Circle". *Popes & Bankers: A Cultural History of Credit and Debt from Aristotle to AIG*. pp. 1-7. Retrieved from: <https://books.google.de/books?id=C9CVARo5snsC&pg=PA1&lpg=PA1&dq=stone+tablets+lending+and+borrowing+records&source=bl&ots=YAPdlUTsCv&sig=ACfU3U1dT9pMAfywvodWFIZdngRdl1Rkvg&hl=en&sa=X&ved=2ahUKEwizyviZ4sLqAhULyKYKHWGnAclQ6AEwAHoECAoQAO#v=onepage&q=stone%20tablets%20lending%20and%20borrowing%20records&f=false>
69. Doceviski, Boban. (2018, January 21). "Cowry Shell Coins: An Ancient Monetary System Based on Sea Shells Used on Almost Every Continent". *The Vintage News*. Retrieved from: <https://www.thevintagenews.com/2018/01/21/cowry-shell-coins/>
70. LePan, Nicholas. (2019, November 15). "The History of Interest Rates Over 670 Years". *Visual Capitalist*. Retrieved from: <https://www.visualcapitalist.com/the-history-of-interest-rates-over-670-years/>
71. Szmigiera, M. (2020, March 20). "Number of FinTech Startups Worldwide 2020, by Region". *Statista*. Retrieved from: <https://www.statista.com/statistics/893954/number-fintech-startups-by-region/>
72. Woolard, Christopher. (2019, February 7). "Regulating Financial Innovation - Going Behind the Scenes". *Financial Conduct Authority*. Retrieved from: <https://www.fca.org.uk/news/speeches/regulating-financial-innovation-going-behind-scenes>
73. Fraile Carmona, Alberto, Conzalez-Quel Lombardo, A., Rivera Pastor, R., Tarin Quiros, C., Fillar Garcia, J., Castejon Martin, L. (2019, April). "Competition Issues in the Area of Financial Technology (FinTech)". *European Parliament*. Retrieved from: [https://www.europarl.europa.eu/RegData/etudes/IDAN/2019/631061/IPOL_IDA\(2019\)631061_EN.pdf](https://www.europarl.europa.eu/RegData/etudes/IDAN/2019/631061/IPOL_IDA(2019)631061_EN.pdf)
74. Robinson, Adam. (n.d.). "Blockchain for Bill of Lading - A Much Needed Update to the Traditional Bill of Lading for E-Commerce". *Cerasis*. Retrieved from: <https://cerasis.com/blockchain-for-bill-of-lading/#:~:text=Blockchain%20for%20Bill%20of%20Lading%2C%20Payment%20Processing%20and%20Traceability%20Brings,traceability%20in%20the%20su>

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