IRELAND'S BLOCKCHAIN, CRYPTO & WEB3 STRATEGY:

A VISION TO ESTABLISH IRELAND AS A GLOBAL WEB3 HUB

Proposal to Government

May 2022

BLOCKCHAIN IRELAND

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- All Blockchain Ireland ecosystem members

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CHAPTER 1

CHAIR'S STATEMENT

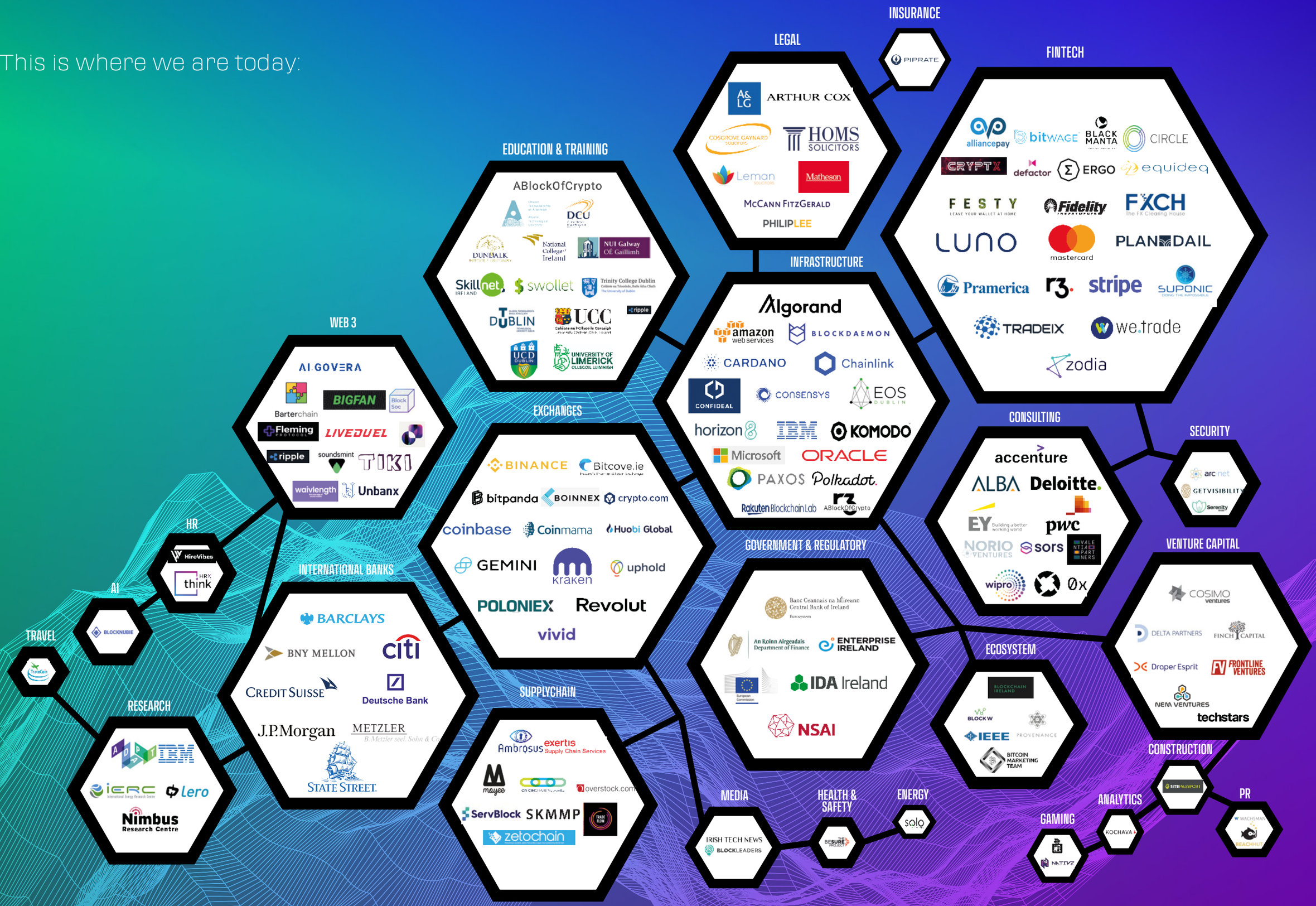
INTRODUCTION AND AMBITION

Sometimes we have to pause and look back in order to see how far we have come.

IRELAND'S CRYPTO EXCHANGE ECOSYSTEM 2022

Below is an image of the beginnings of Blockchain Ireland back in 2015:

This is where we are today:



At the onset of the digital decade we find ourselves at a defining moment as geopolitical and pandemic-related events have necessitated new approaches to our daily lives. Redesigned and more flexible working models, the growth in innovative technologies, and the desire to live in a global village are radically changing the previously accepted norms.

Ireland is fortunate in its ability to scale indigenous companies globally and to promote ourselves as a location of choice for international organisations, underpinned by a friendly, agile, and collaborative business environment, a well-educated workforce, and all with easy access to European markets. A key mechanism is our ability to react quickly to opportunity and to implement frameworks, policies and strategies to embrace these changing landscapes.

These core abilities were the driving force behind the inauguration of Blockchain Ireland in 2015. Blockchain as a technology was in its infancy, and a journey then unfolded to evaluate its merits, the potential impacts for both society and the business world, and to analyse the talent and skills requirements to establish the ways in which Ireland could position itself as a global blockchain hub. Since then we have experienced growth in new iterations of the world wide web, namely in blockchain, cryptocurrency, Web3, and the Metaverse. This document sets out to provide insights into those technologies, the opportunities for Ireland, and to highlight key recommendations in terms of next steps.

The technology is now cross-sectoral, and increasing in visibility globally, and therefore we need to adapt to this changing landscape or we will be left behind. Other EU member states have taken a flexible and innovative approach to supporting blockchain. To keep pace, changes will be required across regulation and legislation for certain industry sectors, enhanced talent and skills programmes will be needed, and support for start-ups to allow them to thrive and to become investor-friendly are all necessary. Within these changes we must also protect our citizens since with all opportunity comes some levels of risk. We already possess years of expertise in the technology sector, a globally recognised financial services sector, world class BioPharmaChem capabilities and a first class legal and regulatory environment. In order for Ireland to become a global blockchain, crypto and Web3 hub we need to leverage and fuse all of this existing expertise to position Ireland as that global centre of excellence.

The purpose of this document is to build a strategy and roadmap for creating a national and international blockchain hub in Ireland and this document makes several recommendations across key pillars, focussing on the contributions from the Blockchain Ireland working groups. The working groups represent various core influences including the start-up ecosystem, the enterprise, the developer, and legal and regulatory sectors with two transversal groups, the communication and the education skills and innovation working groups. These recommendations are the building blocks for consideration for the development of a blockchain strategy for Ireland, as a government led policy initiative will increase our local and global competitiveness.

We want to work together with the government to create a national strategy for blockchain, crypto and digital assets. Together, we can create and execute a roadmap to provide a promising future for the next generation. Blockchain Ireland is positioned to support a national strategy through our working groups. We combine industry and academic expertise with subject-matter experts located in Ireland.

Our ask is for the Government to set up a working group with senior department officials across key departments, to develop a national strategy and implementation plan. Outlined below are the core questions at the heart of our strategy:

In addition to each of our community, ecosystem and working group members, we would like to sincerely thank Minister Paschal Donohoe, Minister Michael McGrath, Government CIO Barry Lowry, Mai Santamaria (Department of Finance), Martin Shanahan (CEO IDA Ireland), Keith Fingleton (CIO IDA Ireland), and Leo Clancy (CEO Enterprise Ireland) for their contributions, and ongoing support.

It is important to note that the purpose of the paper is to start the conversation about the need for a coordinated blockchain, crypto and Web3 strategy and plan for Ireland. It is not perfect, and through our working groups, we would love your help to continue to evolve and refine the strategy, and most importantly, deliver on the actions to make it real.

Dave Feenan

Dave Feenan
Chair Blockchain Ireland

CHAPTER 2

EXECUTIVE SUMMARY

2.1 Context

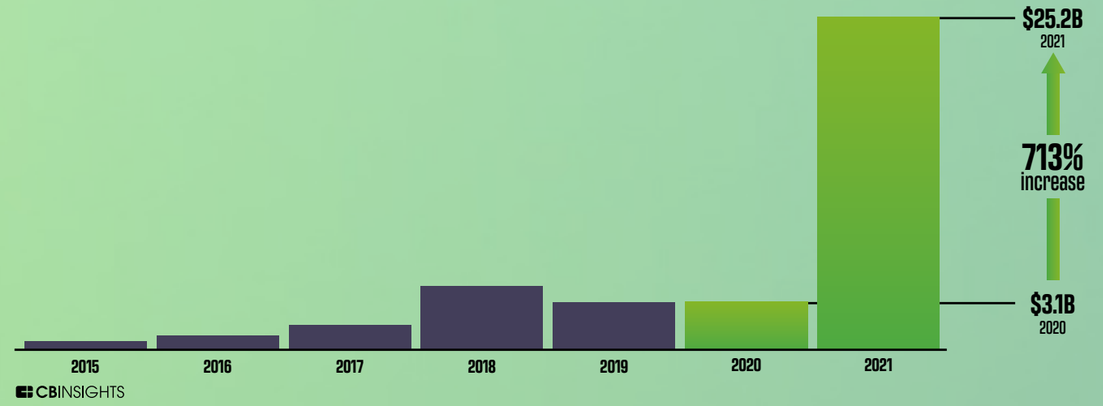
'The technology is reshaping businesses across the globe.'

Blockchain is one of the most significant technological breakthroughs of the 21st century.[1] The blockchain market size is projected to grow from USD 4.9 billion in 2021, to USD 67.4 billion by 2026, at a Compound Annual Growth Rate (CAGR) of 68.4% during the forecast period.[2] The value of the crypto market is now worth in excess of $2 trillion.

The technology is reshaping businesses across the globe, and the associated innovation is outpacing existing business models, ecosystems, policy and legislation.[3] Some countries are embracing the technology by placing blockchain and digital asset specific initiatives at the core of governmental digital strategies to help guide innovation, while others take a 'wait and see' approach.[4]

State of Blockchain : Global Trends : Investment Trends

Global blockchain funding surges 713% YoY to reach $25.2B



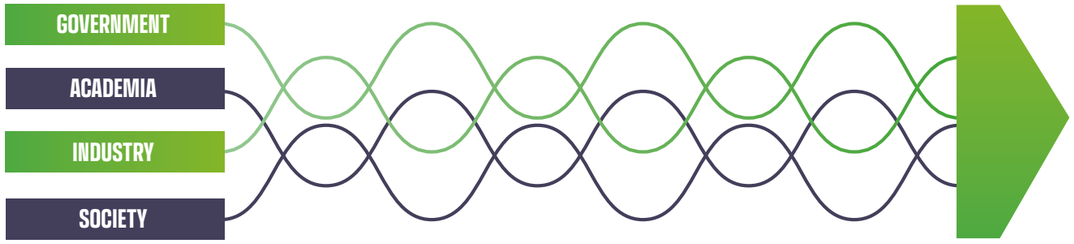
[1] (UNDP 2018) The United Nations Development Programme takes a firm stance, expressing how the future is decentralised. They express the need to research the technology on how it has the potential to disrupt industrial sectors, commercial processes, governmental structures or economic systems.
[2] (Markets and Markets 2021) An estimate of growth in market size that portrays blockchain's economic impact.
[3] (Choudury & Weisman 2021) The world economic forum research on the potential impact of blockchain technology.
[4] (MAS 2022) The Monetary Authority of Singapore is the perfect example of a government authority launching strategic initiatives with the technology to help guide the growth of the industry.

Building on Ireland's established quadruple helix (see image below), Ireland has all the necessary components to further develop as a globally recognised blockchain, crypto and digital assets hub:

1. Flourishing blockchain, crypto and digital asset ecosystem (Blockchain Ireland)
2. World leading FDI infrastructure (IDA Ireland)
3. Strong fintech ecosystem (indigenous and international)
4. Global financial services companies
5. Global technology companies (Technology Ireland)
6. Global pharma and medtech companies (overview)
7. Clear and progressive regulation
8. Globally recognised universities with dedicated blockchain programmes and modules
9. Only English speaking country in the EU

> 'Ireland has an immediate opportunity to become an international hub for blockchain and digital assets'

Blockchain Ireland Quadruple Helix



However, despite many important elements being present in Ireland, a national strategy and execution plan is now required to bring these threads together, and take full advantage of this opportunity. Not doing so would run the risk of Ireland falling behind its European and global peers, some of whom are taking a highly proactive approach to policy, regulation, attracting talent, and innovation.[5]

Ireland has an immediate opportunity to become an international hub for blockchain and digital assets, while improving existing Irish industries, as well as global companies that have established global, EMEA or European headquarters here.[6] In the 1980s, Ireland made financial services a long-term strategic investment, with the establishment of the International Financial Services Centre (IFSC), growing net assets over 80% between 2007 to 2021.[7] Ireland then placed a similar focus on pharma and medtech in the 1990s, which has also been a huge success, and remains so to this day.[8] The last 'big bet' started in 2003 with Google establishing its EMEA HQ in Ireland. As Web2 (websites that emphasise user-generated content, ease of use, participatory culture and interoperability for end users) gives way to Web3 (the new iteration of the World Wide Web that incorporates decentralisation based on blockchains.), now is the time to place another 'big bet' for the coming decades. Gartner predicts the business value-added from blockchain technology will grow to more than $176 billion by 2025, and exceed $3.1 trillion by 2030.

2.2 Critical Points of Information

2.2.1 Blockchain, Crypto and Money Laundering

For some, bitcoin, and cryptocurrency has links to money laundering and other nefarious activities. If you want to carry out activities that do not leave a trail, the last thing you would want to use is an immutable register, for example a blockchain, where all transactions are recorded and each transaction can be tracked from one source to the next. This is to the point where known wallets held by bad actors can, have and will continue to be identified.

> 'If you want to carry out activities that do not leave a trail, the last thing you would want to use is an immutable register'

It is critical to understand this specific area in more detail. Let's look at some hard facts:

- → Based on Chainalysis' 2022 report, their research showed 5% of global GDP is laundered every year through the traditional financial system. This compares to 0.05% for crypto.
- → Forbes' Steve Ehrlich's 2021 piece, covered research carried out by Michael Morell, a 33-year veteran of the CIA. Mr. Morell published an independent paper commissioned by the newly formed lobbying group Crypto Council for Innovation (whose founding members include Coinbase, Fidelity Digital Assets, and Square) directly refuting crypto is the go-to money laundering currency of choice. In an expansive study, Morell came to two key conclusions:
  1. The broad generalizations about the use of bitcoin in illicit finance are significantly overstated
  2. Blockchain analysis is a highly effective crime fighting and intelligence gathering tool
- → Mr. Morell found the percentage of illicit transactions in crypto is minimal (less than 1% according to one report from Chainalysis), and falling. For additional context, he notes that estimates of illicit activity conducted through traditional intermediaries range between 2-4 percent of global GDP.

[5] (BaFin 2017) The German government and financial authority were one of the first countries to provide a framework and research on the technology.
[6] (HSBC 2021) (Quinlan 2018) A major financial institution providing ample proof to why Ireland presents itself as an international hub for technology and innovation. In addition, the announcement of Facebook, now Meta, building an EU headquarters in Ireland creating 5,000+ jobs.
[7] (IFSC 2022) The IFSC website celebrates its 34th year of being one of the leading financial services centres in the world. The IFSC displays its annual revenues from taxes and highlights its status of being globally recognized as a leading location for a range of internationally traded financial services.
[8] (IDA 2022) The IDA website which confirms Ireland is one of Europe's largest MedTech hotspots and, as a globally recognised centre of excellence. Key highlights include: 300+ companies, 40,000 people employed, highest number of MedTech personal per capita in Europe, and having 14 of the top 15 medical companies have operations set up in Ireland.

2.2.2

Sustainability, The Environment and Energy Consumption

Blockchain, crypto, Web3, and energy consumption, is an important subject and deserves constructive debate, rather than people repeating sound bites without understanding the complete picture. It is important to note the following:

Not All Blockchains Are the Same
- → Newer blockchains are up to 99% more energy efficient than older blockchains
- → Ethereum is moving from an energy-intensive mechanism called Proof of Work (PoW) to a far more energy-efficient mechanism called Proof of Stake (PoS). PoS is over 95% more energy efficient.

The Stellar Development Foundation blockchain uses less energy per transaction than a Visa or MasterCard transaction
- → Should we ban Visa and MasterCard?

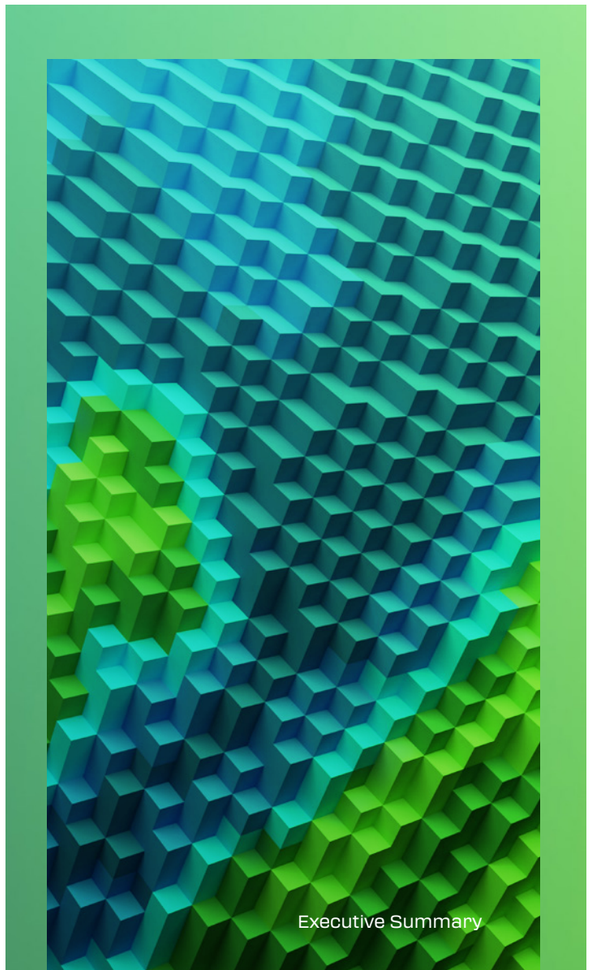
The Bitcoin Blockchain Does Use a Lot of Energy
- → The question here should be, does a decentralised, global and indiscriminate system warrant the energy consumption?

Maintaining Perspective
- → Aviation energy consumption is over 3,000 TWh
- → The annual AC consumption globally is 2,000 TWh
- → Bitcoin is about 135 TWh
- → Data centres use vast amounts of energy: are they considered in the same light?

Do Your Own Research and Look to Triangulate
- → When it comes to blockchain, crypto and Web3, it is critical to do your own research, and not to hold on to sound bites, typically from people who are not in the know

Making Blockchains, Crypto, and Web3 Sustainable
The Ethereum blockchain will soon use far less energy than it does today. For example, non-fungible tokens (NFT) are increasingly being created on newer blockchain and layer two solutions, such as Algorand, Cardano Foundation, Hedera, Polygon Technology, Solana Labs and Tezos, which have been actively designed to be more sustainable. Specifically in relation to NFTs, recent research by the Linux Foundation outlines steps to consider when creating NFTs:

- → Look at the NFT process end to end (minting, purchased, transferred)
- → Pick a lightweight blockchain (PoS)
- → Seek innovative alternatives (Palm NFT Studio)
- → Offset (with verification) what's left
- → Cement commitments from the ecosystem



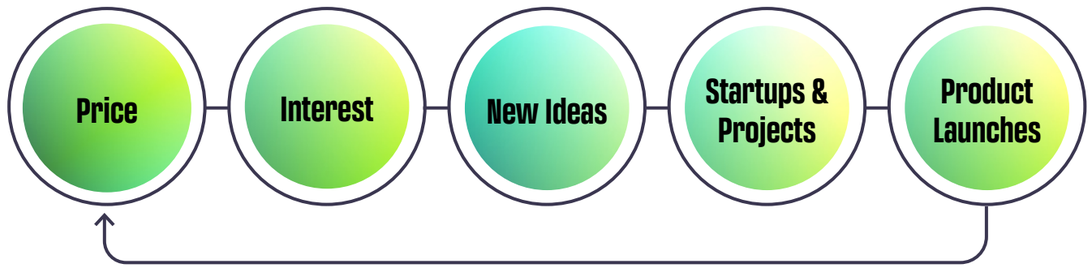
2.2.3

The Crypto Price-Innovation Cycle

The crypto ecosystem works in cycles and must be viewed over a longer term time horizon, rather than activities or events that take place on any given day, week or month. Excellent fact based and data driven research titled 'The Crypto Price-Innovation Cycle' by Andreesen Horowitz's Chris Dixon and Eddie Lazzarin (2020) demonstrates how these cycles can appear chaotic but have an underlying order, roughly characterised as:

1. **The price of Bitcoin and other crypto assets goes up**
2. **Leading to new interest and social media activity**
3. **Leading to more people getting involved, contributing new ideas and code**
4. **Leading to projects and startups getting created**
5. **Leading to product launches that inspire more people, eventually culminating in the next cycle**

The Crypto Price-Innovation Cycle



2.3

Aligning to Europe's Blockchain Strategy

The EU wants to be a leader in blockchain technology, becoming an innovator in blockchain and a home to significant platforms, applications and companies.

The next 10 years will be Europe's Digital Decade because digital technologies create new jobs, business models and ways of living. But for us to reap the full benefits of the digital space we must feel that we can trust the information we share online. It is not only news that can be fake: this can also happen to our personal information, e.g. our diplomas or even to our digital identity. Therefore, the European Commission is promoting and investing in the use of Blockchain technology. In partnership with EU MS we are deploying a European Blockchain Services Infrastructure for cross-border public services. We are connecting with industry to work towards global interoperability across borders and sectors. With the EU Blockchain observatory and forum we bring together the leading Blockchain experts to share knowledge, identify obstacles and find practical solutions. We are also creating an enabling European legal framework for Blockchain uptake. And finally we are investing in research, innovation, startups and skills for Blockchain.

Blockchain Ireland believes it is critical to be fully aligned with the European Commission objectives and is focused on working in lockstep on the objectives below:

→ **Building a pan-European public services blockchain**
Blockchain Ireland works closely with our European friends, colleagues and counterparts across the European Commission, European Central Bank and bodies such as INATBA

→ **Promoting legal certainty**
This is one of Blockchain Ireland's dedicated legal and regulatory working group focal points

→ **Increasing funding for research and innovation**
Through Blockchain Ireland's dedicated Start-up and Web3 working group, coordinated strategic funding is one of the core needs and requests of Government

→ **Promoting blockchain for sustainability**
This is of increasing critical importance to Blockchain Ireland and we fully support the transition from Proof of Work consensus mechanisms to Proof of Stake, as well as the use of renewable energy sources for mining and validation activities. We also promote innovative in companies in Ireland that are looking to be part of the solution, such as Nexalus

→ **Supporting interoperability and standards**
Blockchain Ireland's developer working group keeps current on interoperability and shares updates on the topic as part of our monthly ecosystem updates

→ **Supporting blockchain skills development**
This touched off a number of Blockchain Ireland's core objectives. One of our most active working groups is Blockchain Ireland's Education, Skills and Innovation working group. Research, market mapping and tutorials have been held, as well as detailed recommendations on how to address the skills gap.

→ **Interacting with the community**
Linking back to one of Blockchain Ireland's key tenets, everything we do is to enhance the blockchain, crypto and Web3 ecosystem in Ireland

2.4

Blockchain Ireland Strategy Objectives

The objectives of this Blockchain Ireland strategy paper are to:

i. Document and share the key priority areas identified from each working group:
   - Developer
   - Education and Skills
   - Enterprise
   - Events and Communications (Blockchain Ireland Week)
   - Legal and Regulatory
   - Start-up and Ecosystem

ii. To compare and contrast where Ireland stands in relation to other national blockchain, crypto, and digital asset strategies

iii. Provide an action plan and roadmap for Ireland Inc. to seize the opportunity

iv. In 2022, with the Irish Government, the broader ecosystem and as part of 'The Digital Ireland Framework', We have identified a set of core actions Ireland needs to take to position Ireland for the next generation. The following sections of this paper provide an overview of:
   - Where Ireland is today (relative to our peers)
   - What the opportunities are
     How we can realise them

2.5

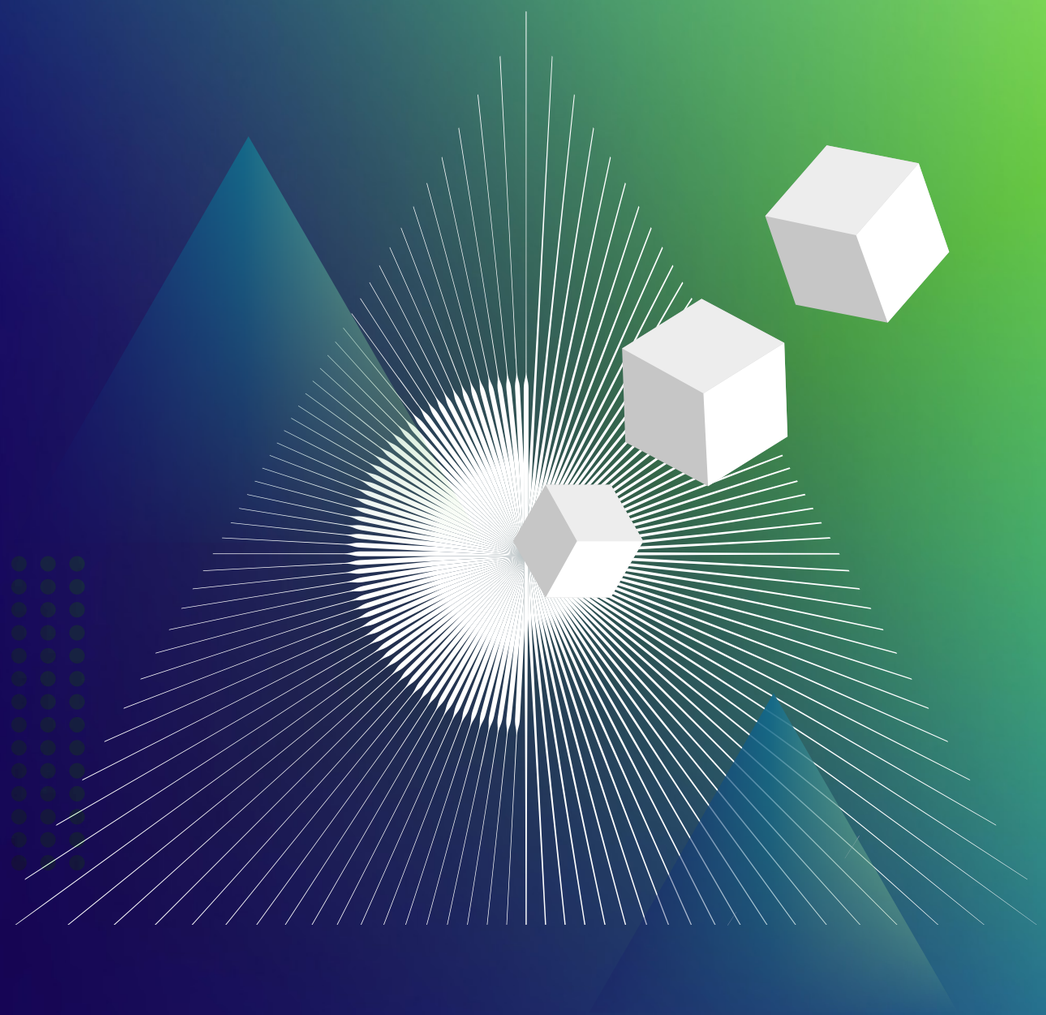
Approach

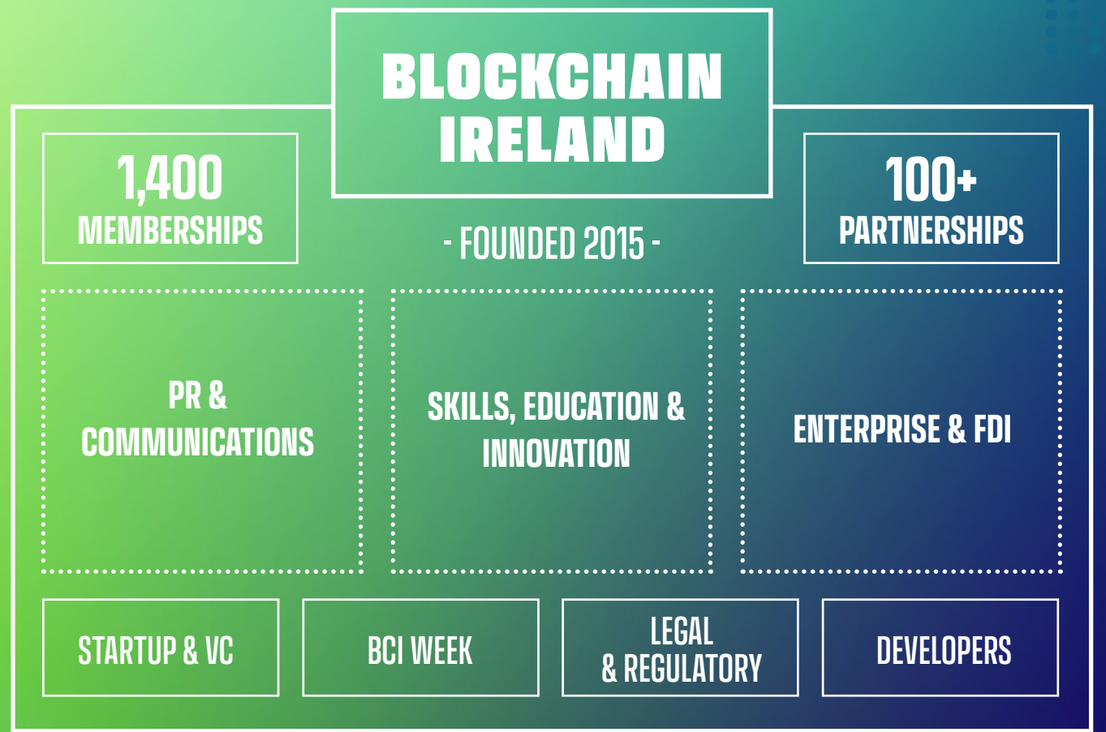
Through in-depth interviews and industry focus groups led by working group leads, ideas and proposals to form a blockchain strategy for Ireland were shared and documented. These proposals were analysed, grouped, and core themes were identified. The findings from each working group are contained in section 9 'Recommendations and Roadmap'.

> 'Blockchain Ireland would like to support the creation of a three year blockchain strategy and execution roadmap.'

CHAPTER 3

BLOCKCHAIN IRELAND OVERVIEW





3.1 Context

Blockchain Ireland is an industry innovation network that works to promote and share information on blockchain and distributed ledger technology (DLT) in Ireland. The organisation which was founded in late 2015, helped form the European Commission's International Association of Trusted Blockchain Applications (INATBA), and co-signed the Cooperation on European Blockchain Partnership in February 2019.

Blockchain Ireland connects with other emerging technology clusters to facilitate the formation of new jobs, to promote notable examples of blockchain and DLT entrepreneurship, and to establish Ireland as a knowledge-hub for crypto-asset and blockchain applications. Structurally, Blockchain Ireland is an unincorporated association, with a steering group providing strategic and tactical input.

Blockchain Ireland has a formalised relationship with Digital Technology Skills Limited who assist and enable Blockchain Ireland by provision of a range of corporate and concierge-type services.

Since its early incarnations in 2015, Blockchain Ireland has grown to partner with more than 100 organisations nationally, and connects with a range of international industry networks including: Slovenian Blockchain Innovation Ecosystem, British Blockchain Association, and the Australian Blockchain Association. It was a founding member of the International Blockchain Associations Forum that facilitates international cooperation between national associations.

3.2
Objectives

Currently, with more than 1,400 active members, Blockchain Ireland's core objectives are:

1. To promote Ireland as a global blockchain, digital asset, Web3 and crypto hub
2. To promote the creation of blockchain, digital asset and crypto-based jobs in Ireland
3. To develop a vibrant diverse and inclusive ecosystem across Ireland, bringing together enterprise, start-ups, technologists, academia, government, regulators, and semi-states
4. To educate and upskill all parts of society in Ireland on blockchain, digital assets and crypto across all industries and sectors

To further these objectives, Blockchain Ireland co-creates a wide range of networking and information-sharing events, including the national annual Blockchain Ireland Week, and collaborates in, and commissions research to scope and advance emerging opportunities in the field.

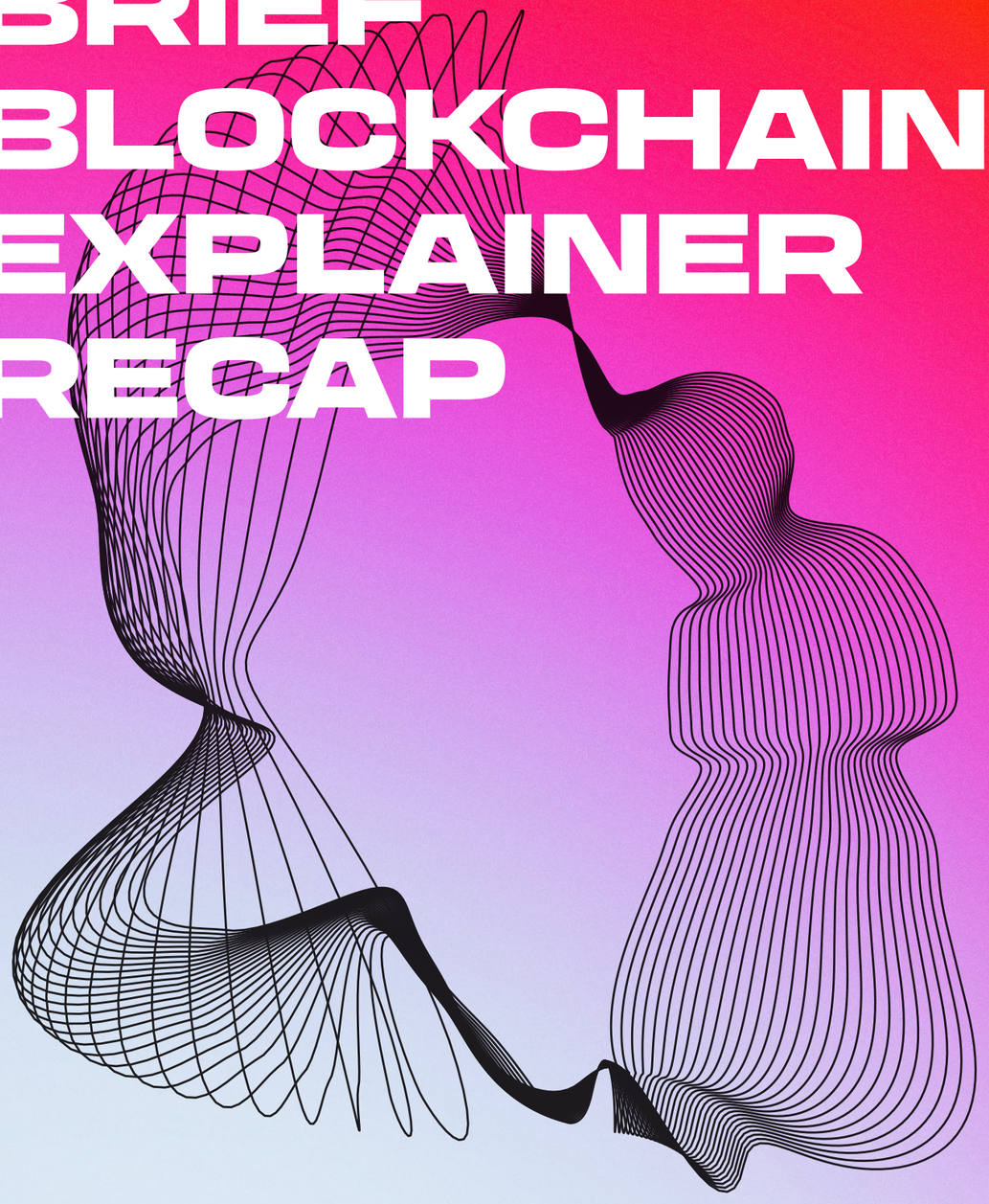
3.3
Structure

The primary structure of the organisation is its Steering Group, with an annually elected chairperson, and the specialist working groups, as outlined on page 10. Each of the working groups has its own programme of engagement for interested members, and run their own events to serve member needs.

To develop a vibrant ecosystem across Ireland, bringing together enterprise, start-ups, technologists, academia, government, regulators and semi-states.

CHAPTER 4

BRIEF BLOCKCHAIN EXPLAINER RECAP



A blockchain is an encrypted distributed database that acts as a system of recording information. Blockchain provides unrivalled data security and protection because of its distributed nature. A blockchain doesn't require a centralised authority to validate transactions; instead, a blockchain stores data in fixed structures or 'blocks'. These blocks create a chain of verified transactions that acts as a distributed ledger. Traditional ledgers record transactions and require mutual understanding between transacting parties. A distributed ledger creates a publicly (whether defined by eligible users, often termed a private blockchain, or open user based) available ledger that is updated and verified by a computer which maintains a history of all transactions known as a 'node'.

A blockchain contains many distributed nodes, meaning transactions are verified by nodes agreeing which 'block' should be added next on the 'chain', eventually forming a blockchain. The objective is to create a single version of the truth, used by all participants, containing an immutable, transparent, and verified data set. This single version of the truth is the alignment mechanism needed to replace the trust of an intermediary. "No one actor is trusted, and no one needs to be trusted. There is no central authority or trusted third party in a distributed consensus network."[9]

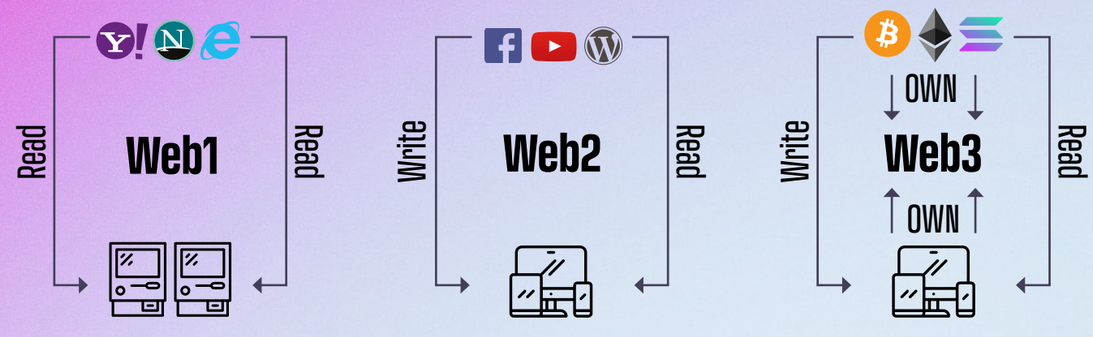
The key components that will help expand the business capabilities of Ireland will consist of the following:

4.1 Web3 and Metaverse

Web3 represents the next phase in the evolution of the internet, and could potentially be as disruptive, and represent as big a paradigm shift as Web 2.0. Web3 is built upon core concepts of decentralisation, openness, and greater user utility. Berners-Lee had expounded upon some of these key concepts back in the 1990s, as outlined below:

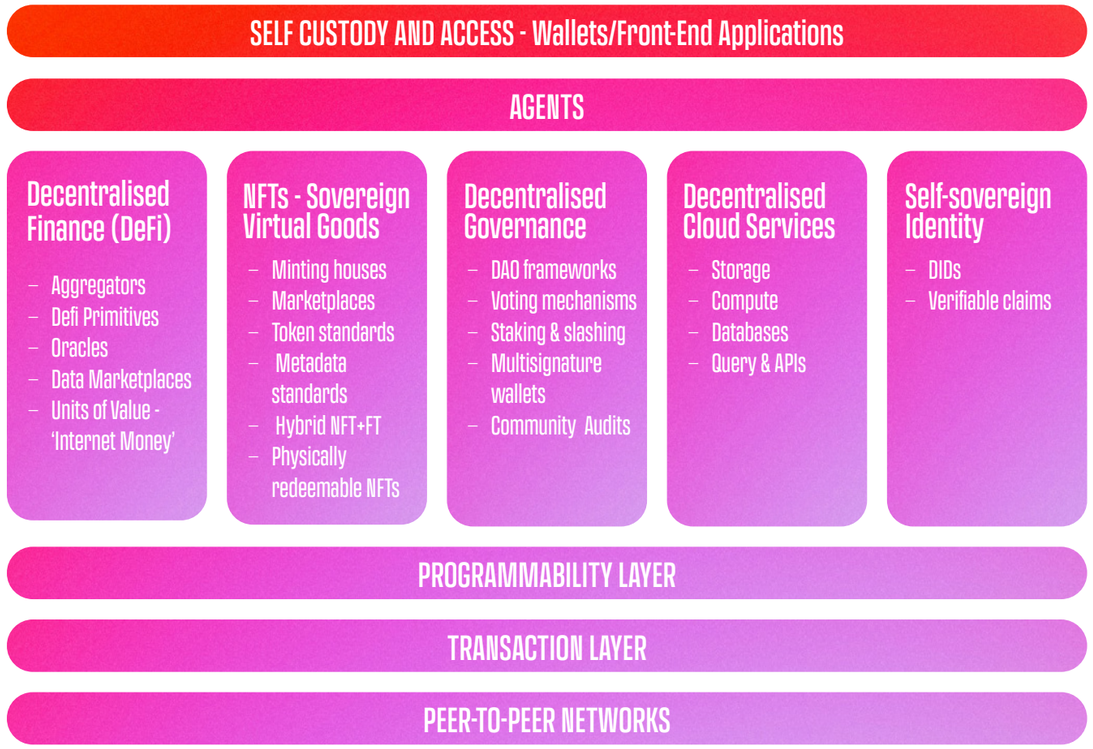
- **Decentralisation**: "No permission is needed from a central authority to post anything on the web, there is no central controlling node, and so no single point of failure...and no 'kill switch'! This also implies freedom from indiscriminate censorship and surveillance."
- **Bottom-up Design**: "Instead of code being written and controlled by a small group of experts, it was developed in full view of everyone, encouraging maximum participation and experimentation."

The diagram below shows the evolution of the internet from read, read-write, to read-write-own



[9](Antonopoulos, 2014) Andreas Antonopoulos is an early Bitcoin advocate and blockchain expert. Over time, blockchain security increases with decentralisation compared to traditional security ledgers.

These core concepts together with DLT form the foundation of web3. As detailed in the following image all functionality that falls under the web3 umbrella operates on or because of peer-to-peer networks, transactional DLT and/or a programmable layer (smart contracts).



The decentralised foundation (peer-to-peer networks) of this new technology stack allows for the key web3 features of transparency and ownership.

- → Transparency because all transactions on blockchain are publicly available.
- → Ownership because DLT can facilitate digital ownership in the forms of token ecnomies and/or NFTs.

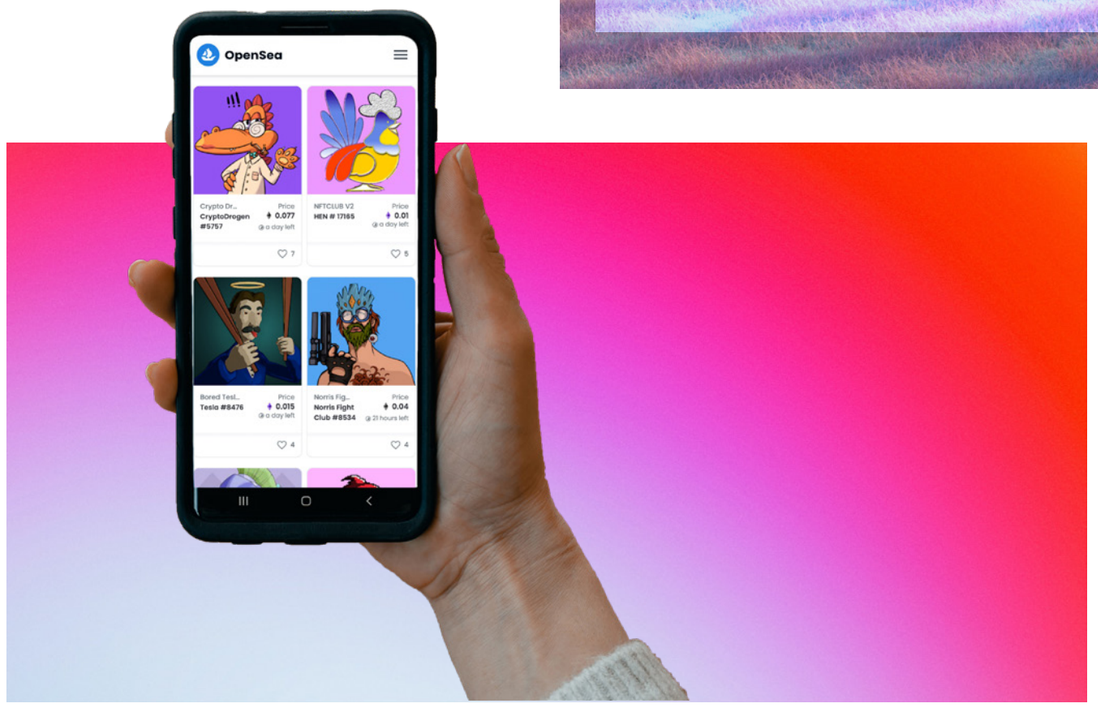
Data ownership and privacy is a key component of web3. Currently, web2 companies generate a lot of revenue by tracking and monetising user data. Web3 flips this by giving users control of their data and allowing them to decide on their own aspirations for data use and monetisation.

Data unions, data cooperatives and data trusts can be appointed to aggregate their data into larger, more valuable datasets, while representing the interests of the individuals. The value generated by the data can then be distributed to the owners.

The Metaverse is a concept of a persistent, online, 3D universe that combines multiple virtual spaces. It can be viewed as a future iteration of the internet. The metaverse will allow users to work, meet, game, and socialise together in these 3D spaces. The metaverse isn't yet fully in existence, but some platforms contain metaverse-like elements. Video games currently provide the closest metaverse experience on offer. Developers have pushed the boundaries of what a game is, through hosting in-game events and creating virtual economies.

4.2
Non Fungible Tokens (NFTs)

An NFT is a special type of digital asset, typically recorded on a blockchain, that can be proved to be one of a kind and not fungible (or exchangeable) with another digital asset, hence 'Non-Fungible Token'. The tokens are created (or 'minted') in accordance with standard frameworks, such as ERC-721, and are deployed on-chain. The Non-Fungible Token can be managed, traded, and owned in accordance with the protocol standards it has been minted on. Commercially, NFT's are typically traded on platforms such as Opensea (the platform's trading volume reached close to $3.5 billion in August 2021), or Nifty Gateway, which styles itself as a digital art online auction platform. The NFT market achieved sales in excess of $41 billion in 2021 and over $7 billion in January 2022. NFT funding growth in 2021 grew 12,878% to a total of $4.8 billion across art, music, sports, gaming and the metaverse.



4.3

DeFi

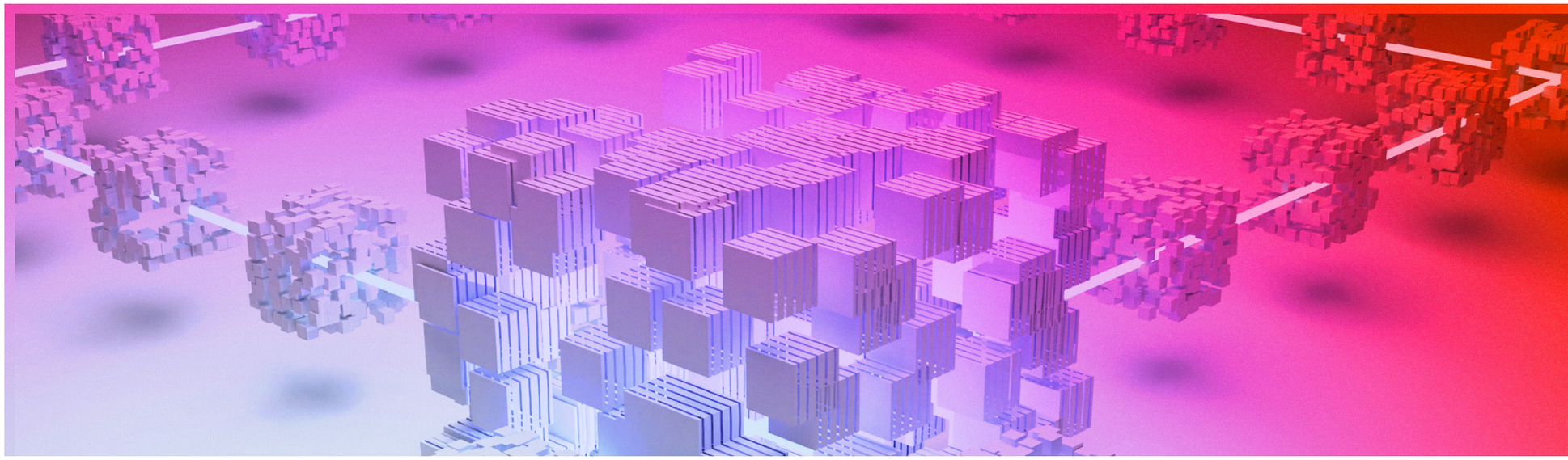
DeFi, or Decentralised Finance, is a form of financial services digital evolution. It enables borrowers to be linked directly to lenders without the need to go through an established intermediary, like a bank. Lenders and borrowers are connected by signing up to a platform such as Compound or Aave. The borrower reviews the crypto-assets available, and agrees to the specific terms of the platform to receive the crypto-asset at a specified interest rate. The lender does the same on the other side to lock in a guaranteed interest rate for leasing out their crypto-asset. Interest rates can range from 1% to 20%, and are typically higher than global central bank interest rates.

DeFi is a rapidly evolving industry within the financial sector, growing from $1 billion in value in June of 2020 to more than $100 billion at the time of this paper. An analogy to DeFi is peer-to-peer banking. The DeFi ecosystem comprises decentralised applications (dApps) that sit on the blockchain and facilitate peer-to-peer transactions and track assets through smart contracts. A digital asset is a piece of content stored in a digital file format. An asset can be tangible (a house, car, cash, land) or intangible (intellectual property, patents, copyrights, branding). Transactions are transparent, permissionless, immutable, and immediate. DeFi challenges existing models by looking to remove potential customer journey friction points (e.g. not requiring credit history, income verification, identification, or social status). The primary tools needed are crypto assets and an internet connection. The open banking system allows anyone to participate while reducing the costs to participate. In an October 2022 report, Goldman Sachs acknowledged that DeFi is easier for underbanked populations, and provides faster settlement for users.

The creation of increased opportunities to earn far higher interest rates than traditional savings methods results in more efficient use of capital for investments deployed in DeFi protocols. For example, currently, there is a DeFi protocol named “Curve” (based on the Ethereum blockchain) offering a 14.67% annual return (0.04% a day). Whereas a standard savings account with a bank for a retail customer in Ireland has an estimated annual return of 0.25% (0.0006% a day). It is important to note that DeFi is currently operating primarily at the retail level and is not (in the main) regulated. The DeFi funding year on year is expected to reach $3.4 billion. As the regulatory regime expands in scope, especially within the EU, more and more DeFi offerings will fall within regulatory remit. There are currently a high volume of regulatory and legislative initiatives in train which will affect DeFi.

The EU Blockchain Observatory and Forum recently published a paper on DeFi titled ‘Decentralised Finance (DeFi), which can be found here.

‘DeFi is a rapidly evolving industry within the financial sector, growing from $1 billion in value in June of 2020 to more than $100 billion at the time of this paper.’



4.4

Staking

Staking is a way of earning rewards for holding certain cryptocurrencies. If a cryptocurrency you own allows staking — current options include Tezos, Cosmos, and now Ethereum (via the new ETH2 upgrade) — you can ‘stake’ some of your holdings and earn a percentage-rate reward over time. This usually happens via a ‘staking pool’, which you can think of as being similar to an interest-bearing savings account. The reason your crypto earns rewards while staked is because the blockchain puts it to work. Cryptocurrencies that allow staking use a ‘consensus mechanism’ called Proof of Stake, which is the way they ensure that all transactions are verified and secured without a bank or payment processor in the middle. Your crypto, if you choose to stake it, becomes part of that process. As with DeFi generally, staking is an area not subject to clear regulatory overhang at present which will increasingly fall within the regulatory regime, by reference to commercial operators enabling staking activities, as the EU rolls out current regulatory and legislative initiatives.

4.5

DAOs

A decentralised autonomous organisation (DAO) is an entity with no central leadership. Decisions get made from the bottom-up, governed by a community organised around a specific set of rules enforced on a blockchain. DAOs are internet-native organisations collectively owned and managed by their members. They have built-in treasuries that are only accessible with the approval of their members. Decisions are made via proposals the group votes on during a specified period. A DAO works without hierarchical management and can have a large number of purposes. Freelancer networks where contracts pool their funds to pay for software subscriptions, charitable organisations where members approve donations, and venture capital firms owned by a group, are all possible with these organisations. As with the above, depending on structure, certain DAO’s are outside much of the regulatory regime, and again, this will change as EU-wide regulatory and legislative initiatives are rolled out. As with all innovative financial service offerings, there may remain a certain degree of ambiguity with reference to application of regulatory regimes, but the general direction of EU intention to apply legal and regulatory requirements to new forms of finance enabled by the blockchain is clear.

CHAPTER 5

AREAS TO BENEFIT FROM BLOCKCHAIN, DIGITAL ASSET AND CRYPTO INNOVATION

Blockchain is rapidly entering every facet of our lives. However, many businesses look set to wait for the government to provide direction before fully committing. “Business leaders and regular people are also slow to adopt blockchain-based systems because they fear potential government regulations might require them to make expensive or difficult changes in the future.”[10] Blockchain innovation is moving fast, really fast. We want to demonstrate what is happening in different industries and highlight best practices by other countries. We selected five areas mentioned by the European Blockchain strategy which are relevant to Ireland: e-governance/ digital identity, healthcare, supply chain, financial services, and energy. We then looked at nine countries with a level of similarity in approval of operations within the government.

‘Blockchain innovation is moving fast, really fast. We want to demonstrate what is happening in different industries and highlight best practices by other countries.’

5.1 E-Governance & Digital Identity

E-identity powered by blockchain will enable citizens to participate more easily in society to improve wellbeing, increase the efficiency of public resources, and reduce the costs for the government. E-governance is increasingly important to engage citizens and to ensure participation. E-Identity allows citizens to instantly verify their identity across multiple service providers, including insurance, healthcare, mortgage applications, education verification, credentialing, etc. Gartner predicts over 60% of governments will have tripled their digital services by the end of 2023.[11] Cutting-edge innovation is coming from Canada, Singapore, Germany, and Switzerland. Switzerland is beginning to consider using e-identity to e-vote in specific areas, ultimately eliminating any risk of voter fraud. Centralised databases are appealing to cyber criminals as a wealth of personal data is stored in one place, for example the HSE cyber attack in May 2021 resulted in a large-scale data breach resulting in the personal medical history of 520 individuals being posted online.[12] Decentralised databases are resistant to this type of attack.

[10](Werbach, 2019) Kevin Werbach points out government regulation is critical for mass adoption. People will use systems only when they trust them. Until there is clear regulation, a cohort of people will be wary.
[12](Gallagher, 2021) The attack on the HSE brought national attention to Ireland’s cyber security measures. It took a month to decrypt 70% of the computers and another three months to reach 95%.

5.2
Energy

The energy sector benefits from blockchain by increasing resource efficiency, renewable marketplaces, and removing intermediaries. This compliments Ireland's role in the European Commission's Green Digital Recovery and Resilience Plan. The United States, Singapore, Australia, and Germany are global leaders in blockchain uses for energy. All three are focused on a peer-to-peer network. The benefits of a peer-to-peer network for direct transacting of energy mean that those individuals, organisations, or governments are not confined to pre-existing contracts, or wholesale-based energy distribution. If one party generated more solar energy than they required, the current model would mean the excess energy would go to waste as the party cannot transfer the energy back to the grid. However, a peer-to-peer blockchain-based network can sell energy to another, creating efficiencies in the market. For example, Brooklyn Microgrid is the first applied engineering programme of energy blockchain globally.[13] Brooklyn Microgrid has eliminated the middleman and has allowed users on the grid to sell excess energy to other users. This process is facilitated using a smart metre in conjunction with a blockchain network.

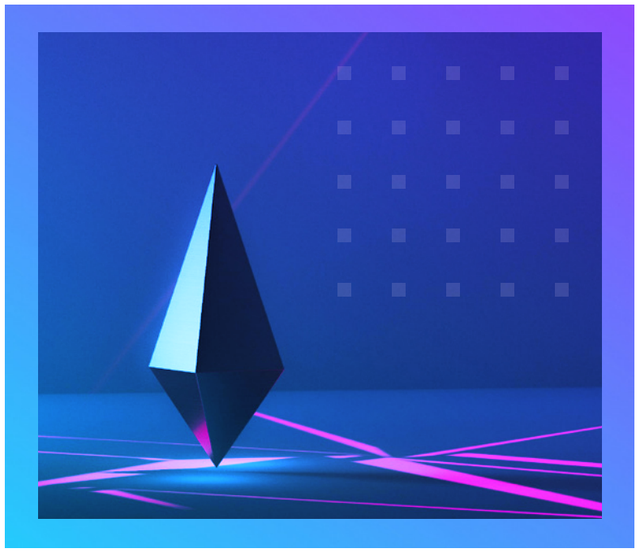
5.3
Financial Services

The financial industries sector is perhaps experiencing the most disruption as a result of the innovation around cryptocurrency. By refining the value propositions presented by cryptocurrencies, such as Bitcoin and Ethereum, regulatory-compliant digital assets, such as Central Bank Digital Currencies, are facilitating the next generation of financial evolution.

Germany, Singapore, Switzerland and the United Kingdom are leaders in financial blockchain innovation. The traditional financial industry requires multiple third parties and intermediaries to perform certain transactions.

Blockchain technology removes the need for many of these intermediaries by streamlining payments services, reducing friction in post-trade settlement systems, and supporting fractional ownership of high-value assets. Further innovations in Financial Services are explored in the regulation strategy sections.

> 'The benefits of a peer-to-peer network for direct transacting of energy mean that those individuals, organisations, or governments are not confined to pre-existing contracts, or wholesale-based energy distribution'



[13](Zhao et al., 2019)

5.3.1
Digital Assets

Digital assets are growing rapidly in both traditional and non-traditional financial markets. Examples of digital assets in this instance are cryptocurrencies, DeFi tokens and NFTs. The German government recognised the urgency to define digital assets, stating that it is, "A precondition for positive developments." In 2021, the German government, more specifically BaFin, established a crypto dedicated regulatory framework relating to crypto-assets, ICO's, and utility tokens.

These can be summarised as follows:

1. **Crypto-custody:** Changes to the German Banking ACT (KWG) laws to enable crypto custody with a clear 6 month approval process timeframe
2. **Spezialfonds:** Up to 20% of Spezialfonds can allocate up to 20% of their capital in crypto assets
3. **Electronic Securities Act:** Enables the issuance of bearer bonds using distributed ledger technology (DLT). In particular, the Electronic Securities Act establishes a legal basis for the trading of rights through electronic securities registers, and adds a new licence category for maintaining a crypto securities register. Eliminating paperwork in securities transactions.[14]

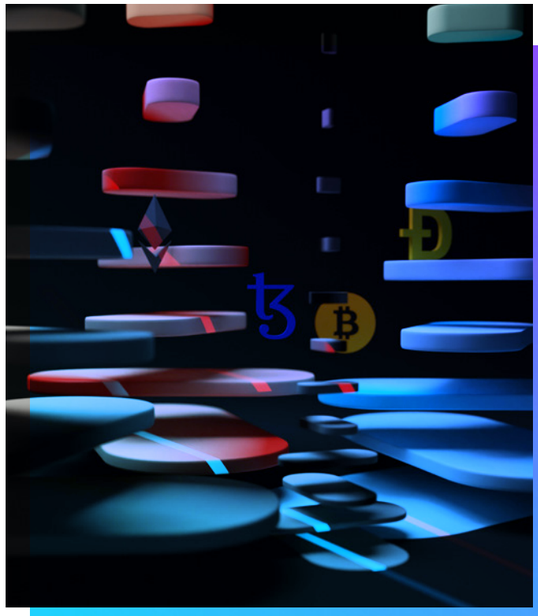
This legislature allowed one of the oldest banking institutions in Germany, Hauck & Aufhäuser, to launch its first crypto fund. Dr Holger Sepp, the board member of Hauck & Aufhäuser, noted that this action has now created an innovative investment opportunity for consumers who are interested in securing new digital assets in an inexpensive and safe manner.

5.3.2
CBDCs and Stablecoins

CBDCs, or central bank digital currencies, are developing forms of regulated, government-issued electronic money. Like cryptocurrencies, CBDCs are emerging from blockchain technology, but unlike a cryptocurrency such as Bitcoin, a CBDC will be backed by its issuing government, and could more comprehensively replace traditional forms of cash.

Stablecoins are cryptocurrencies that attempt to peg their market value to an external reference. They may be pegged to a currency like the U.S. dollar, or to a commodity's price such as gold. Stablecoins achieve their price stability via collateralization (backing), or through algorithmic mechanisms of buying and selling the reference asset or its derivatives.

It must be noted, we welcome the great work by Senator Malcolm Byrne who recently hosted Fabio Panetta, Executive Board Member of the European Central Bank (ECB) for a discussion on the digital Euro in the National College of Ireland.



[14](Jafar, 2020)
[15](Ferreira, 2020)

5.4
Healthcare

The healthcare industry is poised to become more efficient by adopting blockchain technology. Australia, Germany, and Switzerland are leaders in this innovation. Current applications include a distributed peer-to-peer blockchain platform that connects institutions with individuals, a medical device tracking system, and a biopharmaceutical tracking system. While it is critical to verify and authenticate both patients' and doctors' information, barriers are being removed to make the process more efficient. Patients can easily share medical data with other professionals instantly, rather than go through complicated medical requests and authorisation procedures. A decentralised database of authenticated information reduces healthcare costs while giving doctors patient information when needed. Through its peer-to-peer network system, blockchain technology can protect patients and ensure the visibility of medical records by only verified medical professionals.[16] Medical device and pharmaceutical industries use blockchain to track the origin of products to eliminate fraud. Blockchain technology is used to prevent counterfeits within the pharmaceutical industry. Hyperledger launched a research network to verify drugs' production, distribution, and transaction.[17]

'A decentralised database of authenticated information reduces healthcare costs while giving doctors patient information when needed'

5.5
Supply Chain

Digital ledger technology reduces the need for intermediaries to make processes more efficient across areas such as public safety and security, quality management, sustainable supply chain management, inventory management. Increased efficiencies reduce the cost of supply chain transactions. The leaders in this space are Canada, Germany, and Singapore. Simplifying the infrastructure, and creating a decentralised network allows the industry to become more transparent and verified. [18] An improved, verified supply chain system is vital as cities import and export goods. In late October 2021, California's Port of Los Angeles was faced with a significant supply chain issue. The port struggled to keep up with the volume of cargo containers arriving at its terminals. A breakdown of coordination among the adjacent links of the supply chain caused a bottleneck with devastating consequences to the national supply chain. A distributed ledger would create complete transparency among all parties involved to avoid such a bottleneck. The shipping giant Maersk partnered with IBM to create this exact system.[19] The supply chain is built upon trust, and having an immutable ledger will instil that trust across parties involved in a transaction.

[17] (Mettler, 2016)
[18] (Cole, Stevenson, and Aitken, 2019)
[19] (Kramer 2020)

CHAPTER 6

GLOBAL COUNTRY AND GOVERNMENT BLOCKCHAIN POLICY AND ACTIVITY ANALYSIS

The European Commission has set out a high-level strategy to become the leaders of blockchain technology globally. In order to achieve these goals they provided a breakdown of what they referred to as the gold standard for blockchain.

These included:

1. Building a pan-European public services blockchain
2. Promoting legal certainty
3. Increasing funding for research and innovation
4. Promoting blockchain for sustainability
5. Supporting interoperability and standards
6. Supporting blockchain skills development
7. Interacting with the community

Through our research we have identified three key pillars which we believe need to be achieved in order for blockchain technology to flourish within Ireland.

These are:

1. A clear government strategy
2. A robust regulatory environment that enables innovation
3. A thriving ecosystem

With these three pillars in mind, we looked to run a comparison against other leading countries within the blockchain space. For the purpose of this paper we created a set of scoring criteria to directly compare Ireland to other nations, and to explore how other countries were addressing strategy, regulation, and ecosystems.

6.1

Maturity Model Methodology

To create a benchmark for how mature a market is when it comes to the applications of blockchain, crypto and Web3, a series of frameworks and questions have been analysed. The three core frameworks that will be analysed are:

→ Strategy
→ Regulation
→ Ecosystem

The method for grading was developed after analysing several global markets, and conversing with experts in the field. A five point scale was used per category for each country, to create an average score

6.1.1

Strategy

When evaluating the market's strategy, the research needs to identify if there is a strategy being actively pursued by the federal government. Knowing this, we identified two core questions that will help guide the analysis in this are

→ Is there a government-issued blockchain, crypto and Web3 strategy? If not, what is being done instead?
→ Is there a governing department that monitors blockchain, crypto and Web3 activity?
→

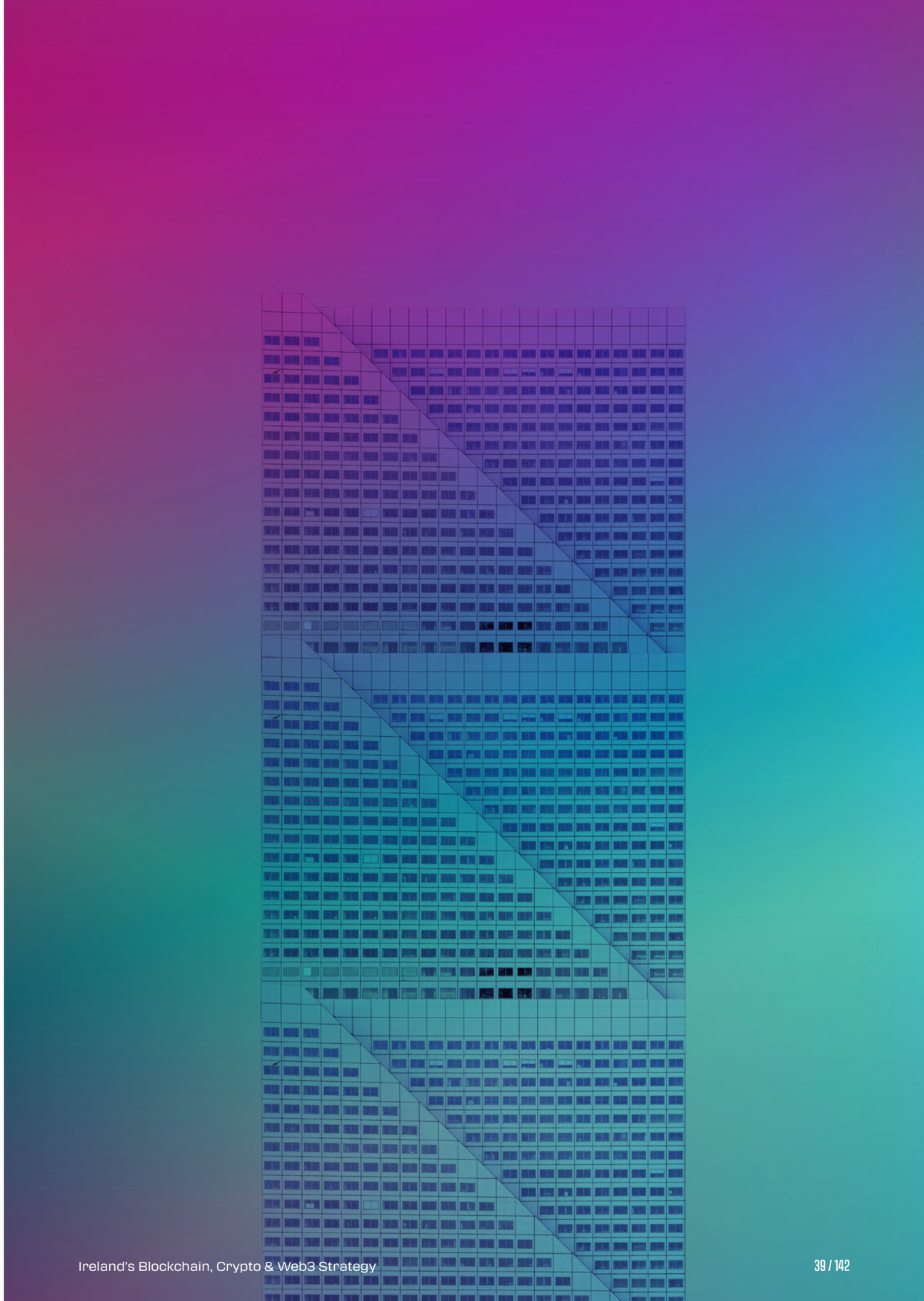
The strategy that is actively being pursued by the market's federal government can be seen in various actions. This includes a government-issued vision, roadmap, or national strategy. Many of the markets that will be analysed within the market analysis section have issued a variation of the forms mentioned. Typically, a vision is a document that shows the government's viewpoints of the technology and how it could utilize in the future. The vision tends to have few actionable items and relies on theory to set the precedent for how the country will address blockchain technology in the future. A roadmap consists of entirely actionable items and goals in which the government is aiming to accomplish by a certain year. The document has little theory and vision for how the government should view the technology. The national strategy encapsulates both a vision and an actionable roadmap. It is the most mature of the strategic actionable items that a government could release.

While it is important to understand a government's viewpoint regarding how blockchain technology can be incorporated into the landscape, it is also important to see how governing bodies help guide the market to accomplish the actionable items. It also creates structure for who should be monitoring various activities. Concerning maturity, markets that have designated taskforces or government-appointed steering committees are seen as more mature. This is due to the creation of positions within a government. Other examples of maturity include having more governing bodies to observe specific activities. This allows for a clearer direction and definition for its use cases. Having a clear understanding of classifications and definitions feeds into the regulatory framework and is directly related.

6.2

Regulatory

The regulations within a market bring light to the federal government's approach to the technology. For the sake of this research, the researcher will solely focus on the regulatory approach within the financial services sector. This is because the financial services industry has proven to be the technology's most mature use case. To understand the technology's regulations within this area, we observed passed legislation as it pertains to cryptocurrencies/digital assets. This includes activities such as funding, transactions, investments, property, and more. While it is important to understand the regulations



in other areas, the financial services sector has the most established legislature when it comes to blockchain technology. We looked at the following key regulatory focused questions:

- → Are cryptocurrencies permitted in the country? If so, what is their approach to them?
- → Are there clear classifications/definitions for these digital assets?
- → Are digital assets taxable?
- → Is there a government-led regulatory sandbox?
- →

In all these markets, one will notice that cryptocurrencies are indeed permitted within the country. Each market takes a considerably different approach to them. This variation in approach is mainly seen through how they classify and define digital assets. More mature markets will have different levels of classifications and definitions based on how the asset is used or transferred. This is seen as more mature because the government is then able to provide specific regulations for the asset rather than grouping them all.
By classifying/defining the digital assets, it helps the market figure out an underlying tax regime for them. When it comes to maturity within the taxation of cryptocurrencies, more mature markets will create new laws or amend existing laws for the digital asset. This method of maturity grading is similar to the approach question. Less mature markets will mould the definition of digital assets to fit into the current structure. This is seen as less mature because it creates a short-term solution for the industry but could create friction as the technology ages.
Along with establishing a regulatory framework for how digital assets are utilised and taxed, another area in which has seen considerable growth are the utilisation of sandboxes. Since 2015, more and more regulatory sandboxes have started to launch within markets (BBVA, 2017). A regulatory sandbox is a government-led initiative that allows organisations to experiment with products and services in an environment where licenses and approvals aren't needed (BBVA, 2017). This allows organisations to test future innovations in a regulation-free scenario. Typically, a regulatory sandbox focuses on the financial services industry, but more mature markets are shifting this focus to include other innovative tech (BBVA, 2017). Markets that are seen as immature in this area are those that don't have this framework. While this might be the case, some markets may utilise innovation hubs or advisory councils so that businesses have a soundboard they can bounce ideas off.

6.3 Ecosystem

The final framework that will be analysed for the maturity of blockchain technology will be the ecosystem. This will consider various industries and the applications of blockchain technology within them. To assess the maturity of an ecosystem we evaluated the level of government involvement for that industry. This is because the federal government can initiate projects, provide funding, create partnerships, and lead research. This level of involvement considers the regulatory framework because it allows the government to observe business practices and predict regulations that might be needed to allow those organisations to grow. Along with analysing the level of government involvement, the we considered the size of the ecosystem as well. Resulting in how many blockchain based businesses are there and how many organisations are using blockchain technology in their practices.
To guide this research, we examined the following questions:

- → How involved is the government in these areas?
- → Are their government funded projects/ initiatives?
- → Is the government leading any research?
- → Are there more private organizations in the space?
- → What does the blockchain ecosystem look like?

To assess the applications, we have provided examples of use-cases and the opportunities they present. In some cases, various applications can span over multiple industries. For example, blockchain technology is currently being used to track the supply chain of pharmaceuticals. This use-case shows how blockchain can bridge the healthcare and supply chain industry. This will only prove its diversity in applications. More importantly, the industries chosen must fit in with the market that these recommendations are being provided for. We identified five core industries that will help compare ecosystems to better understand government involvement and usage in Ireland. These consist of the following:

- → E-Governance & Digital Identity
- → Healthcare
- → Supply Chain
- → Financial Services
- → Energy

Summing up, through our research, we identified three key pillars which we believe need to be achieved in order for blockchain technology to flourish within Ireland. These are:

- → A clear government strategy
- → A robust regulatory environment that enables innovation
- → A thriving ecosystem

With these three pillars in mind, we looked to run a comparison against other leading countries within the blockchain space. For the purpose of this paper we created a set of scoring criteria to directly compare Ireland to other nations, and to explore how other countries were addressing strategy, regulation, and ecosystems. Below is a breakdown of our results with best practices from comparable countries:

> 'This level of involvement considers the regulatory framework because it allows the government to observe business practices and predict regulations that might be needed to allow those organisations to grow'

Below is a breakdown of our results with best practices from comparable countries:

*Please note the list below e is not exhaustive. More countries will be included in the next version such as India, Portugal, UAE, etc. and also more criteria such as tax

Country	Summary	Strategy	Regulatory	Ecosystem	Average
Germany	→ Most comprehensive government issued blockchain strategy that helps foucs on industries other than financial. → No dedicated taskforces to regulate cryptocurrency	4.5	5.0	4.5	4.66
Singapore	→ International focused financial blockchain initiative: Project Libin → No official blockchain strategy or roadmap	4.0	5.0	5.0	4.66
U.K.	→ Consortium led blockchain roadmap and taskforce → Ecosystem is mainly privatised and government led projects have struggled.	5.0	4.5	4.5	4.66
Switzerland	→ Leader in blockchain applications and initiatives of financial services → No official blockchain strategy or roadmap	4.0	4.5	5.0	4.50
Australia	→ Government issued roadmap with newly incorporated roadmap items. → Crypto classifications are molded to fit curent regulations	4.5	3.5	4.5	4.16
U.S.	→ States bring unique advantage for multiple regulatory sandboxes. Current ecosystem completely privatised. → Updated executive order on digital assets and cryptocurrencie.	4.5	4.0	4.0	4.16
Netherlands	→ Ecosystem filled with government led projects and initiatives. → Crypto classifications are molded to fit current regulations	4.0	3.5	4.5	4.00
Ireland	→ Government issued guidelines regarding tax of cryptos. → Ecosystem is entirely privatised but rapidly expanding with talent and global businesses	3.5	3.0	4.5	3.66
Canada	→ Revolutionising government issued project: Jasper → No offical blockchain technology	3.0	3.0	4.0	3.33
Luxemborg	→ Striving to be EU's blockchain hub → Financial focused ecosystem	3.0	4.0	3.0	3.33

6.2

Government Strategy

The best government strategies present a roadmap with actionable steps to reach their goals. The United Kingdom and Germany both meet this criterion with comprehensive plans. Germany created a strategy in 2019 with clear objectives to achieve its five goals:

1. Develop stability, and promote innovations in the financial sector
2. Bring innovation to maturity: advancing projects and regulatory sandboxes
3. Make investments possible through clear, reliable, framework conditions
4. Apply technology - digitise public services
5. Distribute Information

The United Kingdom created an actionable 10-to-15-year roadmap. Other countries created roadmaps, or worked directly with associations to drive objectives. Any government must create a comprehensive blockchain strategy: from taxation to regulation to industry acceptance. Once a plan has been created, a government should ensure a specific department is responsible for each goal.

The U.S. provides a further example of a coordinated governmental approach to digital assets. On March 9th, the U.S. published a factsheet for President Biden to sign an executive order on ensuring responsible development of digital assets. Specifically, the Executive Order calls for measures to:

1. Protect U.S. consumers, investors, and businesses
2. Protect U.S. and global financial stability, and mitigate systemic risk
3. Mitigate the illicit finance and national security risks posed by the unlawful use of digital assets
4. Promote U.S. leadership in technology and economic competitiveness to reinforce U.S. authority in the global financial system
5. Promote equitable access to safe and affordable financial services
6. Support technological advances and ensure responsible development, and use of, digital assets
7. Explore a U.S. Central Bank Digital Currency (CBDC)

Ireland has laid strong foundations from an overall fintech perspective in the form of the "Action Plan for 2021", launched under the IFS2025. In this, the Irish Government committed to establishing a new Department of Finance Fintech Working Group. The working group will develop Ireland's policy positions in response to the EU's Digital Finance Package, coordinate the approach to fintech across the Department, and will engage with external stakeholders to encourage collaboration between policymakers and the fintech community. The Irish Government also committed to establishing an "Expert Group on Future Skills Needs", which will conduct a study to assess the additional skills required to exploit opportunities in sub sectors such as fintech and blockchain, to be finalised in 2022.

Blockchain Ireland's request is that more specific and tangible steps are taken to focus on blockchain, crypto and digital assets related opportunities within financial services, and across other industries. Our detailed recommendations are outlined in section nine.

> 'Our ask here is that more specific and tangible steps are taken to focus on blockchain, crypto and digital assets related opportunities within financial services, and across other industries'

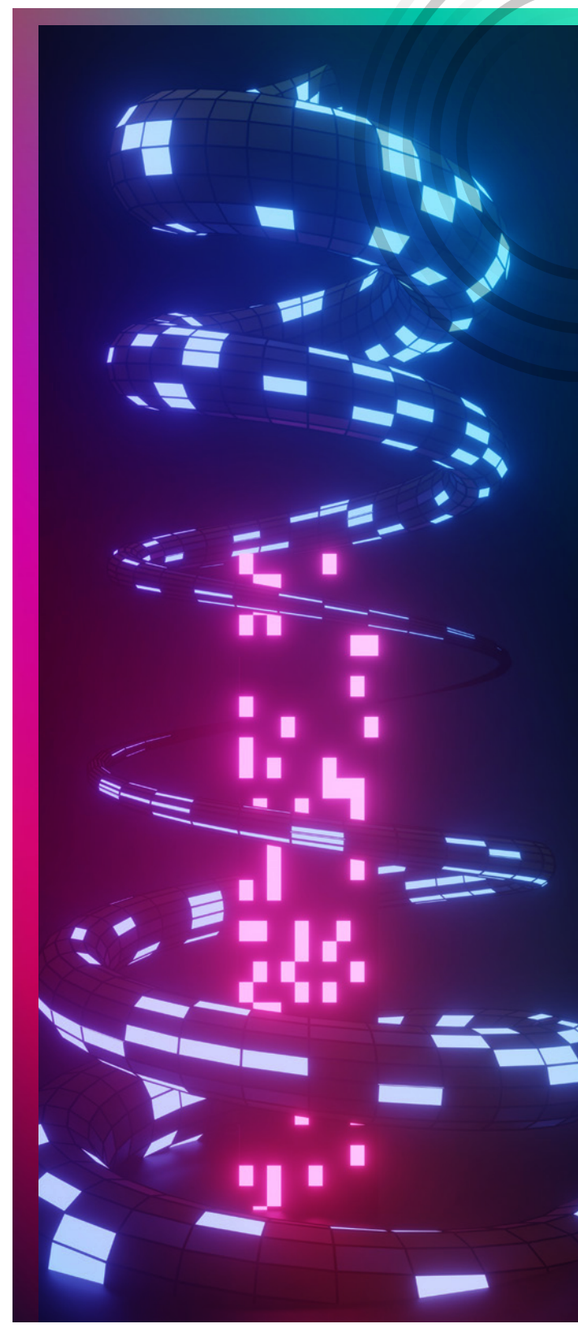
6.3

Regulatory Environment

Regulations within a market demonstrate a central government's approach to blockchain technology. These regulations signal to entrepreneurs, companies and investors, a country's appetite and willingness for innovation.

Every government agency recognises cryptoassets as taxable items, but the majority do not differentiate between the alternative types of cryptoassets, or parties involved. Germany, Singapore, the United Kingdom, and Switzerland are the leaders in regulation to classify and differentiate digital assets. Switzerland uses clear classifications and definitions of multiple types of digital assets: payment, utility, asset, hybrid tokens, etc. These specific definitions help future technology, and ease the approach of creating new regulations. Switzerland released the DLT act, which helps adopt blockchain technology. The FTA provides a transparent tax policy for digital assets using generated classifications and definitions. Because of this clear understanding of each of the various types of digital assets, the FTA can provide unique guidelines for them. For this technology to mature, governments should create new regulations to encourage the growth of different emerging segments, rather than treat all digital assets as one.

While precise regulation is needed for companies to operate, regulatory sandboxes are suggested to encourage innovation. Germany and Singapore offer the strongest examples of effective sandboxes. Germany's BMW uses a guided framework to foster innovation, while Singapore has two different agencies that oversee sandboxes. Singapore offers two innovative methods for administering guidance within the blockchain and fintech space through the Monetary Authority (MAS).[20] The MAS has generated a regulatory sandbox that is similar to all other markets. Unlike most agencies, the MAS offers an express option that fast-tracks approvals for future implementation. The MAS regulatory sandbox works alongside the Singapore Blockchain Innovation Programme (SBIP). Along with the regulatory sandbox, SBIP offers an innovation hub that utilises Proof of Value and Proof of Concept



[20](MAS, 2021) The MAS allows businesses to apply for the sandbox. MAS provides specific regulations for approved businesses during the experiment phase.

(PoV/PoC) consultation for organisations applying the technology. Singapore's approach to regulatory sandboxes creates a welcoming environment for organisations across many industries. The regulatory sandbox is geared towards financial services, but provides a unique express option to fastrack experiments.

A recent paper from the Hong Kong Monetary Authority (HKMA) in January 2022 titled "Discussion Paper on Crypto-assets and Stablecoins", provided a useful table outlining the policy options for regulating crypto-assets. Blockchain Ireland believes this is a strong reference point for the Central Bank of Ireland CBI, Department of Finance and the European Central Bank.

Possible policy options for regulating crypto:

Policy Options	Characteristics	Possible Downside
No Action	→ Market driven	→ Key risks remain and may grow to negatvively impact on the financial system → Unable to meet international standards
Opt-in / Pilot regime	→ Relatively easy to administer → Could test market demand	→ Key risks remain and may grow to negatvively impact on the financial system → Unable to meet international standards
Risk-based regime (e.g. focus on regulation or payment-related stablecoins)	→ Wider regulatory coverage to address risks in a more targeted manner	→ Regulatory and suervosory costs → Pockets of risks may still exist
Catch-all regime (Cover all crypto-assets & crypto-related activities)	→ Wider regulatory coverage to address risks in a more targeted manner	→ Higher regulatory and supervisory costs → Potential regulatory overlaps → May take longer time to implement
Blanket Ban	→ Eliminate new risks to the maximum extent possible	→ Possible challenges to financial innovation

> 'While precise regulation is needed for companies to operate, regulatory sandboxes are suggested to encourage innovation.'

6.4 Ecosystem

An ecosystem is critical to encourage blockchain innovation for use-cases. An ecosystem should drive collaboration through the proper regulation, governance, and stakeholder identification. We looked to see if there was government funding, government-led research, and private innovation. The level of involvement for each government varied across the different industries, however Switzerland is the gold standard to follow. The Swiss government is committed to the blockchain ecosystem and has led, initiated, or funded projects in all focused industries. Each industry showcases extensive plans that help disrupt current applications by implementing blockchain in business practices. Switzerland is an ideal ecosystem to help evaluate the role of the government in industry. To put this into context, as of 2019, Switzerland had 842 blockchain-related companies in Crypto Valley. They had over 4,000 people employed within the blockchain ecosystem, and with five companies being valued over $1B.[21]

This is a small insight into the opportunities that await governments who are willing to implement the right structures today.

[21] https://www.cvvc.com/insights#top50

CHAPTER 7

WHERE IS IRELAND TODAY

Leveraging the comparison framework on pages 28-29, the following section provides a deeper analysis of where Ireland currently sits in terms of strategy, regulation, and ecosystems. Each individual country analysis can be found in the appendix.

7.1 Strategy

Despite Ireland welcoming and helping many blockchain and crypto companies establish a presence here, such as Circle, Deloitte's EMEA blockchain lab, R3, Coinbase, similar to the Canadian market, the Irish government has not issued a blockchain national strategy or roadmap. It must be noted however, that the Irish government is still proactive in trying to progress the conversation of innovative tech. In 2018, the Department of Finance released a discussion paper titled "'Virtual Currencies and Blockchain Technology", that explained virtual currencies and blockchain technology. The document did not feature any actionable items, but instead provided the government's views regarding how the technology may move forward. In July 2021, the Irish government released a National Artificial Intelligence strategy titled "AI - Here for Good: National Artificial Intelligence Strategy for Ireland" which featured smart contracts within blockchain technology. This AI national strategy could lay the framework for how a blockchain strategy document could be produced. The governing bodies responsible for overseeing innovation, regulation, and taxation, consist of the IDA, Central Bank, and the Irish Revenue Commissioners.

In 2020, in line with the emergence of EU Blockchain Services Infrastructure (EBSI) and resources, the Department of Public Expenditure and Reform, through the Innovation Office, commissioned a Science Foundation Ireland (SFI) Research Fellowship, with the purpose of identifying areas of impact for the Irish public administration for blockchain and DLT technology. The provision of trusted, transparent and accountable public services is an important element of the social contract between a state and its citizens. Blockchain technology can help to automate these attributes. Leading initiatives in the public sector include the European Blockchain Service Infrastructure, Chinese Blockchain Service Network, National blockchain test network in Slovenia (SI-Chain), Government blockchain test network in Estonia, and Singapore government blockchain innovation programme. This analysis presents a comprehensive classification of highly impacted blockchain application areas and promising pilots and applications for them. The research provides significant value for researchers and practitioners to reinforce current work, align innovation directions, and develop blockchain roadmaps, including:

1. Managing Public Sector Assets using Blockchain and NFT
2. Managing Building Material Traceability using Blockchain and NFT
3. Blockchain-as-a-Service (BaaS) Architecture for DApps and Application for Veterinary Medicine Case Study in Ireland
4. Emerging innovation ecosystems - blockchain and agrifood

The Department of Public Expenditure and Reform (DPER) blockchain case studies Fellowship 2021 can be found here. Further educational resources published by the Irish government can be found here.

> 'similar to the Canadian market, the Irish government has not issued a blockchain national strategy or roadmap'

7.2
Regulation

Regulatory clarity is one of the primary drivers for companies looking to establish a blockchain, crypto, and digital asset business in Ireland. If there is regulatory ambiguity, businesses will look to jurisdictions in Europe and other parts of the world to set up, and do business from instead. Despite what some may think, rules of the road in this sector are welcomed. Building on this, Ireland has attracted all the major crypto exchanges to be established here, primarily through the Electronic Money (e-money) Institution regulation. An e-money institution is an undertaking that has been authorised to issue e-money in accordance with the European Communities (Electronic Money) Regulations 2011, as amended (EMR).

7.2.1
MiCA

As Ireland is a member of the European Union, Ireland must follow directives/ regulations set out by the European Commission and the direction of the European Central Bank. A harmonised ruleset across the 27 member states has been created, and is currently being progressed through the European parliament. The European Commission's regulation of Markets in Crypto-assets (MiCA) proposal is a regulatory framework developed since 2018 to help regulate currently out-of-scope crypto-assets and their service providers in the EU, and provide a single licensing regime across all member states by 2024. The Department of Finance has been closely involved in this process.

In the interim period until MiCA comes into effect, countries such as Germany (as outlined in section 5.3) are creating an interim set of laws, rules and policies to establish themselves as the go-to blockchain, crypto and digital asset location in Europe. Rather than fall behind, we believe Ireland needs to move from a 'wait and see' approach, to a more active stance. With the Department of Finance, and in partnership with industry representative organisations, such as Irish Funds and the Banking and Payments Federation of Ireland, we believe this is an area that needs to be quickly examined in more detail to assess what actions can and need to be taken.

It is great to see Irish funds will be publishing a paper on digital assets titled "Crypto Assets, Opportunities, risks and future possibilities for regulated investment funds in Ireland". It touches on "Distributed ledger technology (DLT) and cryptography and how they have the potential to drive profound change across all industries, and the financial services industry is no exception.

Not only will it change how financial services firms carry out their roles and processes, DLT and cryptography have combined to create a new asset class which is generating significant appetite amongst investors. Investors want exposure to crypto assets and this demand is growing, notwithstanding the price volatility and risks involved.

Investor appetite for crypto asset exposure is creating opportunities for investment products and services to satisfy this demand and provide exposure to crypto assets in a more risk-managed way. Regulated investment funds could be the optimal vehicle to deliver this exposure as many of the protections which crypto asset investors are seeking - professional asset management, safeguarding of assets, independent valuation, ease of dealing, portfolio diversification, regulatory oversight - are already incorporated into regulated investment fund structures. Further, investor outcomes will be improved by bringing exposure to crypto assets within the regulatory perimeter via authorised investment fund structures.

As a world leader in the funds and asset management industry, Ireland has the ecosystem in place to deal with the needs and complexities of operating authorised investment funds investing in crypto assets. The intention of the Irish Funds white paper is to lay the groundwork for a collaborative effort exploring the feasibility of Irish authorised crypto asset funds.

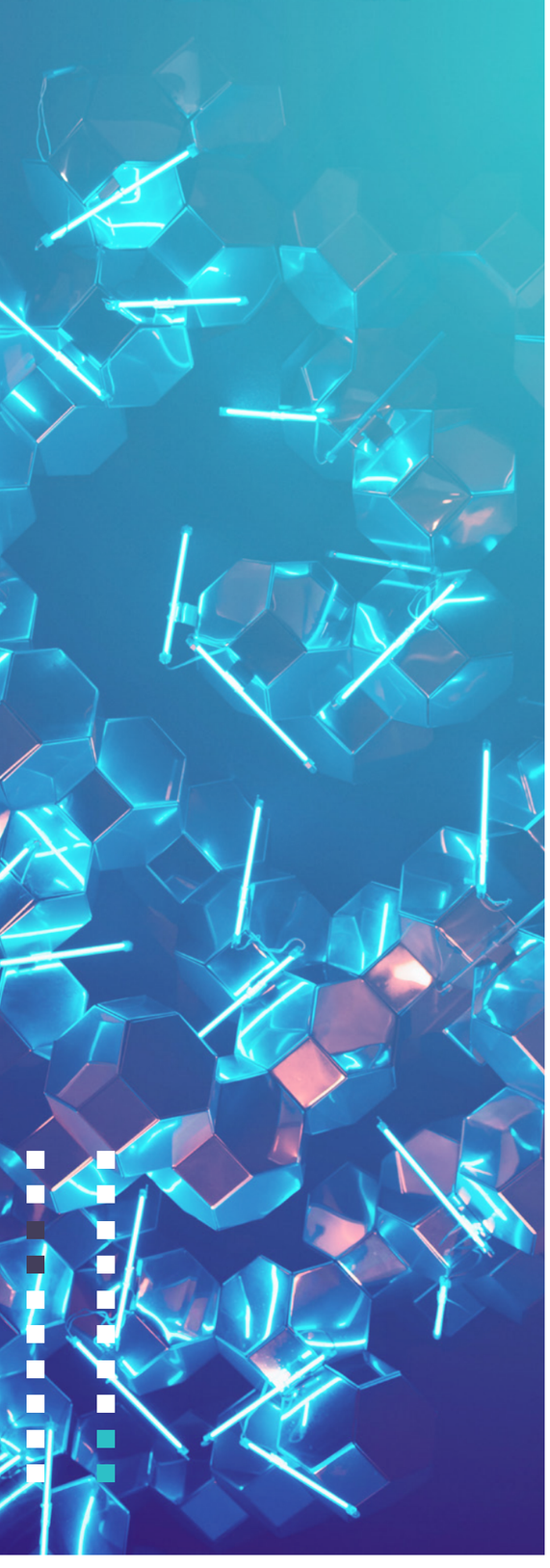
7.2.2
VASP

At present, the Irish government classifies cryptocurrencies as "Crypto-Assets". The European Union's Fifth Anti-Money Laundering Directive (5AMLD) extended Anti-Money Laundering and Countering the Financing of Terrorism (AML/CFT) obligations to entities that provide certain services relating to virtual assets. On the 23rd of April 2021, Ireland transposed 5AMLD into Irish law by way of the Criminal Justice (Money Laundering and Terrorist Financing) (Amendment) Act 2021 (2021 Act) and the provisions of the 2021 Act that relate to Virtual Asset Service Providers (VASPs).

For the purposes of the legislation, VASPs are firms that provide any of the following services relating to virtual assets:

1. Exchange between virtual assets and fiat currencies
2. Exchange between one or more forms of virtual assets
3. Transfer of virtual assets, that is to say, to conduct a transaction on behalf of another person that moves a virtual asset from one virtual asset address or account to another
4. Custodian wallet provider
5. Participation in, and provision of, financial services related to an issuer's offer or sale of a virtual asset or both

The VASP legislation has been largely welcomed by the Irish blockchain, crypto and digital asset community, due to the degree of clarity it provides by setting out a clear 'rules of the road' framework. Larger enterprises typically have access to in-house legal experts, and can call upon external legal counsel to help interpret questions and support applications. However, the same does not apply to smaller entities such as start-ups looking to establish indigenous businesses. This is an area we believe needs to be discussed with the Central Bank of Ireland to ensure smaller companies have access to appropriate resources.



7.2.3
TAX

Based on the latest guidance from The Irish Revenue Commissioners in April 2022, you must pay 33% Capital Gain Tax (CGT) when you dispose of any crypto asset. You have disposed of an asset when you have:

- → Sold it
- → Gifted it
- → Exchanged it
- → Got compensation or insurance for it

In April 2020, the Irish Revenue Commissioners released a tax manual titled “Taxation of Cryptocurrency Transactions” to detail cryptocurrency taxation for both the government and the general public. This level of clarity has also been welcomed by the ecosystem. As of now, cryptoassets are subject to tax-related income, capital gains, and VAT.

7.2.4
Regulatory Sandbox

The Irish government has previously released statements expressing the need for a regulatory sandbox, but there has yet to be progress made regarding it. Ireland is however, home to the Central Bank of Ireland Innovation Hub. The Central Bank of Ireland created the innovation hub to help administer support and guidance for firms innovating in the financial services sector. The innovation hub has been warmly received, and is a welcome addition to the broader ecosystem. However, enabling the innovation hub to provide a regulatory sandbox function similar to the FCA, would give start-ups an opportunity to further test and refine their offerings, provide them with the prestige of being accepted to be part of a CBI regulatory sandbox programme, and also allow Ireland to be looked upon more favourably by our European peers as a go-to fintech location. At present, Ireland loses points on country fintech ranking indices due to the absence of a regulatory sandbox.

7.3
Ecosystem

There is a vibrant blockchain, crypto and digital asset ecosystem in Ireland. This is the result of ongoing support from a number of government entities and departments. The Irish government is actively involved in a variety of blockchain, crypto and digital asset activities. For example, Blockchain Ireland was founded with support from a range of entities, including IDA Ireland, Enterprise Ireland and the Department of Finance. The Central Bank of Ireland, the Department of Public Expenditure and Reform (DPER), Science Foundation Ireland and other departments have also contributed meaningfully to the sector over the past six years, including through holding government run blockchain hackathons, helping to start up a national digital identity initiative ”‘Project Emerald”, running events as part of Blockchain Ireland Week, establishing the Masters in Blockchain in Dublin City University, and participating in many monthly update sessions. The recent introduction of the €90m Irish Innovation Seed Fund is also a welcome development to the start-up sector. However, what is missing is how all these various elements come together to form a joined-up blockchain, crypto and digital assets strategy for Ireland for the next three years. Linking to the European Blockchain Partnership and EU Blockchain Services Infrastructure program would be a logical next step, accelerating Irish Public Sector experimentation with DLT services modelling in an open collaboration with European Commission wider business, policy and technical research community.

CHAPTER 8

RECOMMEN-DATIONS AND ROADMAP

On behalf of our community, Blockchain Ireland would like to work together with the following departments to develop and implement a national blockchain, digital asset and crypto strategy:

1. Department of Agriculture, Food and the Marine (DAFM)
2. Department of Education (DE)
3. Department of Enterprise, Trade and Employment (DETE)
4. Department of the Environment, Climate and Communications (DECC)
5. Department of Finance (DoF)
6. Department of Further and Higher Education, Research, Innovation and Science (DoFHERIS)
7. Department of Public Expenditure and Reform (DPER)
8. Department of the Taoiseach offices (DT

Broken out below are the summaries, findings and recommendations from each of the Blockchain Ireland working groups.

8.1 Education, Skills and Innovation Working Group

8.1.1 Objective

The Working Group on Education, Skills and Innovation is chaired by Professor Joyce O'Connor, co-founder, and Chair of BlockW, Chair of the Digital Group of the IIEA, Chair of the IIEA's Europe's Digital Future Think Tank Network , EU Ambassador 4 Women IT, founding President National College of Ireland . The Working Group is representative of the Quadruple Helix - industry, academia, Government agencies and society. The Working Group's approach is to work within the EU and National policy context.

The overall objectives of the Education, Skills and Innovation Working Group are to:

1. Identify Blockchain Skills needs, gaps and mismatches using an evidence based approach;
2. Help create a Skills Roadmap for policy makers, industry, workplace planning, education, training bodies, and civil society that will facilitate the development of a national Blockchain Skills Strategy within the context of emerging technologies;
3. Provide research based findings that will help deliver appropriate, flexible, future focused education and training geared to the needs of industry, the economy and society. This will involve evaluating both accredited and non-accredited programmes and pathways and
4. Help create awareness of the potential of Blockchain Technologies.

To help achieve these objectives the Working Group worked with key stakeholders on several initiatives which are documented throughout this submission.

A notable achievement of this Working Group commenced in 2017, under the then chairmanship of Gerry Doyle, the Network Manager of the Technology Ireland ICT Skillnet. A decision was made to create of the first ever MSc in Blockchain (Distributed Ledger Technologies). Launched in 2019 by Minister Heather Humphreys TD, Minister for Business, Enterprise and Innovation, and delivered by Dublin City University, this industry led, Skillnet Ireland grant-aided MSc will welcome its fourth intake of participants in September 2022, underpinning the growth in the Blockchain talent pipeline in Ireland.

The Technology Ireland ICT Skillnet, a member of this Working Group, is tasked with the continued development of

such programmes, and pathways to support industry in Ireland. This is an example of a transversal approach within the Blockchain Ireland Working Groups, as all skills and talent development initiatives will be a cross collaboration between our Enterprise, Start-up, Developer and Legal & Regulatory Working Groups. Leveraging the domain expertise across these individual Working Group, we will provide access to world class Blockchain learning programmes.

Supplementing the MSc programme, the Working Group collaborated with the Technology Ireland ICT Skillnet and IBM's SkillsBuild platform in 2021 to launch two Blockchain pathways, one for technologists and the other for business leaders.

The Working Group has liaised with the Economic and Social Research Institute (ESRI) to introduce their research team to the Irish Blockchain Ecosystem as part of their work on the EU CHAISE Project (EU CHAISE Project Fact Sheet Appendix B). A Summary of the EU CHAISE Project publications written by Dr Adele Whelan Senior Research Officer in the ESRI is available in Appendix B. This four year project (2021-2024) financed by the European Commission Erasmus Programme addresses the growing demand for Blockchain and distributed ledger technology (DLT) skills across Europe.

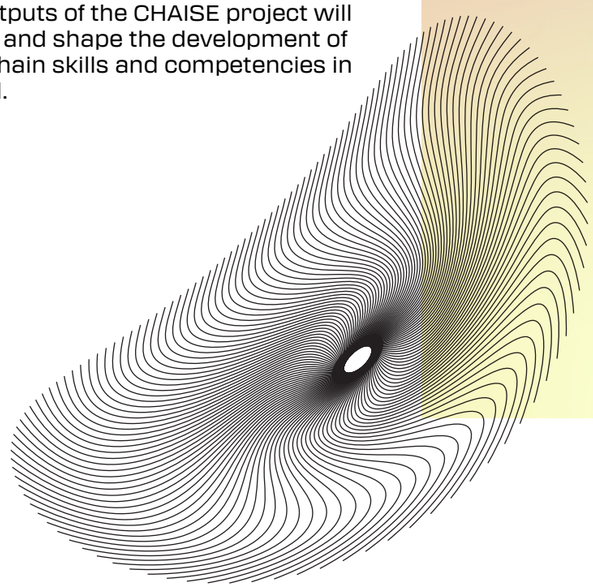
The outputs of the CHAISE project will inform and shape the development of Blockchain skills and competencies in Ireland.

The results of the EU CHAISE Project is a series of publications about the following topics: (EU CHAISE Publications)

1. European and National Blockchain Skills Ecosystems;
2. A European Blockchain Skills Strategy;
3. A forecasting mechanism to anticipate future Blockchain Skills needs;
4. A five - semester Blockchain VET Programme;
5. Transnational mobility schemes for Blockchain students/professionals and
6. The first ever "Blockchain specialist " occupational profile.

The Working Group also liaised with the ESRI on two other studies.

1. Blockchain Skills in the UK and Ireland (Digit-Research.org/Research/Marie-Jaohda-Visiting Fellowships, 2022). In this study the ESRI and DIGIT (University of Sussex UK) identified occupations and jobs within which Blockchain skills are a dominant feature and examined the determinants of demand for blockchain skills.
2. Untangled Horizon 2020-2024. The goal of the Untangled project (CORDIS | European Commission, 2022) is to examine the impact of globalisation, technological transformation, and demographic change on labour markets in the EU and to recommend policies that will contribute to shared prosperity. Following this, the ESRI will publish a case study on the Blockchain Industry in Ireland.



8.1.2 Opportunities

The EU has identified Blockchain/ DLT technologies as one of the key emerging technologies that is shaping Europe's future. The use of this technology presents a high potential to benefit the economy and society (European Blockchain Strategy — Brochure, 2021). "Blockchain can help make interventions between citizens, entrepreneurs and public organisations more efficient, reinforce trust and enable each party to maintain control over its data. It will be instrumental in building a citizen-centric sustainable, transparent and inclusive European digital society" (European Blockchain Strategy — Brochure, 2021).

The Working Group believes that Ireland should create a Global Blockchain Hub. The key to the establishment of such a Hub is the identification of Blockchain related skills that are in demand now and that will be in the future (Stokes, 2021). Blockchain technology has created new market employment opportunities. The EU Chaise Project (CHAISE Blockchain Skills for Europe, 2020) clearly identifies that Blockchain expertise is in high demand. There has been a 300-500% annual increase in the global demand for Blockchain developers. There are currently over 500 Blockchain developer jobs advertised on LinkedIn in Ireland. Over 25,000 Blockchain developer jobs are advertised on LinkedIn globally (www. statista. com: The Global Blockchain Employment Report 2021: Global Blockchain Technology Market Report 2022-2027).

This approach for the next phase of Ireland's digital transformation builds on considerable national work which is in line with the EU'S Digital Decade and the EU Digital Compass: Skills Digital Infrastructure, Digital Transformation for Business and the Digitalisation of Public Services. The National Digital Strategy provides a framework to address these issues. This strategy brings a clear focus, targets and work streams covering four pillars Enterprise, Infrastructure, Skills and Government Services (Harnessing Digital : The Digital Ireland Framework 2022) see also Ireland for Finance 2021 action # 21 Pillar 3, (Ireland for Finance, 2021)

A lack of familiarity with Blockchain Technology and its potential has been shown to unduly limit industry's and policy maker's appetite for engagement with Blockchain technology. One of the findings of the EU CHAISE Project is that it is critical for industry, employers, and employees to understand and harness the strategic value of Blockchain in business, the economy and society (CHAISE Blockchain Skills for Europe, 2020). As is the case in other emerging technologies such as AI and robotisation (Acemoglu & Restrepo 2020 Clifton et al 2020 : Treiblmaier & Beck (Ed) 2018) successful Blockchain adoption requires acceptance of the technology.

Some research studies show that acceptance of this emerging technology depends on a range of contextual factors and can be promoted by various means, such as showing real life applications, telling stories of the positive implications of blockchain (Jansen et al 2020) a broad range of factors over and above the predominantly technology focus of more current work. This lack of familiarity and the opportunity for Ireland to be an exemplar in creating awareness of the business benefits and societal impact of Blockchain must be embraced.

> **'Blockchain can help make interventions between citizens, entrepreneurs and public organisations more efficient, reinforce trust and enable each party to maintain control over its data'**

8.1.3

Recommendations

The Recommendations and Actions outlined below are built on evidence-based research and on a series of expert consultations undertaken with industry, academia, policy makers and civil society.

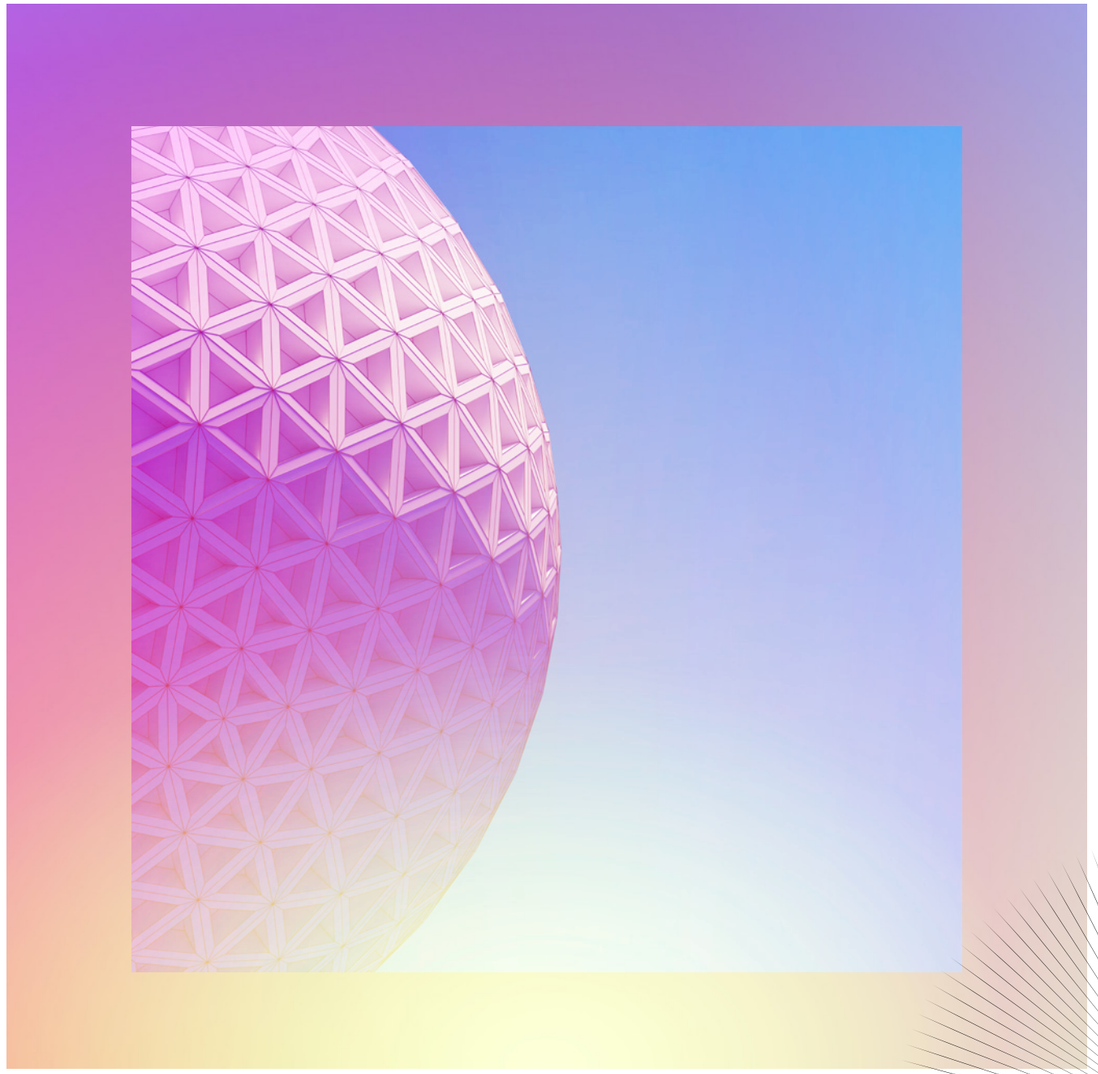
1. **Develop a Global Blockchain Hub, a Multi-Institutional Centre for Excellence using the UN sustainable development goals (SDGs)**.
   The Education, Skills and Innovation Working Group supports the current European and National policy initiatives. Within this context we suggest a multi-stakeholder approach to the development of the emerging technology of which Blockchain is a critical component. See the diagram below — a quadruple helix which lists all the activities to create such an Ecosystem. To create such an ecosystem the creation of a Multi-Stakeholder Global Blockchain Hub of Excellence is suggested. This Hub will bring together all the key components of the Blockchain ecosystem in an efficient and innovative way. The Hub, a Multi-Institutional Centre for Excellence will contribute to drive the promotion of skills and talent in this area and position Ireland as a location of choice for Blockchain Technologies.

2. **Create a Blockchain Skills Strategy and Roadmap.**
   The National Digital Strategy, the Ireland for Finance Pillar, the EU CHAISE Project, together with the UK/ Ireland Blockchain Skills Project, and the Untangled Project, all provide the context for the development of a national Blockchain Skills Strategy informed by existing strategies such as the National AI Strategy. The Blockchain ecosystem in Ireland is challenged by a talent shortage, global competitive pressures, the mismatch between education training and the market and the responsiveness of formal education and training to workplace requirements.
   Higher Education Institutions and training organisations should be encouraged to take a coordinated approach to the delivery of Blockchain education and training informed by the ESRI forecasting model 2021-2025. These programmes will be based on the research that shows there needs to be three elements to these programmes: technical skills, business skills and transversal skills. Micro-credentials are seen by industry and academia as a way to address flexibility and delivery of programmes and investment in their development is critical. Education and training bodies will benefit from using the International Association of Trusted Blockchain Applications Framework (INTABA, 2022) for developing programmes.
   Of the top ten U.S. universities:

   - Four have dedicated crypto centres (Stanford, MIT, Columba and Princeton)
   Almost all have dedicated classes, which in some case are the most popular at the school
   Almost all have dedicated student groups

   A more diverse involvement in stem and emerging technologies including Blockchain continues to need more focus. We suggest that an innovative Expert Group be established to build on previous work and develop an action plan to increase more active participation among women and other groups that are not represented. We will continue to engage with the relevant Government Department, The Higher Education Authority, Skillnet Ireland and other stakeholders to maximise the opportunity for Ireland as a Global Blockchain Hub by creating world class talent pipelines.

3. **Create Public Trust in Blockchain**
   Create awareness around Blockchain's impact for good on the economy and society -a source for social good in Ireland. A lack of familiarity with Blockchain and its potential is seen to unduly limit industry and policy maker's appetite for engagement with Blockchain We suggest that, as with the AI Strategy, there should be a plan developed to involve all Quadruple Helix stakeholders.



'Higher Education Institutions and training organisations should be encouraged to take a coordinated approach to the delivery of Blockchain education and training informed by the ESRI forecasting model 2021-2025'

Supplementary Insights on Working Group Initiatives
Working Group Members have worked on a number of initiatives to create awareness in academia, industry, employees, professional groups, and civil society.

Academia
Creating Awareness, Understanding and Collaboration - Munster Technological Universit.

Dr Susan Rea has a project to stimulate multidisciplinary Blockchain research, research informed teaching for Blockchain and accelerating Blockchain innovation to enhance external partnerships with HEIs, enterprise, communities, and related stakeholders in the region, nationally and at an EU level with the objective of building sustainable impactful additional capacity at MTU and establishing MTU as leader in Blockchain education, research and innovation. Dr Rea is a member of the IEEE Committee UK and Ireland Blockchain Group

Bachelor of Science (Honours) in Digital Accounting - GMIT

Developed in collaboration with the CIMA, CAI, ACCA, and CPA this programme is new, future-proofed and the leader in this emerging area. Dr Trevor Clohessy was a member of an academic team who developed this programme together with input from industry. Mr David Roche, a working group member, was an industry contributor to the programme. Dr Clohessy works with Enterprise Ireland companies to inform SMEs on Blockchain applications

Industry SME and Multinationals
Blockchain Technology in Property Practice - Leman Solicitors

As members of this Working Group, Leman Solicitors are developing blockchain applications as Blockchain applications are being used to revolutionise the cumbersome legal process in the Irish residential new homes space. New technologies such as blockchain has been embraced in the Property Industry to digitise the conveyancing system which has led to drastic improvements in the efficiency, transparency and costs involved in a residential transaction. Through the incorporation of digital signatures, instantaneous stakeholder notifications and electronic payment platforms, the outdated legal process has been transformed. These building blocks have laid the foundations for the incorporation of smart contracts which will automate large strands of real estate transactions and digitise asset ownership.

Blockchain Learning Training Initiative - Blockdaemon

Blockdaemon University is a learning and training initiative which has been created to provide a consistent and structured training, development and on-boarding programme for new hires and new team members. Blockdaemon University will also act like a digital library for existing staff to up-skill, re-skill or use as a source of reference. The purpose of the programme is to pinpoint the knowledge and skills that all new hires and new team members should have, as well as educate, improve communication and interpersonal skills, enhance productivity, initiate creativity and motivate new hires to do their best, given all the knowledge they gain from Blockdaemon University.

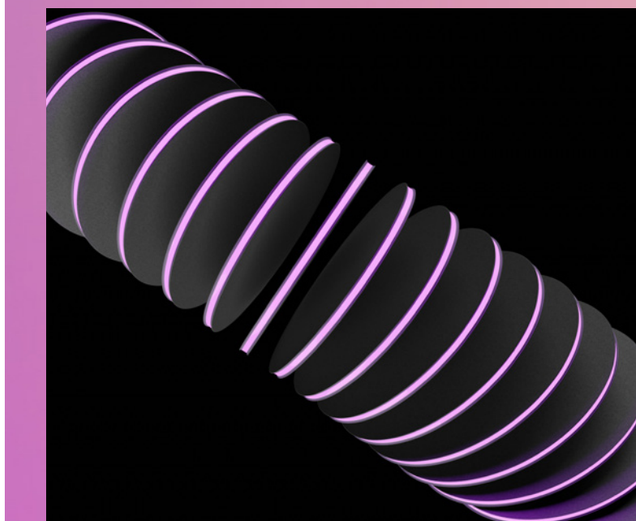
Networks
BlockW - Chaired by Prof Joyce O'Connor

BlockW's mission is to create awareness about Blockchain and emerging technologies, to increase inclusivity and diversity in its uptake and provide information on pathways to education, training, and careers. BlockW interacts with policy makers, industry, academics, research, and citizens to increase their understanding of Blockchain and Emerging Technologies. BlockW has developed partnerships in India, Europe, the USA, the UK, Australia, and in Ireland, including with NCI, UCD, Trinity College, UCC, MTU, and the GMIT Innovation Centre among others.

BlockW has contributed to several initiatives and partnered with amongst others:
1. **The Institute of Banking** - Creating Micro-Learning Modules 2020-present BlockW has developed a series of micro-learning modules for the 34,400 members of IOB. The IOB digital library is available to all members.
2. **Women's Empower Programme** - The Empower Programme is co-funded by the Irish Government and the European Social Fund to develop female entrepreneurship. BlockW helped develop the content and shape of an introduction to Blockchain technology to women on the Programme and to women led SMEs using applications of Blockchain in a business context.
3. **Irish Computing Society** - Creating awareness about Blockchain Technologies by co-hosting a series of webinars

8.1.4
Blockchain Jobs

A core deliverable from the Education, Skills and Innovation working group, is the publication of the infographics below based on research by the ESRI, Chaise, the Economic, Social and Research Council, Digital Futures at Work Research Centre, University of Sussex, and CPI. The infographics outline what policymakers need to know when it comes to blockchain jobs



8.2

Start-up and Ecosystem Working Group

Blockchain Ireland (BCIRL) #Startups ecosystem was formed in February 2021, by working group Chair Fiona Delaney, open innovation specialist, co-founder and CEO, agri-tech company Origin Chain Networks. EU and National Innovation Award winners 2020.

8.2.1 Objectives

The startup ecosystem acts as a community of practice (COP), a recognised framework for open innovation sometimes known as a Living Lab. It is an early-adoptive decental eco-system recognised at EU Blockchain Observatory and Forum (EBOF) for supporting and creating visibility on emerging Web3 practice from Ireland, EU and further afield. This includes fostering collaboration between international and local leaders in blockchain, facilitating engagement across research and the marketplace to air fresh topics and raise awareness about emerging opportunities. The BCIRL Startups ecosystem caters for Web3 innovators, investors, founders, community builders and influencers across a diverse range of membership activities, strategic partnerships and social networking activities.

Community partners include: 'Web3 Meet-up' with Unbanx (Dublin), Block W (Ireland), World Blockchain Hackathon (virtual), Democracy4All (Barcelona), Token2049 (London/HK), DeFi Live (London), Agri-D (virtual/Houston), EU Blockchain Week (Slovenia) and Dogpatch Labs and the NDRC innovation hub network.

> **'Extend the reach of the Irish Web3 and blockchain startups ecosystem through organic growth and partnership'**

Blockchain Ireland #Startups supports strong links with blockchain and DLT focused standards and innovation initiatives:

1. EU Blockchain Observatory + Forum (A Costello)
2. EUOS Standards Observatory/Block (F Delaney, S. Iyer)
3. ISOTC307 AG3 Digital Currencies (F Delaney, P Ryan)
4. ISOTC307 AHG 3 Representation of physical assets as NFTs (F Delaney)
5. ISO/TS 23635:2022 Blockchain and DLT - Guidelines for governance (B O'Connor)

The group aims are to:

6. Extend the reach of the Irish Web3 and blockchain startups ecosystem through organic growth and partnership
7. Enhance knowledge-sharing opportunities across expert domains including technical, legal, and business and finance
8. Create visibility and discovery of Irish Web3 talent, showcasing and accelerating the emergence of Irish innovation in the global digital marketplace

8.2.2 Opportunity

To accelerate the emergence of a Vibrant Web3/Blockchain, Digital Asset and Crypto Startup Ecosystem in Ireland.

Event	BCIRL #Startups ecosystem	BCIRL #Startups ecosystem	Location	In-person/ Hybrid/ Virtual
EU Blockchain Wk	Founding member: "Decentral ecosystem of early-adoptive decental eco-systems" EBOF	Sept 19-24 2021	Ljubljana, Slovenia	Hybrid
Token2049	Community Partner	Oct 7-8 2021	London, UK	In-person
'Hodl a Drink'	Sponsor c/w Sors Digital Assets, Defactor, TokenTraxx	Oct 6 2021	London, UK	In-person
Babylon Project Global Hackathon	Community Partner	Oct 29-Nov 20 2021	USA/global	Virtual
Democracy 4 All - Blockchain Governance	Community Partner	Nov 11-12 2021	Barcelona, Spain	Hybrid
DeFi Live	Community Partner	Nov 11-12 2021	London, UK	Hybrid
Block.IS + EU Digita SME Alliance	Speaker and attendees: Origin Chain Networks, OpenSky	Nov 25-26 2021	Brussels, BE	In-person
#Networking_IRL for Web3 innovators and entrepreneurs	First IRL networking event. Micro-pitching, Startup speed-date, panel discussion and social.	Feb 22 2022	Dublin, IE	Dublin, IE

8.2.3
Recommendations

1. Enhance expert-level review capabilities from a blockchain, DLT and Web3 point of view at decision-making level. A strong reference point here is the €90 million Irish Innovation Seed Fund Programme, Enterprise Ireland, IDA and Government Departments.
2. Provide networking, mentoring, and financial support for emerging DLT entrepreneurs and innovators to participate in national and EU-level innovation events, hubs and clusters.
3. Create an agile, micro-credential framework for Web3/blockchain/DeFi (See 9.1.3(5))

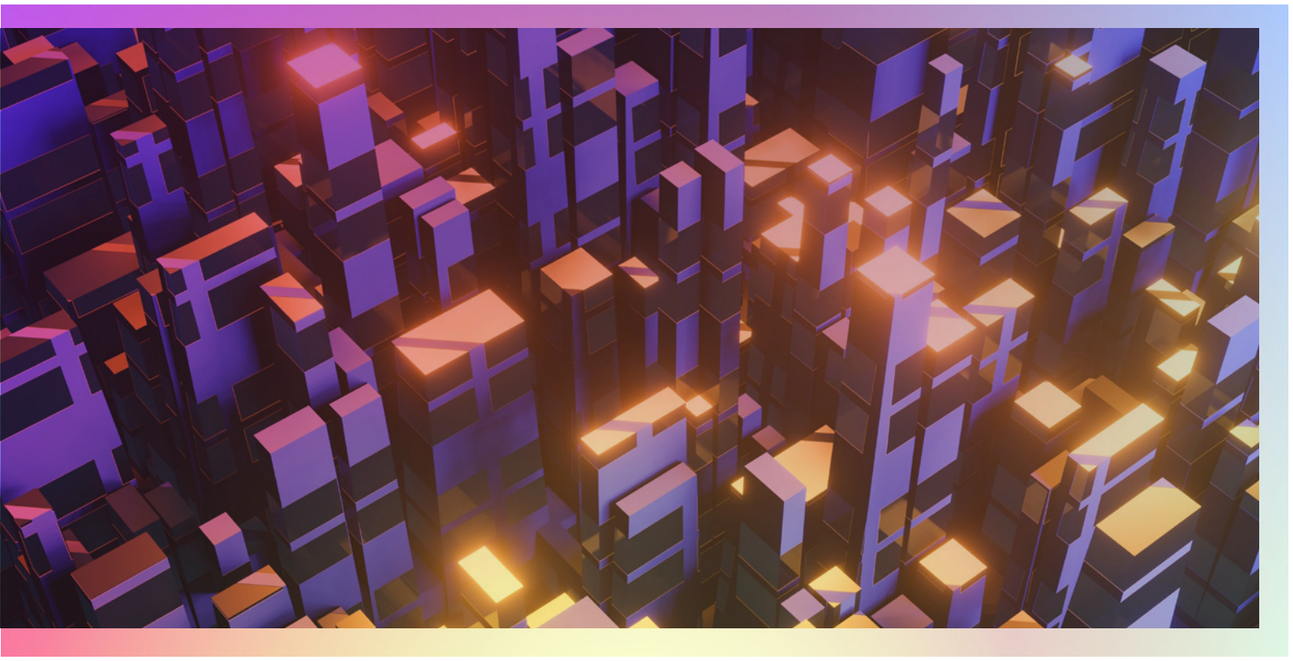
i. Link business with digital skills providers to certify emerging skills in blockchain and decentral business.

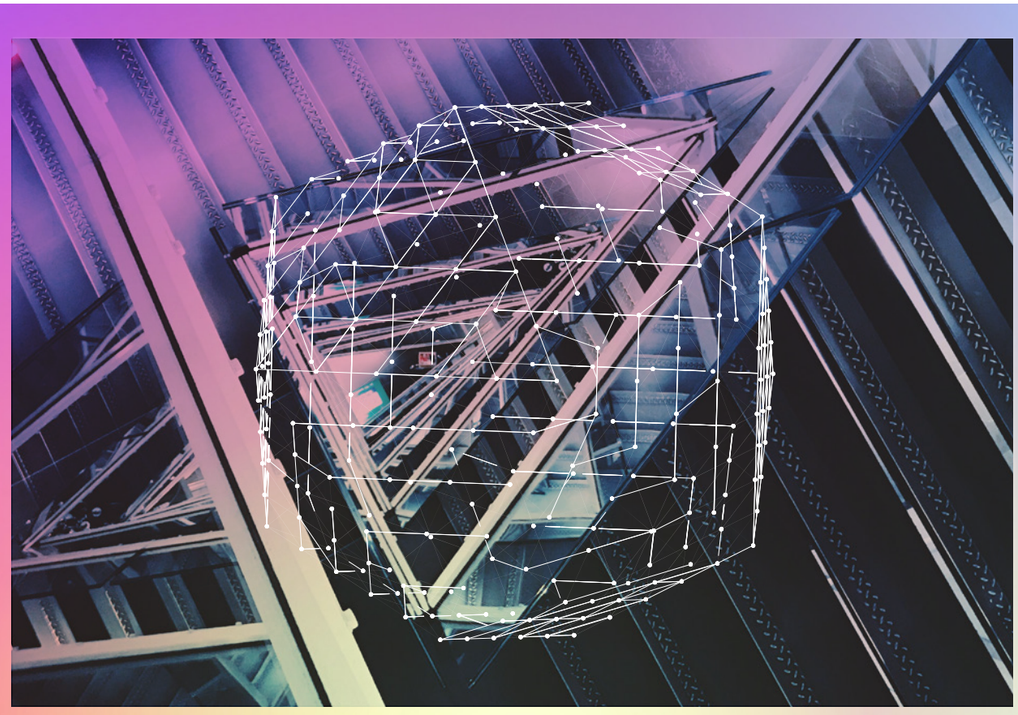
ii. Develop work-based placements to certify participation in real-world implementation, and practice accelerating career opportunities for individuals, and accelerating knowledge and experience in the available talent pool for industry.

iii. Utilise the capabilities of the blockchain itself to deliver autonomous and asynchronous services; verifiable credentials for DLT mentors, SSI-based skills, experience and reputation scores for those looking to make a career in DLT, NFTs that relate to IP and authorship status in industrial design, visual communications and arts practices.

4. Take steps to access EBSI node infrastructure and participate in the EU early adopters program. (Dept. of Public Expenditure and Reform, Office of the Government Chief Information Officer).
5. Establish a formal practice of use-case identification and valorisation to evaluate blockchain, digital asset and crypto business applications. (Ref. ISO DTR3242:2022 Blockchain and DLT - use cases). Example of comparative use case analysis: 'Blockchain and Bioeconomy Infographic' below.
6. Establish a sustainable community of practice in decentral innovation that demystifies through practice, the concept and delivery of decental multi-party system interoperability and governance across trade boundaries, including those at the edge of public administration. (Ref. ISO 5000 series: Innovation Management. Open innovation and the emerging concept of ecosystem innovation).
7. Establish compliant sandbox and test-bed environments to iterate Web3 proof-of-concepts, test implementations, and trial scaling propositions, including data sandboxes, GDPR-compliant, privacy by design and/or mirror population data sets (not real-world users but similar virtual populations) in order to model business use patterns, design new business processes, eg. regulatory sandboxes such as energy data sandboxes, mobility data and traffic modelling, health planning and mirror populations.
8. Highlight complex implications for the future digital marketplace from the point of view of decentralised systems. Use applied, multi-stakeholder approaches to de-risk exclusion from emerging sectors including Community of Practice and applied research resources such as EC early-adopter blockchain service infrastructure, test-bed and community of practice noted at 6, 7 and 8 above.

'Establish a formal practice of use-case identification and valorisation to evaluate blockchain, digital asset and crypto business applications'





8.3

Events and Communications

(Blockchain Ireland Week) Working Group

8.3.1
Objective

Led by journalist and consultant Paul Hearns, and funds expert, Dáire Lawlor, Blockchain Ireland Week is an annual programme of events to provide engagement for the membership. It is a showcase for blockchain activity and adoption in Ireland that also serves as a discussion platform for future development.

Successful events in the past had highlighted a need and appetite for an event to bring together the various voices within the ecosystem to share experiences, insights, developments and opportunities. In 2021, the event week was a digital conference programme of more than 60 presentations, 11 panels, and 30 speakers, covering academia, industry, enterprise and start-ups. The session was opened with a former European Head of State, and two Irish Ministers.

8.3.2
Opportunity

For 2022, the ambition is to deliver a hybrid event that will be a template for all future events, hosting attendees live, while broadcasting digitally to partner associations globally.

8.3.3
Recommendations

1. It is planned to further develop the branding for Blockchain Ireland Week, establishing it as the central calendar event for the ecosystem. BCIRL will build on the success of the 2021 digital event programme with a hybrid format that can be leveraged further in the future.
2. The long term plan is to develop Blockchain Ireland Week into an internationally recognised conference and symposium. To cultivate a select list of internationally renowned voices from all aspects of the ecosystem, building on previous success in both annual events and monthly meeting programmes.
3. As part of that plan, Blockchain Ireland will use the event week to develop stronger and wider ties with other international associations and groups to enrich the platform. Build upon existing connections, such as being a founding member of the Blockchain Associations Forum, to cooperate and co-invest with other national associations and interest groups to promote international events and initiatives. Blockchain Ireland has now worked with: Africa Blockchain Institute, London Blockchain Foundation, The Bigger Pie London, Alastria Blockchain Ecosystem, Global Blockchain Convergence London, and others.

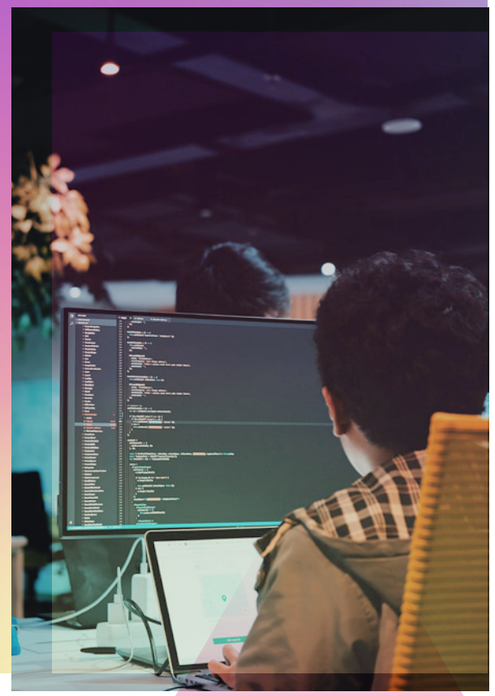
8.4

Developer Working Group

8.4.1
Objective

Chaired by Frank Friel, Director of Architecture, Blockchain Lead at Fidelity Investments, this working group is the meeting place for all technologists, whether an expert or a beginner, who are on a blockchain, digital assets and crypto journey. In a very collaborative way, the group shares best practices and methodologies for this technology. The developers working group is not a talking shop or a place to discuss the latest cryptocurrency prices — it is a focused group, with targeted actions, to help foster and move a community forward.

Blockchain Ireland's Developers working group aims to support Blockchain Ireland's three main objectives, as outlined in section 3.



8.4.2
Opportunity

Nurture talent, and create a network of Irish blockchain developers

1. Produce/collate resources on Blockchain Ireland for developers to assist with their education, training, certification so that they may:
i. Understand how blockchain technology works from a fundamental through to an advanced level
ii. Be enabled to innovate and build new blockchain products
iii. Increase the supply of blockchain developer skills to meet marketplace demand
2. Help arrange or advise on blockchain developer events/meetups so that:
iv. Developers can engage with Blockchain Ireland
v. Developers can network their peers to exchange ideas & collaborate on blockchain

> **'In a very collaborative way, the group shares best practices and methodologies for this technology'**

8.4.3
Recommendations

1. Public Infrastructure: Support developers from academia and startups through to multinational companies, with easy access to blockchain infrastructure so they can learn, explore, and test new innovative products:

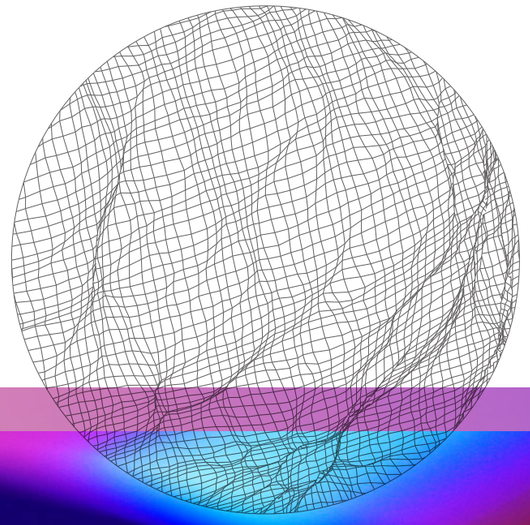
i. Look to join new, or existing innovation hubs within Ireland, providing sandboxes for blockchain development
ii. Provide a service that builds Ireland's reputation in the blockchain ecosystem
iii. Explore the European Blockchain Services Infrastructure (EBSI) and look to participate in the program

2. Technology Committee: Establish a committee of blockchain technologists that can advise on the latest developments within the broad scope of blockchain protocols. The committee could help any team or company understand how they can incorporate the technologies into their products:

iv. Via developers and other working groups, understand who is doing real projects in the blockchain space
v. Build a committee across a diverse range of groups
vi. Set up a process for approach, collaboration and solutioning

3. Use Case Development: Aim to build out a use-case, tackling either an indigenous or a multinational industry within Ireland. Particularly focus on what can set Ireland as an outlier:

vii. Investigate the feasibility and existing work in various industries
viii. Look at building a digital identity system, connecting with EBSI's existing use-case in the space



8.5
Legal and Regulatory Working Group

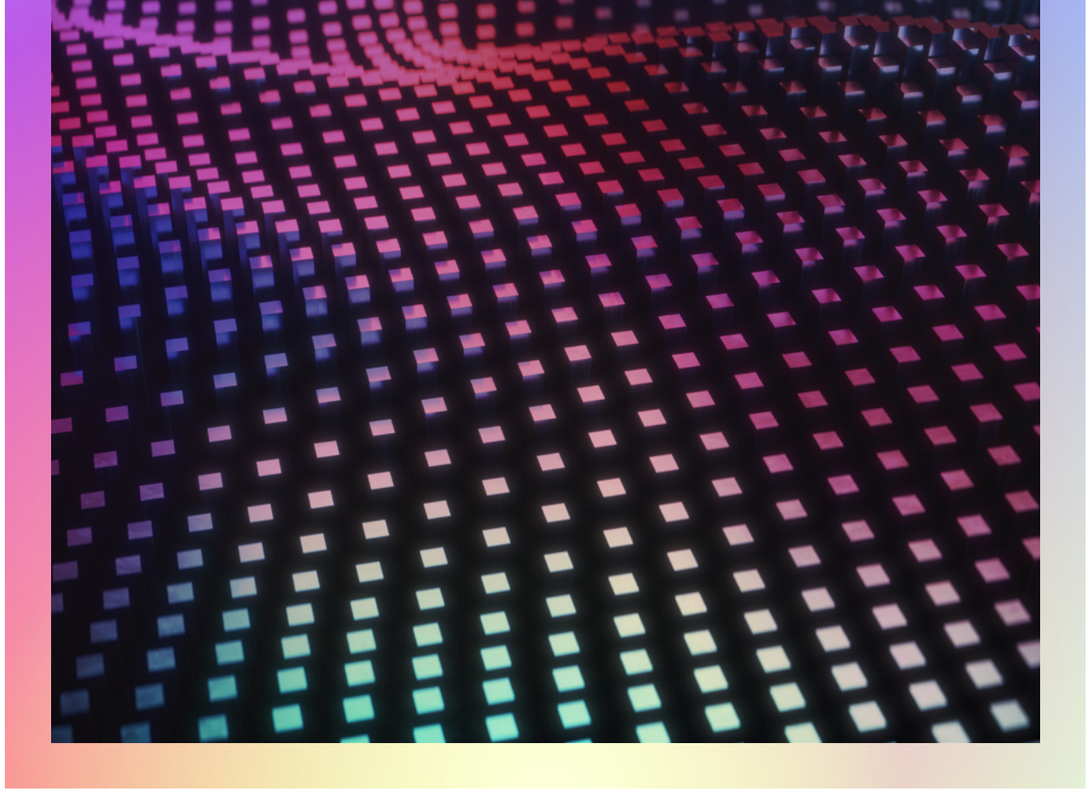
8.5.1
Objectives

Chaired by Pearse Ryan, general counsel of Plandail, this working group meets regularly to discuss, inform, and provide feedback on key areas in the legal and regulatory landscape in Ireland, Europe and globally. The group reviews global trends, and provides insights and best practice examples to the wider cluster.

Blockchain Ireland's Legal and Regulatory Working Group (L&RWG) is a large working group, with in excess of thirty members, including a number of technical advisor members and representatives from agencies holding observer status. The majority of the L&RWG members are legal professionals, both in-house and private practice practitioners, with an increasing number of regulatory practice professionals. The L&RWG invites the chairs of other working groups to attend its meetings, with the Enterprise, and Start-up working group chairs regular attendees at L&RWG meetings.

The L&RWG aims to support Blockchain Ireland's three main objectives, as outlined in Section 3. The L&RWG aims are as follows:

1. To expand knowledge within the L&RWG membership on topics of relevance to legal and regulatory professionals
2. To liaise with other working groups,
3. To review legal and regulatory issues across three main domains (which have been the main topics addressed at L&RWG meetings to date):
4. legal status of smart legal contracts

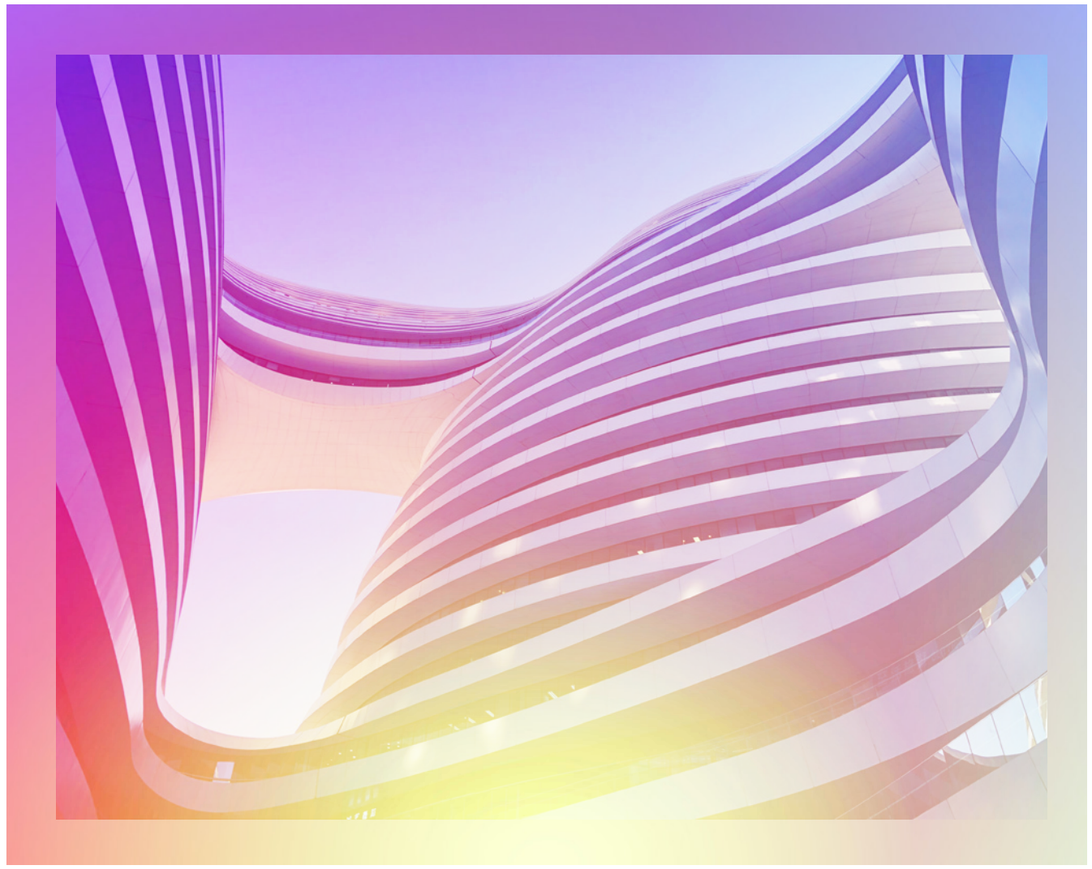


5. issues associated with the intersection of financial services legislation and regulation, together with the legal status of digital assets
6. legal issues associated with the intersection of data protection legislation and both DLT and digital assets
7. Overall, the L&RWG aims to expand the understanding of L&RWG members as to how DLT technology works from a fundamental level, to assist them in their professional practice activities

In pursuance of the above aims, the L&RWG has recently launched a review exercise. The L&RWG has established a sub-group to review the Irish legal status across the three domains mentioned above, namely smart legal contracts, digital/crypto assets and data protection. The sub-review-group (the "review group") is a recent initiative, with the first substantive meeting hosted on 12/11/21.

The review-group has organised its terms of reference, scope of review and working methodologies, following which it has engaged on its substantive review activities.

When its review exercise is complete it will issue its findings, most likely in the form of a report. The review-group has over twenty members, with a mix of private practice lawyers, in-house lawyers and financial services regulatory practitioners. In addition, the review-group has a number of technical experts and observer participants, representing interested public bodies.
The review-group will assess the three in-scope domains and issue objective findings. Reflecting the positions of its participants, it will not advocate for particular legislative change, which is a matter for Government and legislators. The review group is in some regards similar to recent UK initiatives, which have focused on the legal status primarily of smart legal contracts.
The review group is looking at Ireland specific legal issues and is not, for example, looking to engage with areas the subject of current EU legislative initiatives, such as MiCA. Thus, for example, it will work with definitions of what constitutes a crypto-asset derived from MiCA and review how an asset might be treated as a form of property under Irish law (which is a local law topic not dealt with in MiCA).
The review is primarily focused on Ireland specific legal issues which affect the conduct of business based from and applying to Ireland. across the three in-scope domains. The domains are central to conduct of business issues. For example, the review will look at the validity, conclusion, performance and enforcement of smart legal contracts under Irish law, which is a central issue for any DLT base business involving contract arrangements with customers, or enabling arrangements as between on platform counter-parties.
The review is seen as an important component in the provision of improved national law certainty across the three in-scope review domains, recognising the importance of relative legal certainty in the conduct of business.



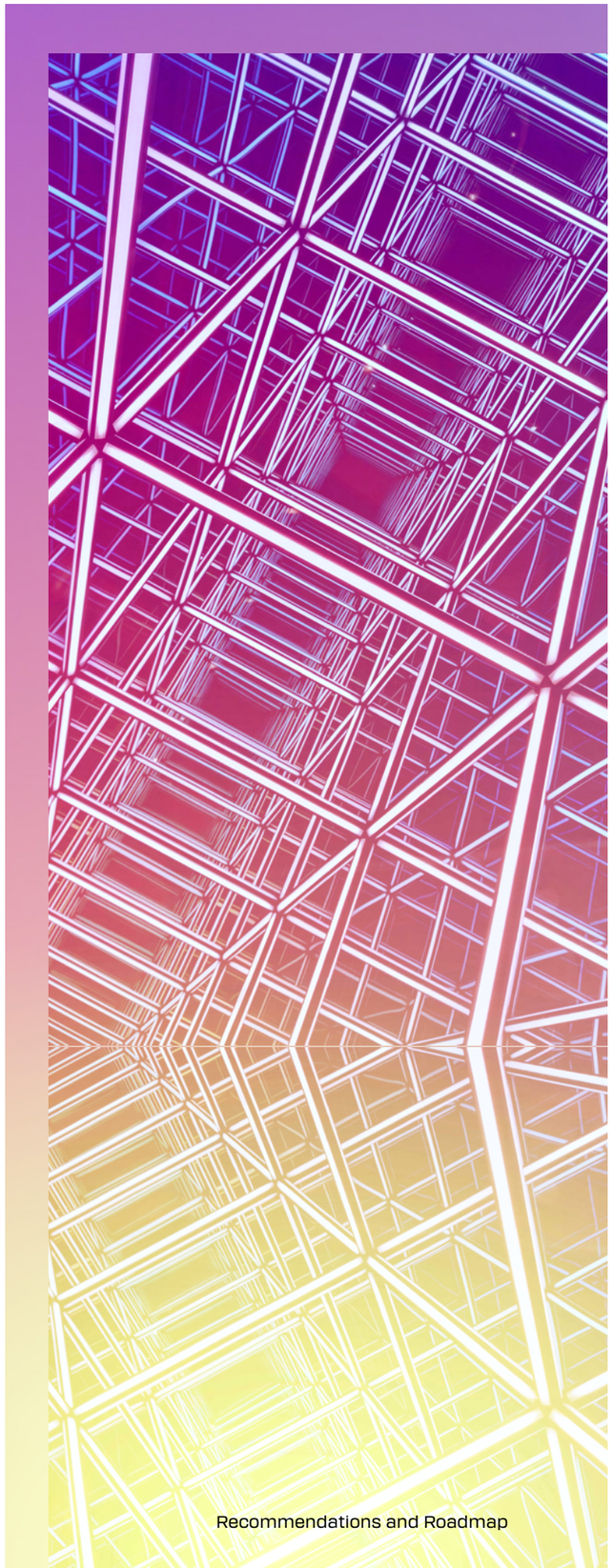
8.5.2
Opportunity

Provide relative legal clarity on Ireland specific issues relating to smart legal contracts, data protection and digital/crypto assets.

'Provide relative legal clarity on Ireland specific issues relating to smart legal contracts, data protection and digital/crypto assets'

8.5.3
Recommendations

1. The review group will review the Ireland legal status of smart legal contracts (to be distinguished from 'smart-contracts'). The review will focus on issues of conclusion, execution and enforceability of smart legal contracts as contracts, together with issues associated with enforcement/dispute resolution of these contracts. The review group is mindful of the work done in this area in the UK by the UK Jurisdictional Taskforce, including subsequent initiatives. Improved legal certainty as to the position of smart legal contracts will encourage commercial activity and delivery of public services over blockchain based applications which include smart legal contracts.
2. The review group will review the Ireland status of issues associated with the intersection of financial services legislation and regulation, together with the legal status of digital/crypto assets. The review group is mindful of EU initiatives in the area of crypto-assets and will focus on Ireland specific issues. In addition, the review group is mindful of the work done in this area in the UK by the UK Jurisdictional Taskforce, including subsequent initiatives.
3. The review group will review the Ireland status of issues associated with the intersection of data protection legislation and both DLT and digital/crypto assets. Again, the review group is mindful of initiatives at EU level in this area and will focus on Ireland specific issues.



8.6
Enterprise Working Group

The enterprise working group is currently led by Jonathan Rafferty, SVP with BNY Mellon.

8.6.1
Objectives

The objective of the Enterprise working group is to bring together MNEs from all industries and sectors to share use cases, identify areas to collaborate on, pinpoint challenges in the adoption of blockchain technology in Ireland.

8.6.2
Opportunity

Provide relative legal clarity on Ireland specific issues relating to smart legal contracts, data protection and digital/ crypto assets.

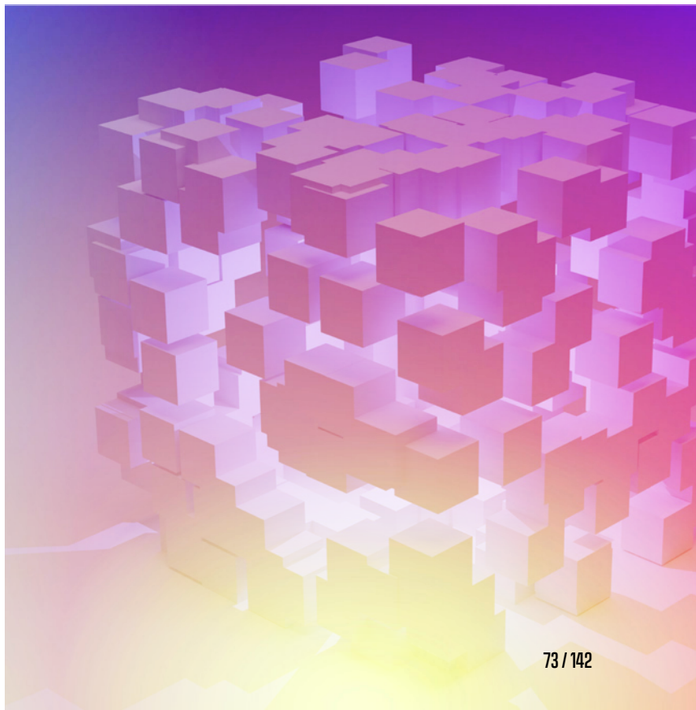
As blockchain technology is a network technology, the main goal of the group is to identify how companies can work together to solve industry problems. For example:

1. **Aircraft Leasing**
   Creating a secure and immutable distributed ledger based platform to enable lessors and airlines share aircraft related data, resulting in reduced time and money to to sell and lease aircraft.
2. **Project Emerald**
   Founded by a consortium of public and private sector companies to advance secure, self-sovereign identity and credential sharing for the island of Ireland. Initially championed by Irish Life, the insurance company, the consortium is growing and includes the Irish Government and a host of blue-chip organisations.
3. **EdQ - Identity**
   Blockchain-based education credentialing platform for financial services. It is the first in the world in production. The platform provides real-time access and an unalterable, trusted store of education qualifications, regulatory and other professional designations, micro credentials and continuing professional development (CPD) records. More than one million data items have been migrated to the new platform.

8.6.3
Recommendations

Group to work together to:

1. Drive industry and cross-industry collaboration to bring national use-case to production
2. Document known industry challenges to the adoption of blockchain and distributed ledger technology and digital assets
3. Create joint thought leadership on the opportunities and challenges blockchain and distributed ledger technology and digital assets provide



8.7

Digital Asset Exchange Working Group

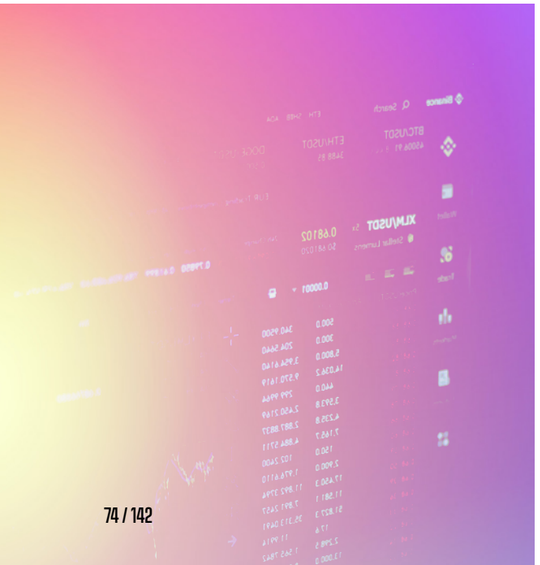
A working group of digital asset exchanges located in Ireland with Global Operations. Contributors of the working group to this submission are: Bitpanda, Coinmama, Crypto.com

8.7.1 Objectives

The objective of the Digital Asset Exchange working group is to bring together digital asset exchanges that are doing business in Ireland in order to work together to address industry challenges and to identify mutually beneficial areas to collaborate on.

8.7.2 Opportunities

1. Make Ireland an attractive country to headquarter group activities for crypto exchanges who operate to the highest standards
2. Become a hub of talent for high tech employment
3. Foster and environment that encourages Innovation, and R&D
4. Create a more crypto-friendly business ecosystem



8.7.3 Recommendations

Make Ireland an attractive country to headquarter group activities for crypto exchanges who operate to the highest standards

- → London became the fintech hub for EMEA from 2010-2020 as an environment that fostered innovation and collaboration amid regulatory clarity. Ireland can achieve such a status with the EU in the Digital Asset industry by fostering close collaboration between stakeholders. Regular communication through working groups promotes dialogue, innovation, regulatory clarity and safeguards the citizens served by a flourishing industry.

- → This Working Group meets on a monthly basis to share good practice in the areas of anti-money laundering, fraud prevention and regulatory compliance to set a benchmark for industry standards to protect and safeguard the interests of the industry and its customers. Ireland can take a global leadership role in the crypto asset industry by empowering entities who are navigating the new world challenges of being regulated for both fiat and crypto assets by issuing clear guidelines and guardrails for all new and existing providers. This will engender trust and confidence with both customers, industry service providers and regulators. We would welcome the opportunity to share our experience with a stakeholder group to embrace this opportunity.

- → Ireland can contribute and lead the harmonization of a regulatory landscape across the EU and globally in the crypto-regulatory landscape, as has been done in the past with the funds / aircraft leasing industries. This would create significant employment both within and servicing the industry as it flourishes. Facilitate a 'trusted environment', engaging with regulators in multiple jurisdictions - sharing best practices globally.

Become a hub of Talent for high tech employment:

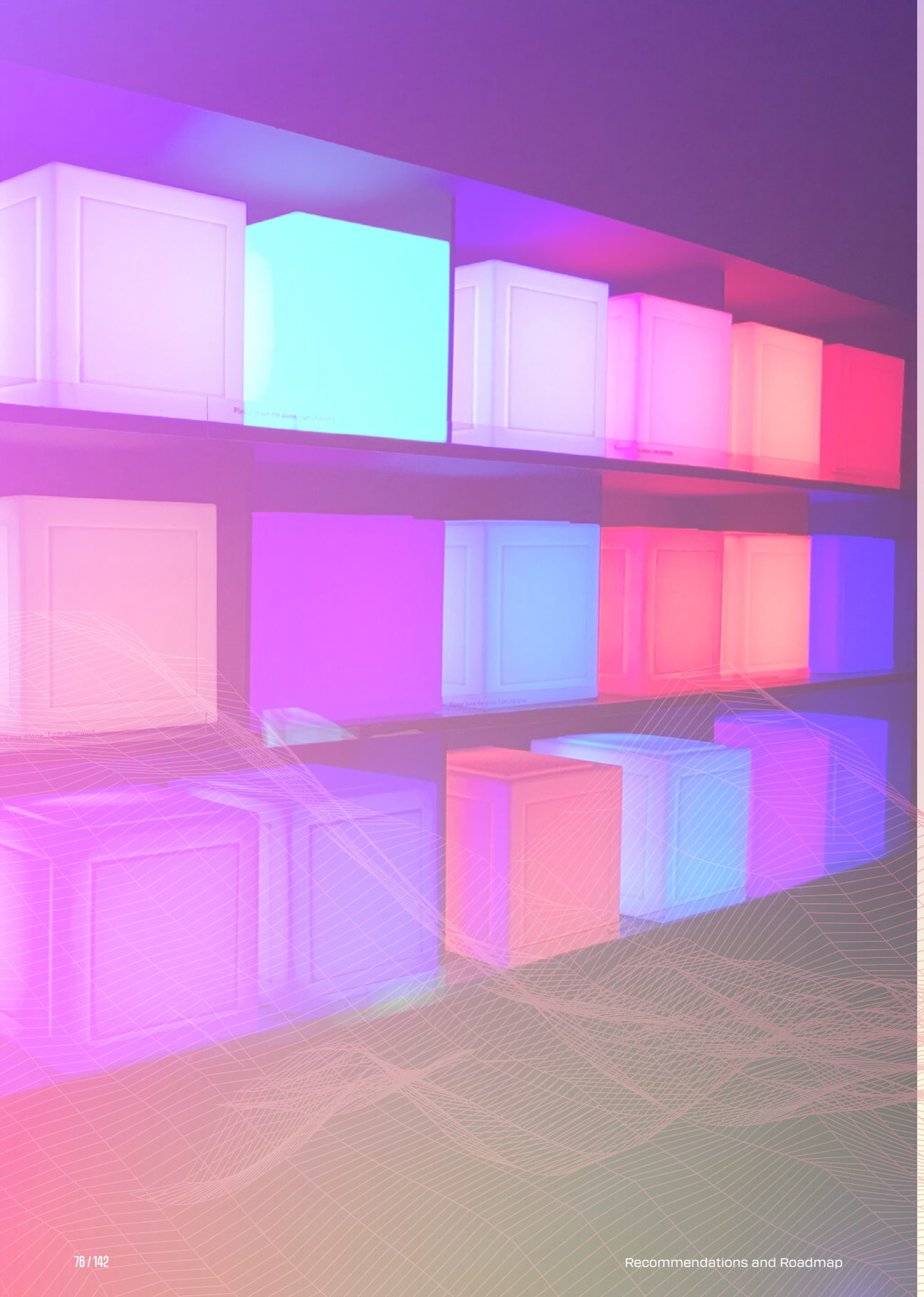
- → The Crypto industry is driving significant job creation. Ireland can service pan-European requirements and our working group has seen a high demand for skilled people here already
- → We support the call of the Education, Skills and Innovation Working Group for upskilling, a skills strategy, and a centre of excellence
- → Talent - Ireland should be attractive for high tech jobs in this sector. We should connect with the tertiary education system to facilitate the development of relevant courses for the industry (including full stack developers, crypto risk management / Blockchain security / crypto compliance including AML / crypto fraud management), and attract new talent to the sector

Foster and environment that encourages Innovation, R&D

- → Technology - Ireland could take a lead by establishing sandboxes such as the UK's FCA digital sandbox for fintech e.g., NFT sandbox, payments sandbox, identity sandbox
- → Establish a favourable environment in the blockchain space with accompanying R&D tax credits that would drive innovation and make Ireland a global leader in the space

Create a more crypto-friendly business ecosystem

- → International communications - Ireland is open for business as a hub for advanced technologies in crypto/web3. While MedTech, funds industry, manufacturing industries receive support and a welcoming environment in both media and government relations, Ireland has not been vocal as a welcoming destination for crypto-native firms.
- → Positive messaging from the regulator, broader Government and related stakeholders would positively improve Ireland's reputation among the crypto community and businesses.
- → Fair and inclusive access to payment services and banking are crucial to the development of industry. Ensuring a level playing field between crypto exchanges and other financial services providers to the payments / banking ('fiat ecosystem') is tantamount to developing the ecosystem. Currently it is difficult for crypto exchanges to open a bank account in Ireland.
- → Payments is an important component of providing utility to everyday consumers and moving the dial on financial inclusion. Facilitating and encouraging acceptance of crypto payments would help accelerate broader adoption of cryptocurrency in Ireland whilst ensuring the fulfilment of promises for broader financial inclusion.
- → Many regulators around the world are proactively exploring how insurance players can work within the cryptocurrency community. We would encourage Ireland to similarly promote a crypto-friendly insurance industry by engaging both crypto players as well as global leaders in insurance.
- → Crypto is more than a solution to banking or financial services. As Ireland takes a leading role in pan-European digital development, a progressive promotion of smart contracts and their utility in everyday life will be essential. We would encourage Ireland to evaluate broader applications of Distributed Ledger Technology (DLT) and the Blockchain to drive efficiency, inclusion, and economic progress both in Ireland and throughout Europe.



8.8
Recommendations Summary

No.	Working Group	Opportunity: What	Recommendation: How
1	**Comms & Events**	Deliver a hybrid Blockchain Ireland Week 2022 event that will be a template for all future events, hosting attendees live, while broadcasting digitally to partner associations globally	→ **Brand:** Further develop the branding for Blockchain Ireland Week, establishing it as the central calendar event for the ecosystem. Build on the success of the 2021 digital event programme with a hybrid format that can be carried on for further delivery. → **Internationally Recognised Conference:** Have Blockchain Ireland Week as an internationally recognised conference and symposium. Cultivate a select list of internationally renowned voices from all aspects of the ecosystem, building on previous success in both annual events and monthly meeting programmes. → **Global Ecosystem:** Blockchain Ireland will use the event week to develop stronger and wider ties with other international associations and groups to enrich the platform. Build upon existing ties, such as being a founding member of the Blockchain Associations Forum, to cooperate and co-invest with other national associations and interest groups to promote international events and initiatives. → **Comms Strategy for Ireland:** Work with Government to create clear messaging outlining Ireland has a vibrant crypto and blockchain ecosystem (industry, government, academia, start-up, regulation) and open for business

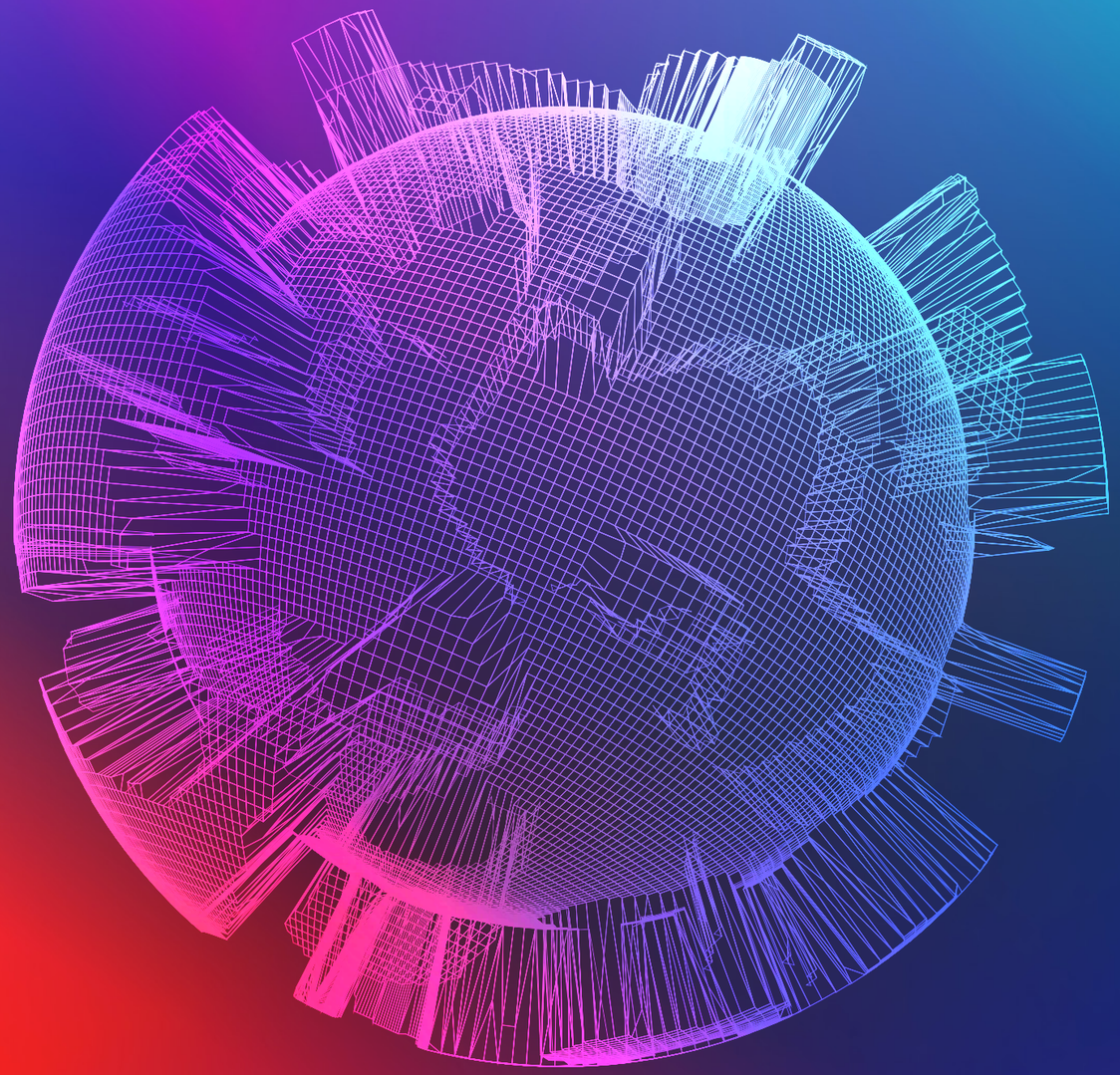
No.	Working Group	Opportunity: What	Recommendation: How
2	**Developer**	Train talent and create a network of Irish blockchain developers	→ **Public Infrastructure:** Support developers from academia and start-ups through to multinational companies, with easy access to blockchain infrastructure so they can learn, explore, and test new innovative products. i. Look to join new or existing innovation hubs within Ireland, providing sandboxes for blockchain development ii. Provide a service that builds Ireland's reputation in the blockchain ecosystem iii. Explore the European Blockchain Services Infrastructure (EBSI) and look to participate in the program → **Technology Committee:** Establish a committee of blockchain technologists that can advise on the latest developments within the broad scope of blockchain protocols. The committee could help any team or company understand how they can incorporate the technologies into their products. iv. Via the developers and other working groups, understand who is doing real projects in the blockchain space v. Build a committee across a diverse range of groups vi. Set up a process for approach, collaboration and solutioning → **Use Case Development:** Aim to build out on a use case, tackling either an indigenous or a multinational industry within Ireland. Particularly focus on what can set Ireland as an outlier. vii. Investigate the feasibility and existing work in various industries viii. Look at building a digital identity system, perhaps hooking in with EBSI's existing use case in the space

No.	Working Group	Opportunity: What	Recommendation: How
3	**Education, Skills, & Innovation**	Development platforms for blockchain skills	→ **Build blockchain skills development through a multi-institutional collaborative centre of excellence (CoE)** i. The Working Group supports the current European and National policy initiatives. Within this context we suggest a multi-stakeholder approach to the development of the emerging technology of which Blockchain is a critical component. See diagram - the quadruple helix which lists all the activities to create such an Ecosystem. ii. To create such an ecosystem the creation of a Multi-Institutional Collaborative Centre of Excellence is suggested. This Multi-Institutional Centre of Excellence will bring together all the key parts of the Blockchain ecosystem in an efficient and innovative way. In particular this Multi-Institutional Collaborative Centre of Excellence will drive the promotion of skills and talent in this area. → **Create a Blockchain Skills Strategy and Roadmap** iii. The EU CHAISE Project, the UK/ Ireland Blockchain Skills Project, the Untangled Project, the Ireland for Finance Pillar and the National Digital Strategy all provide the context for the development of a national Blockchain Skills Strategy informed by existing strategies such as the National AI Strategy. The Blockchain Sector in Ireland is challenged by a talent shortage, global competitive pressures, the mismatch between education training and the market and the responsiveness of formal education and training to workplace requirements under the remit of DFHERIS. iv. Encourage HE Institutions and training organisations to take a coordinated approach to the delivery of Blockchain education and training informed by the ESRI forecasting model 2021-2025 . These programmes will be based on the research that shows there needs to be three elements to these programmes: technical skills, business skills and transversal skills. Micro-credentials are seen by industry and academia as a way to address flexibility and delivery of programmes and investment in their development is critical (DFHERIS:HEA :Skillnet Ireland). Education and training bodies will benefit from using the International Association of Trusted Blockchain Applications Framework for developing programmes. v. A more diverse involvement in stem / emerging technologies including Blockchain continues to need more focus. We suggest that an innovative expert Group be established to build on previous work and develop an action plan to increase more active participation among women and other groups that are not represented (DFHERIS, DETE, DEd, DCEDIY).

No.	Working Group	Opportunity: What	Recommendation: How
3	**Education, Skills, & Innovation**	Development platforms for blockchain skills	→ **Create Public Trust in Blockchain - create awareness around Blockchain's impact for good on the economy and society -a source for social good in Ireland** i. We suggest that, as with the AI Strategy, there should be a plan developed to involve and inform employers, employees, young people and their parents and civil society. We recommend open conversation with parents, young people, civil society and all relevant stakeholders. This would include groups such as: National Parents Council , Comhairle na Nog, DCYA, Civil Society, The Wheel, NALA, BlockW, Media, Public Servants, and all other relevant industry sectors.
4	**Enterprise**		→ **Drive industry and cross-industry collaboration to bring national use cases to production** → **Document known industry challenges to the adoption of blockchain and distributed ledger technology and digital assets** → **Create joint thought leadership on the opportunities and challenges blockchain and distributed ledger technology and digital assets provide.**
5	**Legal & Regulatory**	**The working group has established a review group - the review group mandate is to review the Ireland legal and regulatory position across smart legal contracts, digital/ crypto assets and data protection**	1. **Smart Contracts:** The review group will review the Ireland legal status of smart legal contracts (to be distinguished from smart contracts). The review will focus on issues of conclusion, execution and enforceability of smart legal contracts as contracts, together with issues associated with enforcement/dispute resolution of these contracts. The mini-review-group is mindful of the work done in this area in the UK by the UK Jurisdictional Taskforce, including subsequent initiatives. Improved legal certainty as to the position of smart legal contracts will encourage commercial activity and delivery of public services over blockchain based applications which include smart legal contracts. 2. **Digital Assets:** The review group will review the Ireland status of issues associated with the intersection of financial services legislation and regulation, together with the Ireland legal status of digital/crypto assets. The review group is mindful of EU initiatives in the area of crypto-assets and will focus on Ireland specific issues. In addition, the review group is mindful of the work done in this area in the UK by the UK Jurisdictional Taskforce, including subsequent initiatives. 3. **Data Protection:** The review group will review the Ireland status of issues associated with the intersection of data protection legislation and both DLT and digital/crypto assets. The review group is mindful of initiatives at EU level in this area and will focus on Ireland specific issues.

No.	Working Group	Opportunity: What	Recommendation: How
6	**Startup & Ecosystem**	Enable the creation of a vibrant blockchain, digital asset and crypto startup ecosystem	1. **Visibility:** Support emerging Irish blockchain, digital asset and crypto businesses, making them 'visible' to the Irish and international blockchain and DLT interested parties and stakeholders. 2. **Network, Mentoring & Funding:** Provide network, mentoring and financial support for emerging DLT entrepreneurs. 3. **Sharing Content:** Utilise virtual resources, including YouTube, LinkedIn and other social channels to disseminate content widely and asynchronously. 4. **Skills:** Link with digital skills providers to certify emerging skills in blockchain and decentral business. 5. **Placements:** Develop work-based placements to certify participation in real-world implementation and practice accelerating career opportunities for individuals, and accelerating knowledge and experience in the available talent pool for industry. 6. **Use Blockchain:** Utilise the capabilities of the blockchain itself to deliver autonomous and asynchronous services; verifiable credentials for DLT mentors, SSI-based skills, experience and reputation scores for those looking to make a career in DLT, NFTs that relate to IP and authorship status in industrial design, visual communications and arts practises. This could be built on the EdQ platform created by the Institute of Banking, Deloitte, Bank of Ireland, Ulster Bank and AIB. 7. **Sandbox:** Establish a compliant multi-sector approach to providing sandbox and testbed environments to iterate proof of concepts, test implementations, and trial scaling propositions. 8. **EBSI:** Take steps to access EBSI node infrastructure and participate in the EU early adopters program. 9. **Innovate:** Grapple with the complex implications of the future digital marketplace and the role of decentralised systems and business for Irish society. Use applied, multi-stakeholder approaches to de-risk exclusion from emerging sectors.

CHAPTER 9
CONCLUSIONS



Ireland is in the enviable position of possessing all the necessary components to become a globally recognised blockchain, crypto and digital assets hub.

What is needed next is:

i. An overarching strategy to bring it all together
ii. A phased plan to make it clear what needs to be done and when
iii. Funding and resources to quickly make it a reality

Using a Silicon Valley framework, Ireland has a blockchain, crypto, and Web3 flywheel. We have done the hard work to create an Ireland blockchain, crypto and Web3 flywheel. The focus must be now on how we all work together to get it moving smoother and faster.

Ireland Blockchain, Crypto & Web 3 Flywheel

Government

- Department of Finance
  › Ireland for Finance
- IDA Ireland
- Enterprise Ireland
- Department of Public Expenditure and Reform

Ecosystem

- Blockchain, crypto, Web3
- Fintech
- Big Tech
- Supply Chain

Talent & Skills

- Large and growing talent pool
- MSc, Blockchain
- Dedicated crpto certificates

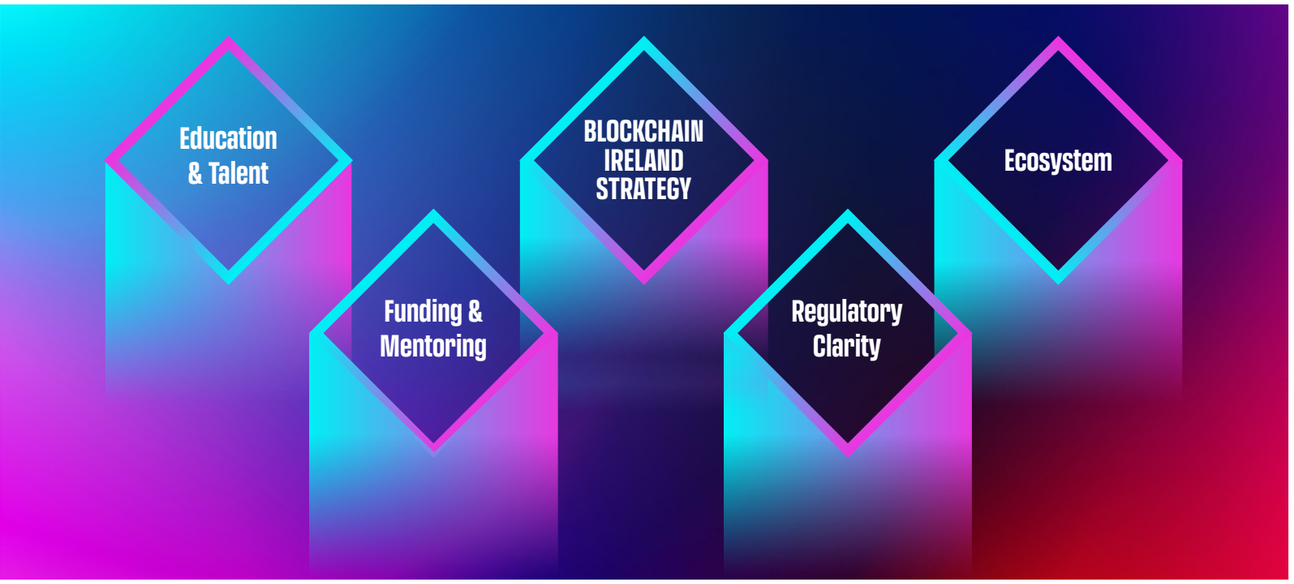
Regulation

- VASP
- AMLDV
- QIAF
- MiCA

In this paper we:

1. Analysed where Ireland is currently positioned relative to our peers
2. Identified gaps, themes and opportunities to investigate further
3. Shared the voice of our community members through our working groups
4. Put forward a clear set of actionable recommendations to work with Government in order to establish Ireland a globally recognised blockchain, crypto and digital asset hub

Through our analysis, we identified the following core themes for Ireland to become a globally recognised blockchain, crypto and digital assets hub:



9.1
Education and Skills

A multi-institutional collaborative centre of excellence in Blockchain DLT will foster and develop education, skills and talent that will facilitate the development of an international Blockchain Hub in Ireland.

9.2
Funding, Mentoring &Tax

9.2.1
Funding

With the establishment of welcome enterprise and innovation initiatives, including the new €90 million Irish Innovation Seed Fund Programme from Enterprise Ireland, IDA and Government Departments, additional resources are now required to upskill and enhance expert-level review capabilities in decision-making and point of selection areas. This is not only important from a blockchain, DLT and Web3 point of view, but from the perspective of the emerging and convergence technology and transformation contexts across elements such as 5G, IoT/ Edge, Cloud and serverless infrastructure, Cybersecurity, Quantum-readiness, AI and Machine Learning capabilities.

9.2.2
Mentoring

Emerging DLT entrepreneurs and innovators need networking, mentoring and financial support to participate in national and EU-level innovation events, hubs and clusters. Providing access to, and awareness of, available resources is key.

Inclusion, equality and diversity measures are frequently named contexts in mentoring and other supports. It is well known that doing the same things, in the same ways, cannot deliver the necessary outcomes in terms of business and culture transformation. It is important that impact-driven decisions are made that foster and fund emerging business and technical talents in the Irish technology innovation scene.

9.2.3
Tax

Tax is a critical area for Ireland to get right when it comes to blockchain, crypto and Web3. In Ireland, you must pay 33% Capital Gain Tax (CGT) when you dispose of any crypto asset. You have disposed of an asset when you have:

- → Sold it
- → Gifted it
- → Exchanged it
- → Got compensation or insurance for it

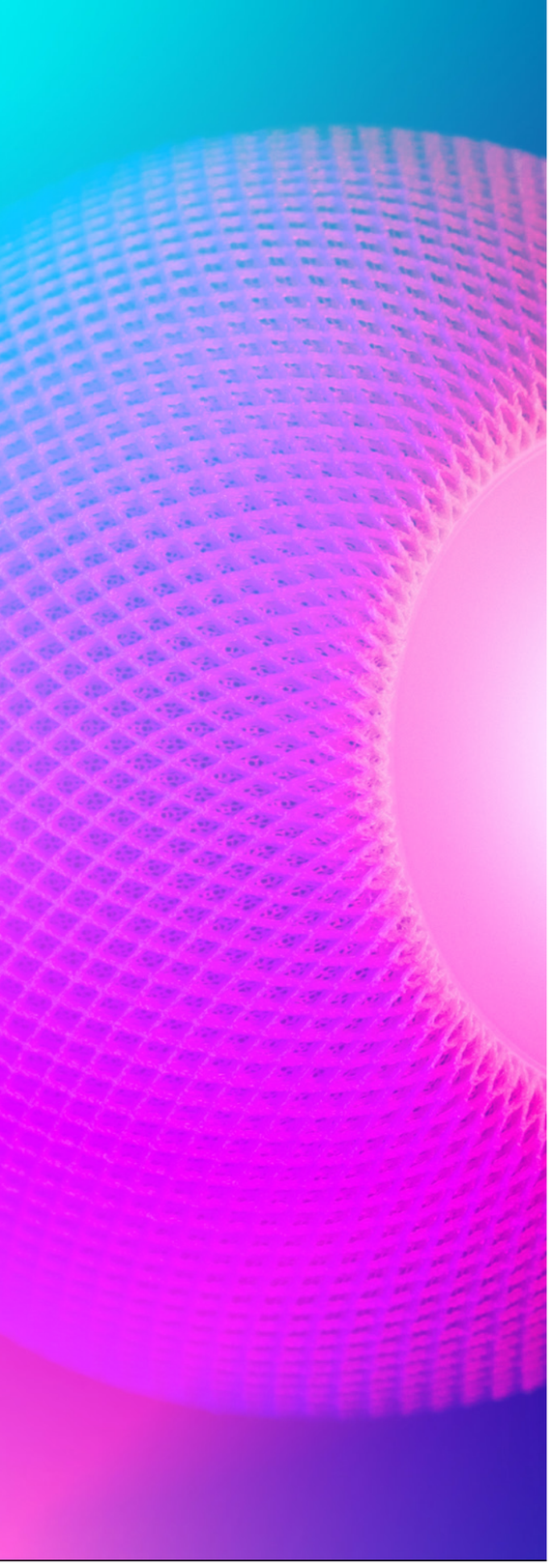
To be clear, any crypto gain when you dispose of an asset is a taxable event. This includes DeFi, staking and stablecoin related activities. This approach is quite different to the likes of Portugal, Germany and the UK

- → In Portugal, there is 0% CGT on crypto, although this looks set to change. There are now a number of Irish companies based in Portugal due to this, and a strong crypto ecosystem is forming due to this.
- → In Germany, cryptocurrencies can be sold tax free after one year of possession, even if they're used for staking.
- → In the UK The Treasury is pressing ahead with plans to legalise cryptocurrencies known as “stablecoins” as a form of payment in Britain

What this means for Ireland, is that individuals and companies are being incentivised to be based and set up companies in other countries in Europe with more favourable tax environments.

9.3
Regulatory Clarity

The European Commission has issued a call for a blockchain sandbox operator, via EBSI and EU Blockchain Partnership framework (Cointelegraph, 2022). Such sandboxes or testbed environments are necessary to effectively iterate Web3 proof of concepts, test implementations, and trial scaling propositions, especially where data regulation compliance is a known constraint, in order to model business use patterns and design new business processes eg. regulatory sandboxes for energy data, mobility data and traffic modelling, health planning and mirror populations, as well as for decentralised finance and new digital asset and wealth management contexts.



9.4
Ecosystem

The need for sustainability within innovation ecosystems is recognised. Blockchain Ireland has a thriving community of leading Web3 innovators, and in order to accelerate the benefits and opportunities for this community, investment is required. The potential benefits of such investment include: accelerated growth in Web3 businesses, flourishing of Web3 innovation, talent, and the exponential access to global knowledge and investment networks through network effects.

The Blockchain Ireland Startups innovation ecosystem operates from a Living Lab open innovation model, known to successfully accelerate knowledge and capacity across multi-stakeholder communities. This approach seeks to demystify, raise awareness and foster collaboration pathways for members and other stakeholders, including public administration.
In the context of low acceptance, poor adoption and risk aversion toward blockchain and DLT by public sector administrations, even in the most pressing and urgent innovation domains, including those of circular and cascading bioeconomies[24] (Rejeb et al, 2022) any startup ecosystem must strive to remain industry-lead, independent, and agile in the face of inertia. The provisioning and potential cooperation between public and private sector in a sandbox co-creation environment affords sufficient separation for public sector bodies, without compromising access to learnings, benefits and ability to take advantage of emerging opportunities.

> **'Blockchain Ireland has a thriving community of leading Web3 innovators, and in order to accelerate the benefits and opportunities for this community, investment is required'**

[23]Barriers to Blockchain Adoption in the Circular Economy: A 1
Fuzzy Delphi and Best-Worst Approach 2
Abderahman Rejeb 1,*, Karim Rejeb 2, John G. Keogh 3 and Suhaiza Zailani 4
[24](Rejeb et al, 2022)

9.5
Closing Thoughts

Based on the points outlined above, we would like the Government to action the following elements:

Task Force

→ Form a dedicated task force with Blockchain Ireland, to rapidly build upon this paper and co-develop an integrated strategy to swiftly seize the opportunity blockchain, crypto and Web3 provide

The rationale for the Department of Enterprise Trade and Employment to lead the task force is based on DETE housing / owning:
Minister of State for Trade Promotion, Digital and Company Regulation, Robert Troy
The National Digital Strategy
IDA Ireland relationship
AI Strategy for Ireland
Enterprise Digital Advisory Forum
Digital Services Act
Digital Markets Act
Digital Economy and Society Index

Resourcing

→ The task force is to be made up of Government representatives across Department of Finance, Department of Public Expenditure and Reform, Department of Further and Higher Education, Research Innovation and Science, and Blockchain Ireland

→ If we look at the Central Bank of Ireland's recent Innovation Hub Report for 2021, 39% of all enquiries were digital asset related, continuing a growth trend observed since 2019

→ Following the approach of the New York department of Financial Services (NYDFS), more resources are being allocated to speed up the provision of BitLicense. We feel the same should be done in Ireland with more resource to be allocated to:

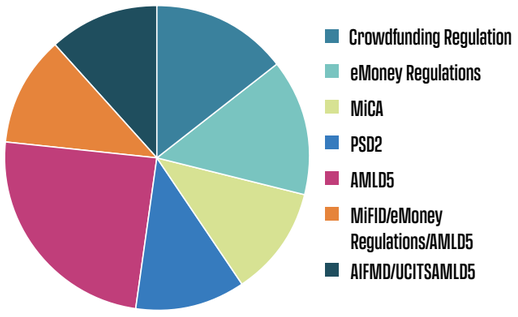
The Central Bank of Ireland's (CBI) Electronic Money Institution (EMI) licence review and approval team to avoid losing out on companies setting up in Ireland due to lengthy review and approval processes

The Central Bank of Ireland's (CBI) Virtual Asset Service Provider (VASP) review and approval team to avoid losing out on companies setting up in Ireland due to lengthy review and approval processes

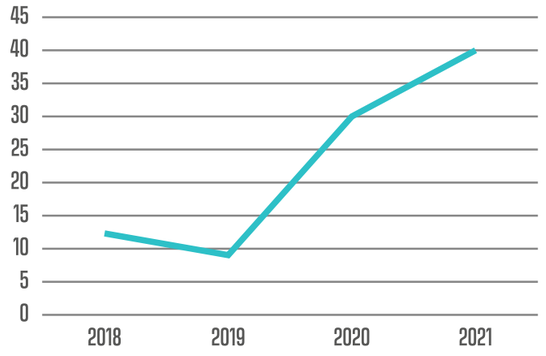
The Central Bank of Ireland's Innovation Hub (but hopefully the progression of the Innovation Hub to a Regulatory Sandbox)

→ A clear set of timeframes for how long application processes will take, similar to the process BaFin in Germany have established, and the FCA in the U.K.

% overall enquiries digital assets related



Digital Assets: the continued growth of institutional intest and an increse in DFi and tokenisation enquiries



The benefit of clear and transparent processes enables applicants to understand and plan, but also a functioning portal enables the applicant to understand where they are in the process at any given moment, what the next step is, who the proverbial ball is with

Funding

→ As Blockchain Ireland is a voluntary based initiative, we are seeking Government funding to hire a full-time individual to manage the day-to-day activities of Blockchain Ireland, and be the dedicated liaison between Government, Government backed entities, and Blockchain Ireland

National Digital Strategy & Enterprise Digital Advisory Forum

→ Ensure blockchain, crypto and Web3 is included as a core component of the Irish National Digital Strategy, and in addition to AI, ensure there is a representative from Blockchain Ireland in the Enterprise Digital Advisory Forum

Ecosystem Infrastructure

→ As previously stated in section 8.7.3, a critical component to enable the ecosystem is for blockchain, crypto and Web3 startups to be able to set up bank accounts to run payroll, receive loans and basic banking facilities.

Communications

→ Despite the great work by Government, industry, academia, and the startup ecosystem, Ireland is currently not seen as a friendly blockchain, crypto and Web 3 location. A communications plan is needed to demonstrate a cohesive narrative addressing the following:

Ecosystem

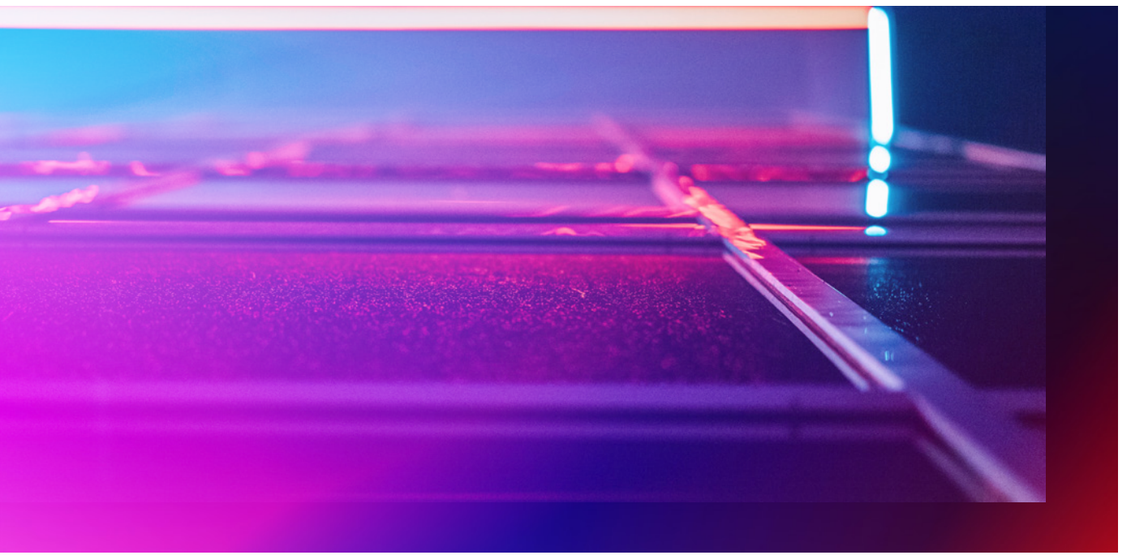
→ Seven out of the top ten global crypto exchanges have their European headquarters in Ireland

→ The blockchain, crypto and Web3 ecosystem in Ireland has been flourishing since 2015

→ The blockchain, crypto and Web3 ecosystem continues to evolve and has proved resilient

→ The number of blockchain, crypto and Web3 start-ups is at an all-time high, and is set to increase

→ The broader tech and fintech ecosystem has never been so strong. With a mix of global banks, fintechs and large tech companies continuing to invest in Ireland, and more specifically invest in blockchain, crypto and Web3 (e.g. Stripe, BNY Mellon, Meta), this broader ecosystem is feeding into, and accelerating the pace of adoption and innovation in the blockchain, crypto and Web space in Ireland



Regulation

→ Ireland has a strong and respected regulatory environment

→ Ireland has clear regulation for all entities working in the blockchain, crypto and Web3 space through the Virtual Asset Service Provider (VASP) regulation

→ The Central Bank of Ireland (CBI) have approved in principle a Qualifying Investor Alternative Investment Fund (QIAIF') with a low level of exposure to cash settled Bitcoin futures traded on the CME

Talent

→ Ireland continues to be selected as a destination of choice for blockchain, crypto and Web3 companies due to the existing and growing talent pool that exists here

Skills

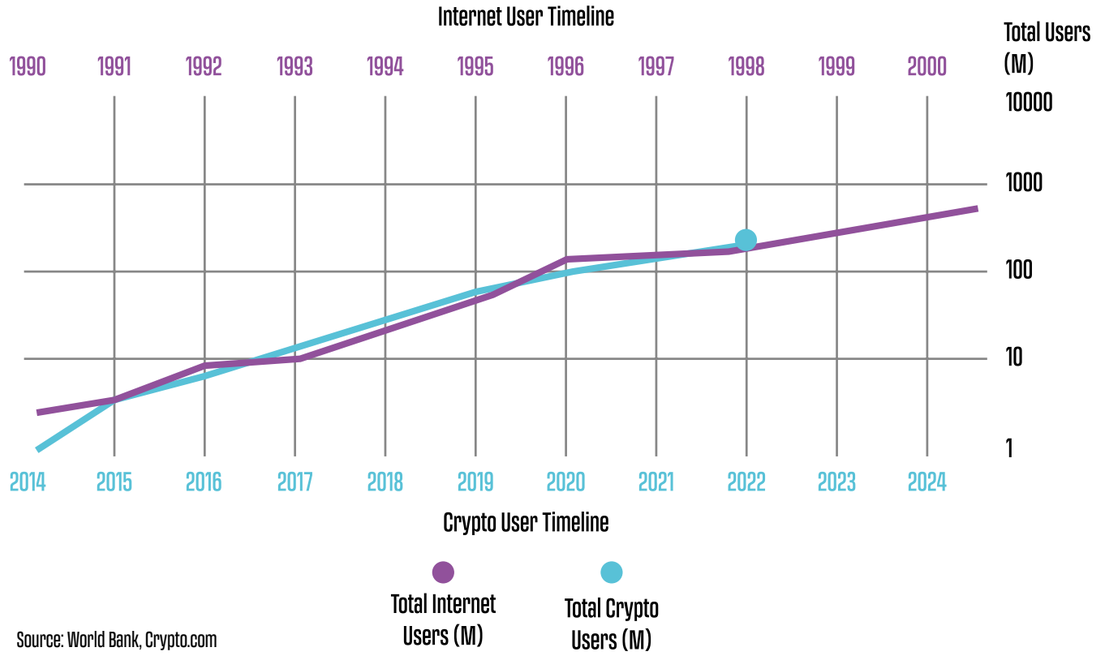
→ Skills being developed at all levels through dedicated programmes, like the MSc. in Blockchain in Dublin City University, dedicated hands-on certificates on crypto and Web3crypto and Web space in Ireland

We Are Still Early

→ If the crypto adoption trend below holds true, it's predicted that there will be 1 billion crypto users by 2026/27. That's a 5x increase from current estimates of around 200 million crypto users

→ Based on LinkedIn and market data trends, the number of open roles for blockchain, crypto and Web3 will exceed AI roles by the end of the year. The Irish Government published a National AI Strategy in 2021 which sets out how Ireland can be an international leader in using AI to benefit the economy and society, through a people-centred, ethical approach to its development, adoption and use. In a similar vein, we strongly believe and implore the Irish Government to develop a blockchain, crypto and Web3 strategy.

Internet vs. Crypto Adoption



Source: World Bank, Crypto.com

We are at a similar stage to where Ireland was in the early 2000s, in relation to the Internet and Internet adoption. We now have a **unique opportunity** to drive forward and become a true global blockchain, crypto and Web 3 hub.

See you back here for the 2023 edition.

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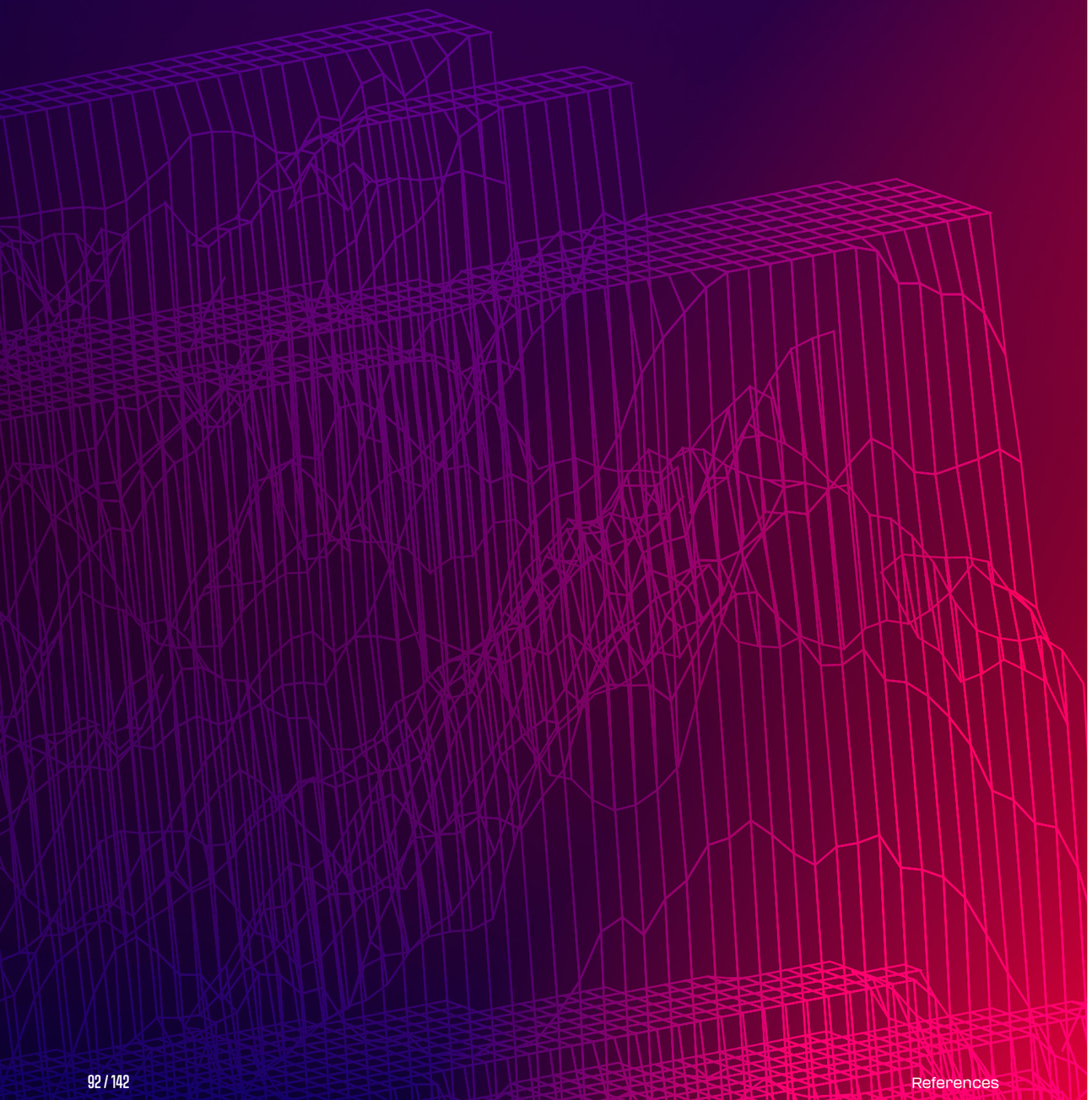
References



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Apendix

Appendix A - Blockchain Ireland WG6: Education, Skills, and Innovation Working Group

Terms of Reference

1. Group Chair: Prof. Joyce O'Connor

2. Group Overview: WG6: Education, Skills, and Innovation Working Group is part of Blockchain Ireland and will align its strategic deliverables in accordance with the direction given by the Blockchain Ireland Steering Group. This WG will support and actively participate in cross WG initiatives under the Blockchain Ireland remit.

   This Working Group is focused on education, training, blockchain skills needs and competency gaps that must be addressed. The group is also focused on creating awareness and literacy level programs and the leadership skills required to understand the impact that blockchain technologies can have for an organisation. A proposal to develop a Blockchain Centre of Excellence with Industry, Research Centres, Educational Institutions and Citizens is being developed. This Working Group consists of individuals from large industry, SMEs and academia.

3. Term: This Terms of Reference is effective from (24/09/2021) and will be ongoing until terminated by agreement between the parties.

i. Membership: This Working Group comprises of:
   Prof. Joyce O'Conor, Chair
   Dr. Trevor Clohessey, GMIT, Secretary
   Dr. Susan Rea, MTU
   Ms. Carmel Somers, ICT Skillnet
   Mr. Dave Feenan, ICT Skillnet
   Ms. Sorcha Mulligan, SME Chain
   Mr. Jonas Pfannschmidt, Blockdaemon
   Mr. John Hogan, Leman Solicitors
   Mr. David Roche, ex. Tata Consulting Services
   Mr. Gavin Fitzgerald, Leman Solicitors joined the working group in February 2022

ii. Group Objectives
   Development of a Blockchain Education Framework, based on the International Association of Trusted Blockchain Applications (INATBA) framework - Blockchain Education: A Prerequisite for Socio-Economic and Technological Advancement, targeting:
   - Awareness programs
   - Literacy programs
   - Business leadership programs
   - Role of microcredentials
   - Education & skills gap analysis

   Disruptive technology convergence
   Implications/role of technology regulation "regtech" on Blockchain Education & Skills
   A proposal to develop a multi-institutional collaborative Blockchain Centre of Excellence with Industry, Research Centres, Educational Institutions and Citizens is being developed

The membership of this Working Group will commit to:
Attending scheduled Working Group meetings where possible
Sharing communications and information across all Blockchain Ireland executive committee and Working Groups

4. Meetings
   - All meetings will be chaired by Prof. Joyce O'Connor with Dr. Trevor Clohessy in the role of Group Secretary
   - Decisions are made by consensus (i.e. members are satisfied with the decision even though it may not be their first choice). If not possible, the Working Group chair makes final decision

   Meeting agendas minutes will be provided, this includes:
   - Preparing agendas and supporting papers
   - Preparing meeting notes and information.

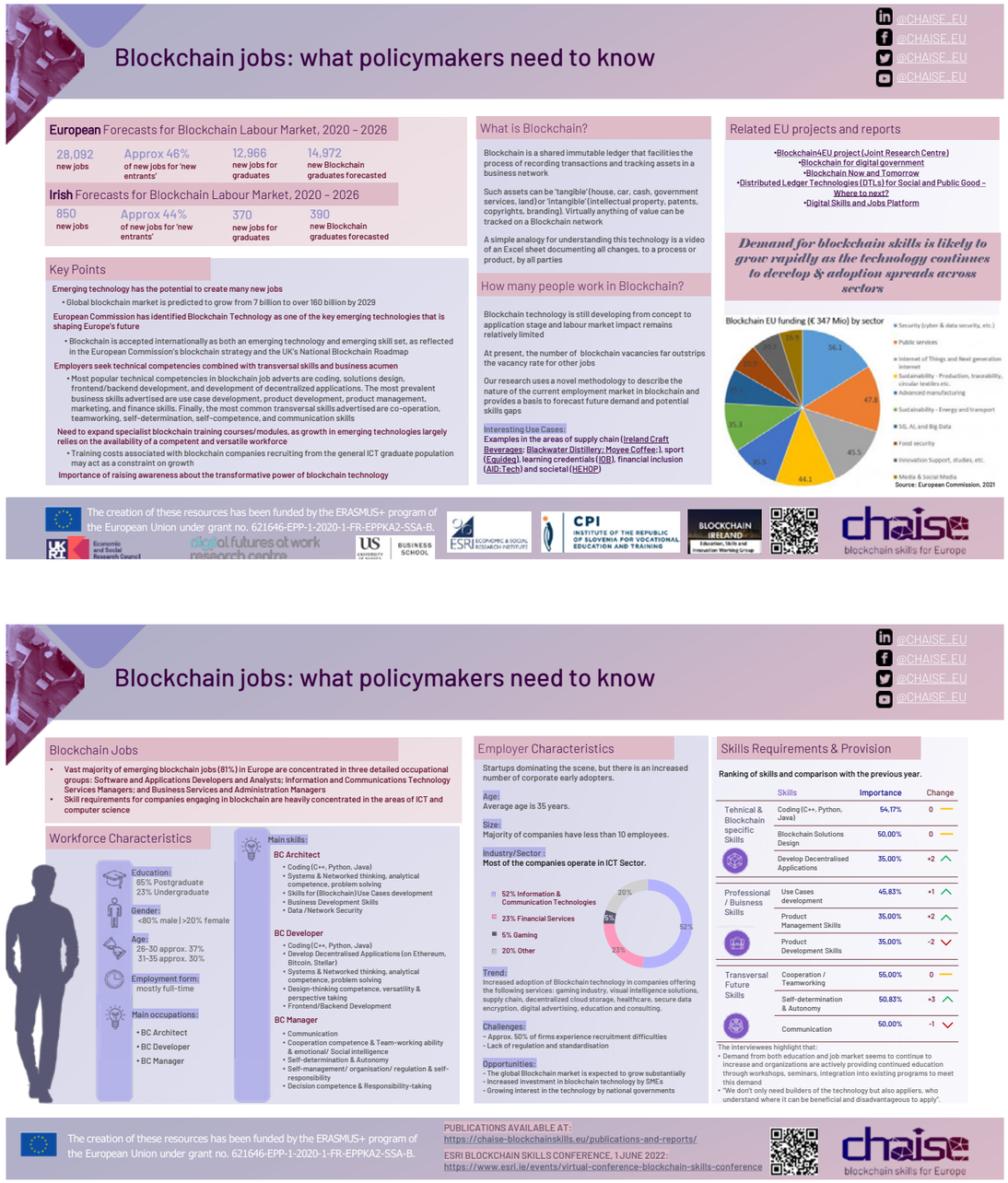
   Meetings will be held monthly via teleconference, face-2-face or via a hybrid model for 1 hour
   If required subgroup meetings will be arranged outside of these times at a time convenient to subgroup members.

5. Conflict of Interest
   Group members are requested to identify any potential conflicts of interest; these include financial and non-financial interests and relationships, direct employment with a private sector entity (whether full or part-time), and service on private sector and non-profit Boards and advisory panels, whether paid or unpaid. Members should also disclose any conflict of interest that may have influenced the work of this group, including but not limited to academic or business interests and rivalries, and any personal, religious or political convictions relevant to the Group's work.

6. Acknowledgement
   When appropriate the work of this group should be duly acknowledged, identify, where appropriate, the input the group provided including but not limited to intellectual assistance, and technical help.

7. Amendment, Modification or Variation
   These Terms of Reference may be amended, varied or modified in writing after consultation and agreement by the Working Group members.

Appendix A - Blockchain Jobs



Appendix B -
EU CHAISE Research Summary by Dr Adele Whelan, Snr Research Officer ESRI

The Economic and Social Research Institute (ESRI) joined the CHAISE consortium in November 2019 to "design Europe's strategy for blockchain skills". The consortium is led by the Université Claude Bernard Lyon 1 (UCBL) and consists of European and global leaders in blockchain and DLTs, including academic and industry partners, and sectoral organisations and communities. This four-year project will develop a certified training programme for blockchain and DLTs, and the first-ever "blockchain specialist" occupational profile. The CHAISE project is tasked by the European Commission to develop a new skills development strategy to address the lack of talent in blockchain and distributed ledger technologies (DLTs) across Europe. The ESRI has liaised with Blockchain Ireland's Working Group for Education, Skills and Innovation in order to collect national information on blockchain skills development as part of the CHAISE project. For more information on the project, please see https://chaise-blockchainskills.eu/.

Since the launch of the project there have been four significant publications to date: (i) Study on blockchain labour market characteristics (INATBA, 2021); (ii) Study on blockchain skill demand (Whelan et al., 2021); (iii) Study on blockchain skill supply (University of Ljubljana, 2021); and (iv) Study on skills mismatches in the blockchain sector (Brunner and Ehlers, 2021). The first publication by INATBA (2021) was an initial scoping exercise and reports that although the European blockchain sector is well placed on acquiring global leadership, its future development and competitiveness largely relies on the availability of a competent and versatile workforce. The findings from the initial research suggests that as demand for blockchain skills is steadily increasing, employers face a shortfall of skilled professionals. The second report by Whelan et al. (2021) provides unique insights in the demand for blockchain skills within Europe. The research begins by providing some much-needed detail on both the structure and form of blockchain skill demand. Results from a large European online survey and in-depth interviews revealed that the most blockchain intensive industries are ICT, financial services and education. In terms of the firms that recruit blockchain talent, evidence from online job adverts indicated that almost three-quarters of recruiters were blockchain service providers. With respect to occupational profile, recruitment appears to be most concentrated within developer and engineering roles. Employees in the blockchain sector are typically young, with an average age of under 35, with possession of a postgraduate qualification also typical. Nevertheless, there is evidence from the online job advertisement data and in-depth interviews that employers do not tend to focus entirely on academic qualifications when hiring blockchain professionals. Over 40 percent of job adverts did not specify a minimum educational requirement or, alternatively, stated that no formal degree was required. This suggests that currently for a large proportion of blockchain employers, the possession of specific professional skills and/or labour market experience is of much higher importance than academic credentials. Over a third of new jobs appear to be open to new, or inexperienced, labour market entrants with either no, or up to 3 years' experience; rising to 52 percent when we also consider the proportion of job adverts with no stated experience requirements.

The initial analysis of the job advert data and in-depth interviews indicated that employers routinely sought technical competencies combined with transversal skills and business acumen. The most popular technical competencies in blockchain job adverts are "coding", "engineering", "frontend", "backend" and "design". The most popular business skills in blockchain job adverts are "management", "marketing", "finance", "product development", and "design". The most popular transversal skills in blockchain job adverts are "self-competence", and "co-operation", "responsibility", "product teamwork", and "communication". A significant proportion of job adverts (42 percent) contained at least one of the most commonly requested technical, business and transversal competencies. Finally, there is further evidence of potential skill shortages in the sector with just over half of firms surveyed reporting having experienced recruitment difficulties.

A major focus of the qualitative stakeholder interviews in this study was to gather opinions on the skills in demand for current and future employees. In terms of specific skills, stakeholders were asked to discuss technical, business and transversal skills. Needless to say, 'a good understanding of computer science' combined with 'the basic concept of how Blockchain works' was often highlighted as essential. Many stakeholders made reference to 'knowledge of any programming language plays a vital role'. In relation to transversal skills, the most discussed terms included capabilities in the areas of: cooperation competence, emotional and social intelligence, problem solving, creativity, system and network thinking, future-oriented mindset, remote work, languages (particularly English), teamwork, passion for new technologies, an appetite for continuous professional development, self-reliance, self-motivation, self-organisation, responsibility-taking, adaptability, project delivery, patience and strong communication skills (those who can understand and explain the blockchain technology). It was often suggested that 'there is a lack of communication skills to translate technical knowledge into business language'.

Using the information provided in the large CHAISE European Online Survey, the job vacancy rate (JVR) of total firm employment was calculated and presented by Whelan et al. (2021). For the Q1 2021 period, which aligns most closely with the CHAISE online survey data, average vacancy rates in the EU area stood at 2.1 per cent. In the survey respondents were asked to record both total employment and blockchain employment, allowing an estimate of both general and blockchain vacancy rates to be calculated. The general and blockchain specific vacancy rates are 6.7 percent and 12.5 percent, respectively, and both lie well above the EU average (2.1 percent). More specifically, at 12.5 percent the blockchain JVR is over 6 times the EU average, pointing to a very high level of relative labour demand for blockchain workers in Europe. Taken as a whole the research suggests that the demand for blockchain labour is very high relative to the EU average and that firms with high blockchain JVR's are much more likely to experience skill mismatches in the form of unfilled or hard-to-fill vacancies. There is a clear need to develop a strategy to address the issue going forward as the demand for labour accelerates.

In terms of future progress, there is an understanding that 'increasing specialisation will be required due to technological progress' in 'larger and more diverse application areas'. Finally, stakeholders interviewed varied in their views on the most important perceived changes within blockchain organisations into the future, with a selection of views particularly apparent relating to ways in which the sector will expand, education and training provision, and overcoming other key barriers faced in the sector (for example, legal aspects, government regulation, complexity of explanations and hesitancy related to new technologies). However, there was an overarching consensus on 'constant evolution' and 'high-growth' potential within the field of Blockchain.

The third study by University of Ljubljana (2021) investigated the supply of blockchain skills in Europe and showed that there is a lack of formal education in the field of Blockchain and that informal education cannot fully cover the qualifications needed. Communities and fora offer a useful exchange platform but are not sufficient for the education and training of Blockchain experts as the content can lack integrity and professionalism. It was found that most blockchain education and training offerings have a duration from 1 day up to 15 weeks

and the target audience for blockchain courses are ICT professionals or a general audience interested in the theory. Overall, blockchain is not yet offered as a separate course of degree across Europe, but only as a superficial specialisation module for mainly ICT courses. Blockchain training contents are mainly developed by private companies/institutions and both business and transversal skills are often missing in educational and training programmes. Furthermore, due to the lack of official training programmes, a preferred training method has yet to be identified. However, formal training and certifications are seen as increasingly important by companies. Stakeholder interviews analysed in Whelan et al. (2021) expressed that training courses should be practical, interactive and interdisciplinary and cover Blockchain projects from beginning to end. Furthermore, it was suggested that organisations should offer their employees more learning opportunities and promote an exchange with other companies, e.g. in the form of hackathons.

The most recent publication by Brunner and Ehlers (2021) examines skills mismatches in the blockchain sector. They suggest that the future Blockchain ecosystem necessitates an EU-wide regulatory framework for the use of Blockchain technology for different industries and application areas (the financial sector, supply chain management and for the public sector). They propose that each EU country needs a national strategy that is aligned with an EU-wide Blockchain strategy. For greater efficiencies, communities and exchange platforms combined with a Blockchain skill Hub for Blockchain experts and researchers should regularly exchange with policy-makers and educational institutions to address the latest trends and developments in the Blockchain sector.

Envisioning the future Blockchain ecosystem, Brunner and Ehlers (2021) suggest that blockchain development projects and research are funded by the state and the EU, especially projects in the public sector that promote the common good. Furthermore, the use of national and international communication strategies will help to educate the public about the potential of Blockchain technology and to strengthen trust in the technology. In order to have an overview of the labour market developments, the development of an EU-wide blockchain workforce database is required serving as a monitor for the skills and employment situation within the EU and can be further used for policy decisions within the education sector.

The next publications from the CHAISE consortium include the following outputs (with their expected publication timeframes): A Study on the EU Blockchain Growth Strategy (December 2021); A Blockchain Skills forecasting model (January 2022); A European Blockchain Skills Strategy (April 2021). More specifically, the ESRI has been tasked with setting a collaborative method for the anticipation of future blockchain skill demand and supply, acting as an early warning information mechanism to mitigate possible labour market imbalances, and supporting education and training, and labour market actors in making evidence-based decisions. The ESRI will build on CEDEFOP forecasting methodologies to develop the CHAISE blockchain skills forecasting model for Europe. The CHAISE partnership working with a broad range of external stakeholders will map out different scenarios to forecast the evolution of blockchain skill supply and demand based on evidence-driven assumptions for micro and macro-environment developments for each subsequent year of the project. This activity will be repeated on an annual basis. The ESRI will run the model and present forecasting results. The evidence will be based on blockchain relevant online job vacancies and compare each year's findings with those of the previous years to detect labour market developments.

Appendix B - Education, Skills & Innovation Working Group Initiatives on Creating Blockchain DLT Awareness

The Working Group Members have worked on a number of initiatives to create awareness of Blockchain DLT in academia, industry, employees, professional groups and civil society.

Academia

Creating Awareness, Understanding and Collaboration : Munster Technological University Dr Susan Rea has a project to stimulate multidisciplinary Blockchain research, research informed teaching for Blockchain and accelerating Blockchain innovation to enhance external partnerships with HEIs, enterprise, communities, and related stakeholders in the region, nationally and at an EU level with the objective of building sustainable impactful additional capacity at MTU and establishing MTU as leader in Blockchain education, research and innovation.

New course development

Bachelor of Science (Honours) in Digital Accounting GMIT https://www.gmit.ie/bachelor-of-science-honours-in-digital-accounting

Developed in collaboration with the CIMA, CAI, ACCA and CPA this Programme is new, future-proofed and the leader in this emerging area. The knowledge, skills and competitiveness of the future graduates of this Programme are identified by industry and employers as critical and in short supply. Dr Trevor Clohessy was a member of an academic team who developed this Programme together with input from the industry. Mr. David Roche was an industry contributor to this Programme. Dr Trevor Clohessy works with Enterprise Ireland companies to inform SME's on Blockchain applications

Certificate in Emerging Digital Technologies National College of Ireland https://www.ncirl.ie/Courses/NCI-Course-Details/course/CEDT

The National College of Ireland responded to a request from BlockW to develop an online Certificate in Emerging Digital Technologies. BlockW members worked with the academic team in relation to the content and the introduction to the Blockchain Ecosystem. The aim of this Programme is to give employees / employers an understanding of new emerging technologies and how they can be utilised to create opportunities in their industry and develop their career prospects. This Programme is funded by Technology Ireland ICT Skillnet and Engineers Ireland are partners to this Programme. The Programme is targeted at non-Computing professionals who work to understand the latest emerging digital technologies and to integrate them into their workplace .

MSc in Blockchain - Distributed Ledger Technologies
https://www.ictskillnet.ie/training/msc-in-blockchain/

This 2 year part-time Masters programme in Blockchain (Distributed Ledger Technologies) is delivered primarily part-time by Dublin City University (DCU) in response to industry demand. Working with Blockchain Ireland, Technology Ireland ICT Skillnet identified skills gaps for software developers with the requisite Blockchain knowledge and development skills needed in industry and as a direct result is co-funding this MSc since 2019 as a direct response to this need.

Industry SME and Multinationals

Leman Solicitors: Blockchain Technology in Property Practice

Leman Solicitors are developing blockchain applications and they state that:
Blockchain applications are being used to revolutionise the cumbersome legal process in the Irish residential new homes space. New technologies such as blockchain has been embraced in the Property Industry to digitise the conveyancing system which has led to drastic improvements in the efficiency, transparency and costs involved in a residential transaction. Through the incorporation of digital signatures, instantaneous stakeholder notifications and electronic payment platforms, the outdated legal process has been transformed. These building blocks have laid the foundations for the incorporation of smart contracts which will automate large strands of real estate transactions and digitise asset ownership.

Blockchain Learning Training Initiative
Blockdaemon University is a learning and training initiative which has been created to provide a consistent and structured training, development and on-boarding program for new hires and new team members. Blockdaemon University will also act like a digital library for existing staff to up-skill, re-skill or use as a source of reference.
The purpose of the program is to pinpoint the knowledge and skills that all new hires and new team members should have, as well as educate, improve communication and interpersonal skills, enhance productivity, initiate creativity and motivate new hires to do their best, given all the knowledge they gain from Blockdaemon University.

BlockW: Creating Awareness of Blockchain Technology
BlockW is working with professionals in the financial service industry, information and communication technology professionals in Ireland and industry, academia and civil society. BlockW ' s mission is to create awareness about Blockchain and emerging technologies, to increase inclusivity and diversity in its uptake and provide information on pathways to education, training and careers. BlockW interacts with policy makers, industry, academics, research, and citizens to increase their understanding of Blockchain and Emerging Technologies. BlockW has developed partnerships in India, Europe ,the USA , the UK , Australia, and in Ireland , including with NCI, UCD, Trinity College , UCC , MTU, and the GMIT Innovation Centre among others.

BlockW and Institute of Banking: Creating Micro-Learning Modules 2020-present
BlockW has developed a series of micro- learning modules for the 34,400 members of IOB. The IOB digital library is available to all members. The purpose of the micro learning modules is to introduce real life applications using blockchain technology that are of benefit to the economy and society. The availability of these micro learning modules offers members the opportunity to explore how blockchain technology can be integrated into aspects of their work and help develop their career.

BlockW and Irish Computing Society 2020-present
The Irish Computing Society promotes and represents the interests of the ICT professionals in Ireland. There are 15, 000 members and BlockW webinars which are open to non-members and are aimed at an introduction to Blockchain / DLT applications other than bitcoin and cryptocurrency. The webinars are available on the ICS web site as a resource to students and are used as a resource by Third Level Colleges like the National College of Ireland on their Certificate Level 7 Emerging Technologies.

BlockW and Women4IT 2019-2022
The Empower Programme is co-funded by the Irish Government and the European Social Fund to develop female entrepreneurship. BlockW helped develop the content and shape of an introduction to Blockchain technology to women on the Programme and to women led SME's using applications of Blockchain in a business context.
BlockW and Women4IT 2019-2022
This is an EU funded Programme promoting solutions to the engagement of women in IT working with industry, mentors and community. The Chair Block W received an EU Ambassador Women 4IT Award.

National College of Ireland and BlockW: Transitioning into a career in Blockchain May 26th 2021
The National College of Ireland ran an event on transitioning into a career in Blockchain. Attended by 120 participants from all over Ireland it provided a platform for understanding the job and career opportunities available. The webinar also signposted the Education and Training programmes available.

Webinar Institute of Banking and BlockW Blockchain for Learning Credentials: A First in the world for Ireland.
The IOB, the largest professional education body in Ireland have, in partnership with Deloitte, developed an innovative learning credentialing platform called Ed Q.

The Oireachtas Friends of Science and BlockW Briefing May 12th 2021
This meeting of the Oireachtas Friends of Science (Aidtech, Origin Chain Networks and Ireland Craft Beverages/Killowen Distillery) explored the use of Blockchain applications, sharing examples of how Irish companies use blockchain in supply chain and for digital identity and showing how this transparency and traceability can be used in the distribution of funds and resources by Governments, Banks and NGO's.

BlockW and GMIT Student Scholarship: Summer 2021
A paper was developed and presented at the British Blockchain Association 4th International Scientific Conference ISC2022.
Dominic Allen, Trevor Clohessy , Joyce O' Connor , "Developing Educational Awareness of Blockchain: A Student led Blockchain Research Fellowship"

The Working Group's Exploration of a Test Node
The Working Group Initiated, Chaired, provided Secretariat to a Multi stakeholder Group, policy makers, industry, academia, and civil society together with the Slovenian National Blockchain SI-Chain to explore setting up a test node. Lessons were learned for future developments.

Membership of IEEE Committee UK and Ireland Blockchain Group
Dr Susan Rea is a member of this group founded in2018 to focus on IEEE Blockchain Initiative (BCI) such as pre / standards, education, conferences and events, community development and outreach publications and special projects undertaken by the UK and Ireland Section.

Micro-credentials
It is the view of Blockchain Ireland Group Education, Skills and Innovation that micro-credentials are new types of qualifications and short-study courses that are emerging as a prominent way to align workers' skills with Europe's digital and green transition. Their case is strengthened by the current COVID-induced economic crisis. Micro-credentials offer flexible learning paths to adapt to shifting economic circumstances. Yet, today in Europe we miss standards about their delivery mode, duration, assessment process, validation, accreditation or indeed incorporation into larger credentials, also known as "stack ability". The European Consortium of Innovative Universities (ECIU) describes stack ability of micro-credentials as "certification of learning that can accumulate into a larger credential or degree, be part of a portfolio that demonstrates individuals' proof of learning, or have a value in itself"
In discussion with Industry, Start-Ups, SME, Enterprises, Business and Community Groups the Blockchain Ireland Working Group on Education, Skills and Innovation see that Micro-credentials can help address the development of skills and talent and employability while

creating flexible and inclusive learning paths to accommodate an increasingly diverse population. Just in 2019, there were more than 820 MOOC-based micro-credentials available world-wide. The view of industry, business and community groups is that, compared to conventional degrees and certificates, micro-credentials offer shorter, more targeted and flexible ways to fill the gap between academic programmes and skills required in a fast-changing labour market. 80% of individuals in OECD countries found professionally useful the non-formal education and training activities they drive the successful uptake of micro-credentials, and we need a clear definition of micro-credentials that will forge a more common and clearer understanding of the content and quality of these new learning possibilities and allow for a range of possibilities with regards to how they can be stored (e.g. A lifelong learning wallet) as well as how they are presented. The Working Group for Education, Skills and Innovation welcomes the Commission's intention to define the concept of micro-credentials in its re "European approach to micro-credentials" publication. There are a number of areas that need to be addressed at an EU and Member State Level including educational institutions, training bodies and professional groups. The Irish Universities Association is working on these issues as are professional groups such as IEEE, however an overall European approach will be very helpful. We must also look at these issues in an international context. The Working Group agreed that the following six areas need to be addressed:

- A focus on minimum levels of objectivity and standardisation in the skills certified by micro-credentials
- Clear differentiation between traditional degrees and micro-credential certificates delivered upon completion of a learning programme
- Quality assurance, through the establishment of an EU register of trusted issuers open to non-formal education providers, like industry, regardless of their headquarters' location
- Interoperability across learning management systems and promotion of learning content standards
- Financial support to leverage content from various micro-credential providers
- A future-proof European Digital Credentials Infrastructure (EDCI) envisaging badging/ recognition of skills validated in professional online networking platforms.
-

Appendix B

Appendix C
Blockchain Business Use Cases @ BCIRL #Startups

No.	Domain	Business Use Case	Speaker	Country	On Youtube
D.1	Data assurance + valorisation				
D1.1	Data ownership	Tiki.com	Barry O'Connor	IRELAND	#StartupsLunchbox01
D1.2	Content Timestamp	Wordproof.com	Sebastiaan van der Lans	NETHERLANDS	#StartupsLunchbox01
D.2	Supply chain				
D.2.1	Fashion	DeCommerce fashion	Paula Kilgarriff	IRELAND	#NFTWorkingLunch01
D.2.2	Agri-food	Origin Chain Networks	Fiona Delaney, Saad Shahid	IRELAND	#BCIRL_Week OCN+GMIT
		GMIT	Trevor Clohessy	IRELAND	#BCIRL_Week OCN+GMIT
		Eato X System	Jason Curry, Ciaran Keegan	IRELAND	
D2.3	Smart Energy	CENTS project/IERC	Brian O'Regan	IRELAND	#StartupsLunchbox4+5
		Power Ledger	Gemma Green	AUSTRALIA	
		Sustainable Energy Dev. Authority	Hazril Izan Bahari	MALAYSIA	#StartupsLunchbox4+5
		Energy Authority, Florida	Elizabeth Massey	USA	#StartupsLunchbox4+5
		Property Management	Paul O'Connor	IRELAND	#StartupsLunchbox4+5
		Bristol Smart Cities	Ruzanna Chitchyan	UK	#StartupsLunchbox4+5
		Block Energy	Kraken Yu	IRELAND	#StartupsLunchbox4+
		Host in Ireland	Gary Connolly	IRELAND	#StartupsLunchbox4+5
		IERC	Padraig Lyons	IRELAND	#StartupsLunchbox4+5
		IEA	David Shipworth	UK	#StartupsLunchbox4+5

No.	Domain	Business Use Case	Speaker	Country	On Youtube
D2.4	Enterprise supply chain management	GMIT	Trevor Clohessy	IRELAND	#StartupsLunchbox07
		ProHub4	Sean Field	IRELAND	#StartupsLunchbox07
D2.5	Climate neutrality	Plastiks	Andre Vanyi-Robin, Fernanda Accorsi	SPAIN	#StartupsLunchbox09
D3	DeFi				
D3.1	Securities Issuance & Trading	Horizon Fintex	Andy Le Gear	IRELAND	#StartupsLunchbox08
D3.2	DeFundraising for Startups	Sors Digital Assets	Brian Elders	IRELAND	#StartupsLunchbox02
		Lemniscap	Nicola Santoni	HONG KONG	#StartupsLunchbox02
		Gekko Governance	Shane Brett	IRELAND	#StartupsLunchbox02
D3.3	Trade Finance	Defactor	Alejandro Guiterrez	IRELAND	#StartupsLunchbox03
D3.4	Sustainable Finance	Green Bonds/ Blockchain and Climate Inst	Pedro Baiz	UK	#NFTWorkingLunch03
		SMEChain	Sorch Mulligan	IRELAND	#NFTWorkingLunch03
		Host in Ireland	Gary Connolly	IRELAND	#NFTWorkingLunch03
D3.5	NFTs	Clout Art	Jure Zih	SLOVENIA	#NFTWorkingLunch02
		@Griff digital art	Shane Griffin	IRELAND/USA	#NFTWorkingLunch02
		Akasha	Caoimhin O'Meallain	IRELAND/UK	#NFTWorkingLunch01
		Sors Digital Assets	Brian Elders	IRELAND	#NFTWorkingLunch01
		Coinsillium Group	Eddie Travia	HONG KONG	#NFTWorkingLunch02
		Plastiks	Andre Vanyi-Robin , Fernanda Accorsi	SPAIN	#StartupsLunchbox09
		@CiaranDunbar1	Ciaran Dunbar	IRELAND	#StartupsLunchbox09
		Tokken Trax	Tommy D, Brian Elders	UK	Web3 Innovators
D4	Public sector innovation				
D4.1	Government	Canadian Govt	David Baines	CANADA	#StartupsLunchbox06
		Irish Govt, DEPR	John O'Donoghue	IRELAND	#StartupsLunchbox06
		DEPR Research Fellow	Kosala Yapa	IRELAND	#StartupsLunchbox06
		Irish Govt, DEPR	Phillip McGrath	IRELAND	#StartupsLunchbox06
D4.2	Enterprise	Open Sky Data Systems	Tudor Pitulac	IRELAND	#StartupsLunchbox06
D4.3	Smart Energy	Sustainable Energy Dev. Authority	Hazril Izan Bahari	MALAYSIA	#StartupsLunchbox4+5
		Energy Authority, Florida	Elizabeth Massey	USA	#StartupsLunchbox4+5
		Bristol Smart Cities	Ruzanna Chitchyan	UK	#StartupsLunchbox4+5
		IERC	Padraig Lyons	IRELAND	#StartupsLunchbox4+5
		IEA	David Shipworth	UK	#StartupsLunchbox4+5
D4.4	Climate neutrality	Plastiks	Andre Vanyi-Robin, Fernanda Accorsi	SPAIN	#StartupsLunchbox09
D5	Research				
D5.1	Cybersecurity	Holistic models of centralisation in DLT/UL	Ashish Sai	IRELAND	#StartupsLunchbox08
D5.2	Pseudonymity on the web	Pseudonymity and the digital marketplace/ NUIMaynooth	Grace Walsh	IRELAND	#StartupsLunchbox01
D5.3	D5.3 Indicators of investability in DLT	V-heel research	Michael O'Sullivan	IRELAND	#StartupsLunchbox02
D5.4	Smart Energy	CENTS project/IERC	Brian O'Regan	IRELAND	#StartupsLunchbox4+5
D.5.5	Irish Government	DEPR Research Fellow	Kosala Yapa	IRELAND	#StartupsLunchbox06
D5.6	Enterprise supply chain management	GMIT	Trevor Clohessy	IRELAND	#StartupsLunchbox07
D.5.7	Agri-food	Origin Chain Networks	Fiona Delaney, Saad Shahid	IRELAND	#BCIRL_Week OCN+GMIT
D.5.8	Blockchain and Business	GMIT	Trevor Clohessy, Amaya Vega	IRELAND	#BCIRL_Week OCN+GMIT

Appendix D - Key Features

- **Elimination of Third-Party** - Blockchain eliminates the need to use third parties to verify information and holdings due to its peer-to-peer verification system. The network within the blockchain competes to verify digital payments or transactions, which generates a true source of trust (Ammous, 2016).
- Blockchain Architecture - The network architecture that blockchain utilises eliminates the need for a central database. Blockchain stores information on each of the nodes within the network—this forces organisations to digitally transform their infrastructure (Zheng et al., 2017).
- **Public Networks** - For transactions or transfers of information to occur verification must take place through the nodes within the blockchain network. While an increase of nodes will generate more CPU power to verify blocks within the chain, the expansion of a network allows organisations to utilise different sources of information (Morkunas, Paschen and Boon, 2019).
- **Private Networks** - Organisations that utilise blockchain technology can create a private or public network. Private networks verify information that is not readily available to the public, while public networks can tap into data presented across a blockchain system. Organisations can use private networks and pre-validate users and nodes within the network (Morkunas, Paschen and Boon, 2019).
- **Identity Protection** - Blockchain's highly scrupulous architecture allows for users to interact with the network and ensure that their identity is safe (Shrier, Wu and Pentland, 2016).
- **Smart Contracts & Block Creation** - The creation of the blockchain network enhances an organisation's ability to build from it. One aspect that has seen tremendous growth is the utilisation of smart contracts (Cong and He, 2019). Smart contracts enable organisations to automate processes once a series of events occur. As a network continues to grow, this ability to automate processes can only grow due to the expansion of information. organisations can then create more blocks. Smart contracts then tap into an emerging Internet of Things (IoT) industry.

8.1

Creating a Roadmap for Industry Growth, Workplace Planning and Societal Career Choices

This section will be updated when the EU CHAISE Blockchain Skills Demand, Supply and Mismatch is published later this month. The Report covers 27 member states as well as Ireland The Blockchain Skills UK/Ireland Project will be published in February 2022 . Preliminary findings may be available late November / early December

Context

Blockchain technology is at the core of the European Digital Agenda to advance digital transformation. This technology has the potential to benefit society and businesses and stimulate sustainable growth. The European Blockchain Forum's sector vision is to acquire global leadership and increased market penetration. It is clear that its competitiveness largely relies on the availability of a competent and versatile workforce. Whereas the demand for blockchain skills is steadily increasing, employers face a shortfall of skilled professionals that prevents the sector from fulfilling its full potential. The Blockchain sector is challenged by a talent shortage, global competitive pressures, the limited connection between education and the market, and low responsiveness of formal education to new workplace requirements.

Creating Awareness

Blockchain and Distributed Ledger Technology (DLT) have created new market opportunities worldwide. Developing the opportunity presented, blockchain will require government, industry and public awareness and will also require collaboration between these stakeholders. Ireland's ability to capitalise on our current standing and to reach the potential of blockchain, domestically and international, is largely dependent on having key fundamentals being in place which include;

- Effective, appropriate regulation and standards;
- Enhanced collaboration;
- Further international investment;
- Development of new skills and capabilities.

2

Skills and capabilities are key to driving innovation

It is important that we have evidence-based research to build policy and investment. The EU CHAISE Project gives us the possibility of establishing a short to medium term road map for industry growth, workplace planning and societal career choices. Given that Blockchain technology is a relatively new technology there is a need to both build a skills base that can translate into the driver of innovation and to educate government, society and industry about blockchain potential. A lack of familiarity with blockchain and its potential may unduly limit industry and policy makers' appetite for engagement with blockchain. A key finding of the CHAISE Project is that it is critical for industry employers, employees to understand

and harness the strategic value of Blockchain in business, economy, and society. Matching and reconciling the constraints of a currently maturing technological, organisational legislative and regulatory Blockchain environment with the innovative opportunities that public permissionless Blockchain offers is critical. The findings from the CHAISE Project are in line with previous Irish studies which have examined the organisational readiness of organisations for Blockchain technology. For example, Clohessy et al., 2018[1] conducted one of the first blockchain organisational readiness studies in Ireland in 2018, which highlighted the need for enhanced Blockchain awareness, increased legislation and regulation, and the need for the development of courses that tailored for both the soft business skills and technical skills, which are nuances to Blockchain technologies.

Detailed findings from the CHAISE Project can be found in Appendix C.

Appendix G
International Market Update
(Updated 15 May, 2022)

Australia

In December of 2021, the Australian government announced they would propose new laws to help regulate Crypto and general “Buy-Now-Pay-Later” laws (Jose and Kaye, 2021). Their plans were to begin consultation in early 2022 to develop a licensing framework for digital exchanges, amongst others to better create a regulated environment. In an interview with 7NEWS Australia, the Australian Treasurer said that this would be the biggest reform in the country’s payment system in 25 Years. This would include a revamp of (Gkritsi, 2021):

- → The licensing of firms that buy and sell cryptocurrencies
- → The development of a central bank digital currency
- → BNPL Regulations
- → Research Committees

Previous Strategy Ranking: 4/5

Updated Strategy Ranking: 4.5/5

The Australian government has defined a short-term plan of action on what they plan to implement next to further the development of cryptocurrencies/blockchain technology. They have provided clear and actionable areas in which they plan to regulate next.

Strategy
In February 2020, Australia Announced the launch of a Blockchain Technology Roadmap (Australian Government, 2020). The roadmap features an extensive vision for Australia as it progresses with the Technology. While Australia has made large efforts towards the financial services sector, the roadmap showcases applications in the agriculture supply chain industry, e governance. The Roadmap has set forth government-led initiatives happening in the coming years that address the supply chain within the wine sector and verifying trusted credentials in the world of academia (Australian Government, 2020). The government estimates that the economic value will add an annual business value of over $175 Billion through blockchain applications(Australian Government, 2020). The roadmap also addresses challenges, opportunities, research, and a general strategy created by the federal government (Australian Government, 2020).

To oversee blockchain activity there are many governing bodies that observe its activity. From taxation, regulation, to industry acceptance the government takes a big role and addresses who monitors what. The following list breaks down each governing body and their individual role:

- → Reserve Bank of Australia (RBA) - Australia’s central bank. Oversees all monetary and currency stability. Contributes towards the welfare of the country (Australia and Australia, 2021)
- → Australian Securities and Investments Commission (ASIC) - Set up under the Securities Investments Commission Act of 2001, ASIC is a regulator of integrated corporate, markets financial services and consumer credit (ASIC, 2021c).
- → Australian Transaction Reports and Analysis Center (AUSTRAC) - Responsible for addressing criminal abuse within the financial system of Australia (Australian Government, 2021).

→ Australian Taxation Office (ATO) - Oversees and administers guidance regarding taxation within Australia (ATO, 2021).

Regulation
The legal status regarding cryptocurrencies are completely dependent on how the cryptocurrency is structured and the rights to which are attached to it (Reeves and Shen, 2021). Cryptocurrency has seen wide acceptance throughout Australia and its actions can be defined within the sales regulations. For general purposes, Australia categorises cryptocurrencies as financial products (Reeves and Shen, 2021). Instead of creating or amending new laws for these financial products, Australia has moulded its definition to fit within current legislation.

The ATO views the taxation of cryptocurrency based on how the financial product is held, exchanged or transferred (ATO, 2021). Due to this nature, cryptocurrencies are subject to holders and issuers tax within the country. Previously mentioned, Australia's national acceptance of cryptocurrency within the sales industry has made it subject to a Goods & Services Tax. However in 2018, public and industry backlash has forced the ATO to remove the double tax (Reeves and Shen, 2021). This was because the financial services industry saw this and thought it prevented economic growth.

Australia offers two innovative regulatory services for blockchain, cryptocurrency, and fintech activities. ASIC offers an innovation hub for blockchain applications which serves as a sounding board for business advisory (ASIC, 2021b). Along with this Innovation hub, ASIC also provides an enhanced regulatory sandbox. The regulatory sandbox provides start-up organisations in the financial services industry a regulation-free environment to experiment with innovative products and services (ASIC, 2021a). They also offer a unique financial services licence that helps with the funding of projects (Reeves and Shen, 2021).

Ecosystem

E-Governance & Digital Identity
Within the national blockchain roadmap, the government brought forth an actionable item to verify university credentials for the business industry (Australian Government, 2020). This service was brought forth by RMIT, a university in Australia, and rolled out by the government. Australia currently utilises this service to verify skills, credentials, and certificates. Australia has an extensive certification requirement for high risk employment, so this project is to combat the verification and authentication problems that are associated with this process (Australian Government, 2020).

Healthcare
Scalamed is an Australian start-up organisation that's utilising blockchain technology to change the way doctors and patients interact regarding prescriptions. Through the storage of digital prescription, it eliminates error and creates a need for authenticity when dealing with potential health risks. Similar to identity protection, Scalamed is using blockchain technology to create a digital prescription inbox that only medical professionals, pharmacies, and patients can access (Baldassarre, 2017).

Supply Chain
Previously mentioned, the National Blockchain Roadmap features a government led project to address supply chain challenges presented in the agriculture industry. The project designed to approach this problem addressed production, packaging, and logistical aspects within the wine industry (Australian Government, 2020). The project was facilitated by KPMG and administered on Mitchell Wines (Australian Government, 2020).

Finance & Transactions
DigitalX is a blockchain enabled payment solutions organisation that specialises in fintech and digital payments. Through Australia's creation of a "crypto-friendly" business environment, DigitalX has decided to utilise crypto exchanges to take full advantage of arbitrage trading. This will allow them to analyse mispricing across approved exchanges (Pash, 2017).
Along with businesses taking full advantage of the "crypto-friendly" environment in Australia, it has led to public crypto exchanges created and used in Ireland. Two notable Australian exchanges are Coin Spot and CoinJar. While there are other exchanges that are active within Australia, they are not based within the Country.

Coin Spot was founded in 2013 and is considered to be Australia's most digitally trusted online exchange (Marteq, 2021). Coin Spot is an industry leader in security and provides its users with instant currency buying and selling (Coin Spot, 2021) The exchange allows users to purchase, store, and transfer many different digital assets. The exchange caters to all users whether they are expert traders or beginners looking to jump into crypto.

CoinJar is a seamless exchange that enables use of all currencies worldwide (Marteq, 2021). Similar to Coin Spot, Coinjar was launched in 2013 and is considered to be one of the world's first digital currency exchanges on the market. The exchange is backed by many venture capitalist organisations and puts the consumer first through an easy to navigate experience. CoinJar has innovated to create a mobile app and a debit card that enables all people to have access to the digital currency exchange (CoinJar, 2021).

Energy Sector
Power Ledger is reshaping how markets could distribute utilities such as electricity and water. The energy provider uses blockchain technology to enable a peer-to-peer network that allows for a transaction (Cooper, 2018). This could have the potential to disrupt the entire energy industry.

Along with Power Ledger, trials have occurred in Perth to test out whether a peer-to-peer energy network would be useful to an area. In this trial, they used surplus renewable energy to be transferred to other members in the community (Monroe et al., 2020). It helped explore whether a new structure could be imposed, rather than the usual governance structure. The results of the study concluded that a decentralised network for peer-to-peer energy could be useful for a given area. The limitations regarding this study deduced that it would require a collected coordinated action to correctly work within an environment (Monroe et al., 2020).

Canada

There have been no significant advancements within the Canadian market in regulation or strategy since the initial research was performed. A new maturity grade is not needed.

Strategy
Currently, Canada does not have an active roadmap or national strategy administered by the federal government. While this may be the case, public consortiums such as The Chamber of Digital Commerce - Canada & Canadian Blockchain Consortium act as advisory teams to the government (CDCC, 2019). Along with these consortiums providing voluntary guidance for the federal government regarding blockchain applications, the government has also issued a proposed framework for crypto-asset trading platforms (Grant, Lim and Peters, 2021). This document reviews guidance and regulatory requirements within digital exchange platforms that utilise cryptocurrencies.

To oversee blockchain activity there are many governing bodies that observe its activity. From taxation, regulation, to industry acceptance the government takes a big role and addresses who monitors what. The following list breaks down each governing body and their individual role:

- → Canadian Securities Administrators (CSA) - The CSA is Canada's Provincial regulator for all securities. They aim to oversee all Canadian capital markets and work collaboratively with all regulatory procedures throughout the country (CSA, 2021a).
- → Investment Industry Regulatory Organisation of Canada (IIROC) - The IIROC is the investment industry regulator. They oversee all investments from dealing to trading on various marketplaces (IIROC, 2021).
- → Canadian Revenue Agency (CRA) - The CRA is responsible for the guidance and application of Taxation. They oversee personal income taxes, business taxes and many other forms that involve transaction and personal economics (Agency, 2020).

Regulation
The Canadian Government permits cryptocurrency activity within the country. The CSA is the main government entity that provides guidance and frameworks for blockchain technology within the country. For regulatory purposes, the CSA categorises cryptocurrencies as a security. Since 2017, the CSA has remained very active trying to issue notices across departments on how they should deal with the security (Grant, Lim and Peters, 2021). Currently, there is no underlying tax regime. Due to this oversight, the CRA takes the CSA's classification of a security and applies it as a commodity for income purposes. This means that the taxes are typically addressed on how the digital asset is used (Grant, Lim and Peters, 2021). This includes acquisition, holding, and disposition for personal purposes, and Barter and Sales transactions for business purposes (Agency, 2021).

Along with administering regulatory frameworks for blockchain activity, the CSA also provides a regulatory sandbox. Similar to many other regulatory sandboxes, the CSA offers a regulation free environment that encourages experimentation. This initiative is mainly focused on the financial services industry and specifically targets FinTech organisations (CSA, 2021b).

Ecosystem

E-governance & Digital Identity
E-governance and digital identity have proven to be an optimal industry for blockchain activities in Canada. The organisation SecureKey launched an identity verification/ authentication app that has partnered with government entities such as the Digital Identity Council of Canada, the Command control, and Interoperability Center for Advanced Data Analytics. It has also partnered with Canada's leading financial institutions such as BMO, CIBC, Desjardins, RBC, Scotiabank and TD (SecureKey, 2021). By developing a unique collaboration with financial institutions and government entities it has allowed Canada's citizens to easily verify their identity when utilising various service providers. In 2019, Secure Key launched Verified.Me which only improved the capabilities for the distributed network (Verified. Me Team, 2019). The launch of the new network signified the connection of government, financial, and insurance entities allowing consumers to share their information quickly and securely with partnering organisations. By allowing access to a digital identity application, it has opened the door to many government opportunities. One of the biggest opportunities that's presented from this is eVoting. The Canadian government is already in deliberations regarding how to carry out this initiative formatting legal framework and deploying an electoral system. In 2017, Canada released a publication that discussed the path forward for federal elections. There they took note of Estonia, a leader in digital identity, and its national identification system in healthcare and approach to voting (Government of Canada, 2017). While eVoting has been an ongoing topic within the Canadian government, it has yet to be connected to a blockchain network.

Healthcare
Currently, there are very few applications regarding blockchain technology within the healthcare industry in Canada. Apart from this, the government has very little involvement in this industry. While this may be the case, conferences and proposals are being rolled out for blockchain technology to be in the conversation. In 2018, Toronto hosted the Healthcare Conference Network, and part of that conference was a devoted segment to blockchain technology (Healthcare Conference Network, 2018). This conference was to push forward the conversation of deploying blockchain technology within the healthcare industry. In March of 2020, Canada saw one of its first blockchain technology applications to address health consent (Insights, 2020a). This application created a collaboration with IBM to produce a mobile application to allow patients to control who has access to their data. Beyond this application, there has been little advancement in the field. In October of 2020, the Journal of Medical Internet Research released a proposal for the implementation of blockchain technology for data management (Cadoret et al., 2020). Wes constructed a data infrastructure based off of publicly available data and produced a recommendation based on flow gaps and inconsistencies.

Supply Chain
The Supply Chain industry within Canada has seen government and private applications in the promotion of Blockchain technology. In January of 2020, the Canadian government tapped into Peer Ledger and Mavennet to develop an innovative solution to track steel within its supply chain. In order to do this, the Canadian government invested $300K to develop a blockchain solution. If successful, either of the companies could receive up to $1 MM to refine its prototype and to put it into market (Innovation, Science and Economic Development Canada, 2020). Beyond this government led initiative, Walmart Canada is continuing to reduce its costs and errors within the supply chain by implementing a distributed ledger to streamline the various processes. To do so, Walmart plans to roll out a freight system that uses the technology.

This would be a part of its $3.5 billion digital transformation initiative (Berthiaume, 2020). Aside from these applications, associations are developing to further the conversation of blockchain technology within the supply chain industry and to stress the importance of innovation. The leading association in this field is the Canadian Blockchain Supply Chain Association (CBSCA). This association creates a forum for individuals and companies looking to collaborate and create a network to develop solutions to improve the supply chain (CBSCA, 2021). This organisation isn't affiliated with the Government, but it serves to advise various departments and communicates a streamlined usage of the technology.

Finance & Transactions
The Canadian Government has been actively involved in developing the financial industry in regard to blockchain technology. Since March of 2017, the Canadian government has issued notices and press releases that note their guidance and opinions on the topic of cryptocurrencies (Grant, Lim and Peters, 2021). While there are no specific regulations that place cryptocurrencies in its own category, the government actively labels it as a security. This information can be found within the regulatory environment section above. Financial Institutions have gone as far as developing an understanding of a form of cryptocurrency, stable coin (Grant, Lim and Peters, 2021). They believe that stable coins have greater potential for adoption rather than an asset like Bitcoin. The connection between financial institutions and the government has remained active throughout the cryptocurrency lifespan. The government issued "Project Jasper" which was a project involving the bank of Canada to form an experiment where distributed ledger and blockchain are at the forefront. Project Jasper consisted of 4 phases that spanned from 2016-2019. Each of the phases can be found below (Bank of Canada, 2021):

1. Investigated the use of DLT for the settlement of high value interbank payments 2. Rebuild the platform using an alternative DLT to further test efficiency when clearing and settling high-value interbank payments.
2. Explored the potential benefits of integrating “cash on ledger” with other assets, such as foreign exchange and securities.
3. Partner with various other countries to create a cross-currency settlement system.
4. After demonstrating Project Jaspers success. There are now contingent plans for a central bank digital currency. This CBDC will be designed to implement a variety of initiatives to better prepare Canada for future currency usage (Bank of Canada, 2020).

Energy Sector
Similar to many other international markets, blockchain technology usage within the energy sector for Canada has remained relatively immature. For Canada, the local conservation authority has stressed the importance of combining renewable energy with innovative tech. Like many of the markets mentioned previously, Blockchain is being leveraged to develop a peer-to-peer platform that automates the control of distributed energy resources. The Toronto and Region Conservation Authority (TRCA) called on its Sustainable Technologies Evaluation Program (STEP) to develop an initiative for local communities to distribute energy resources (Kaaru, 2020). This is due to the growing number of local energy producers within various regions. STEP then partnered with INSOLAR to develop a suitable platform (Insolar, 2020). Projects are still being drafted and implemented throughout Canada and information is being gathered on whether future application is required. In addition to this need to distribute renewable energy resources, experts speculate this could be the perfect environment for crypto mining (Pappas, 2021). Due to the amount of untapped renewable energy, it could be seen as a viable energy source for mining. The Canadian government has issued statements that they do not wish to partake in these activities due to the amount of energy required (Grant, Lim and Peters, 2021). Some energy organisations have announced that they will attempt to tap into this unused energy for crypto mining activities.

Germany

Market Update: 15/5/2022

German Regulators have announced new tax regulations pertaining to digital assets that will allow investors who have held Bitcoin or Ethereum for more than a year to face zero taxes on those digital assets. The official BaFin document details extensive conversations and consultations with key financial stakeholders within the country. This new tax regulation encourages the holding of earnings, while also providing a haven for those who have held the digital asset and potentially staked them (Toppa, 2022).

As Germany is a leading market from a regulatory lens, there is no new maturity grade needed.

In February of 2022, The European Union brought forth new Anti-Money Laundering regulations with the intention to provide oversight on cryptocurrencies (Valero and Comfort, 2022). The European Commission and various other authorities are currently engaging in discussions to design a body that will start operations in 2024. Germany is currently leading the EU to design this body (Valero and Comfort, 2022). There are currently no public records of names associated with this project.

In March of 2022, the EU voted on a regulatory framework for crypto assets that had the potential to ban key digital currencies including Bitcoin and Ethereum in Europe (Henning, 2022). The intention of the parliamentary vote was focused on an amendment that targeted environmentally sustainability standards for cryptocurrencies. The amendment focused on many crypto assets’ proof-of-work infrastructure. This legislation, dubbed MiCa, is continuing forward but the vote to pass the amendment failed (Preiss, 2022).

There are no other significant advancements within the German market in regulation or strategy since the initial research was performed. There are no new maturity grades needed for this market.

Strategy
The German federal government was one of the first countries internationally to develop a cohesive blockchain strategy. This national blockchain strategy was created by the digital government and features a vision, general strategy, and roadmap with goals and end targets. The national strategy was released in 2019 and has influenced other countries to take a similar approach (Jafar, 2020). The document aims to facilitate each of the following objectives (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019):

1. Secure stability and promote innovations in the financial sector.
2. Bring Innovation to maturity: advancing projects and regulatory sandboxes.
3. Make investments possible through clear, reliable framework conditions.
4. Apply technology – digitise public services. 5. Distribute Information.

To satisfy these goals, the German national government has concrete objectives that they will attempt to complete. This includes leading and initiating projects, publishing regulations and legislation, and implementing services to guide the process (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019).
To oversee blockchain activity there are many governing bodies that observe its activity. From taxation, regulation, to industry acceptance the government takes a big role and addresses who monitors what. The following list breaks down each governing body and their individual role:

- → Federal Ministry of Finance of Germany – Is the highest government authority in the field of finance.
- → Federal Financial Supervisory Authority (BaFin) – The government authority that oversees all activity regarding financial transactions, trading, and general legislation. They set forth regulations regarding cryptocurrency and blockchain activity (Koinly, 2021).
- → German Federal Central Tax Office (BZSt) – The BZSt is the central tax office in Germany. They administer guidance on the taxation of currencies and other financial assets (BZSt, 2021).
- → Federal Ministry of Economic Affairs and Energy (BMWi) – The BMWi is the federal ministry of innovation and technological applications that have a direct effect on economic activity (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019).

Regulation
Germany permits cryptocurrency and blockchain technology within the country. Instead of applying current legislation to cryptocurrencies, Germany has created a new definition and has amended laws to fit that definition. They classify cryptocurrencies as “Crypto-Assets.” BaFin and other legislative authorities acknowledged the digital aspect of the currency and recognized that they are not part of any central institution (Koinly, 2021). BaFin also has created terminology for those who perform roles regarding cryptocurrency. They classify them as “Cryptocurrency Custodians.” These individuals have custody, admin powers, and security towards crypto-assets (Koinly, 2021).
Along with BaFin, the BZSt provides clear guidance on the taxation and regulation of cryptocurrencies. For tax purposes, “Crypto-Assets” generally fall under income tax. That

being said, the tax is only administered when a profit of 600+ euros is made in the same year that the transaction occurred (BZSt, 2021). This is because the BZSt views some cryptocurrencies as property.

The BMWi has made monumental efforts in the regulatory sandbox space. While overseeing all activity within it, they have also published a guide as to creating a regulatory sandbox (BMWi, 2021). This helps other markets as they decide to move forward with launching a regulatory sandbox.

Ecosystem

E-Governance & Digital Identity
Within the German government, The Federal Ministry of Interior is responsible for the strategic direction and development of e-governance practices. Germany has developed a deep connection between its business organisations and government entities and understands that modernising public administration and data will attract more business. To do so, The Federal Ministry of Interior generated the E-Government Act which facilitates electronic communication (Federal Ministry of Interior, Building and Community, 2021). This allows authorities to create a user-friendly experience while digitising administrative services. While this Act doesn't explicitly denote that blockchain technology will be utilised, it creates opportunities for future practices due to the administration creating open data. This digitisation of records allows for smaller blockchain projects to form when working under the regulatory sandbox.

One initiative that the German government plans to implement and fund is the verification of educational certificates (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019). This action was set forth within the national blockchain strategy act that was released in 2019. This initiative takes on the form of digital identity by creating an electronic verification system using a blockchain network. Since the plan was created, the Government has announced the backing of a German innovation company called IDunion. IDunion is currently under its second phase in a secure digital identity project and has now gained partners including DB Systel, Deutsche Telekom, GS1 Germany, Robert Bosch, Siemens and many other associate partners (Insights, 2021a). IDunion plans to use self-sovereign identities to create a network of identity applications. All ranging from education, health, and other various solutions. Most notably IDunion plans to work with enterprise blockchain firm R3 to help facilitate this strategy (Insights, 2021a).

Healthcare
For the German Healthcare industry, digital identity is the most optimal use of blockchain technology. Its ability to allow access to personal data is the perfect entry point for the technology to be implemented (Bittroff and Sandner, 2020). Due to Germany's government back project system, digital identity management companies abide by GDPR regulations and provide safety for all users, companies, and public authorities. The German healthcare ecosystem creates a huge opportunity for this technology to be utilised. Currently, the ecosystem is very traditional where citizens are required to obtain either statutory or private health insurance (Bittroff and Sandner, 2020). Along with this traditional health insurance system, the healthcare industry contains traditional record keeping. In 2018, the federal commission of stakeholders ordered an organisation called "Gematik" to develop a strategy to digitalise the healthcare industry. This digitization of records allows for the opportunity to further develop digital identity with blockchain technology (Bittroff and Sandner, 2020). It also shows the government's understanding of how vital it will be to have access to digital records.

Another project that has proved to be a successful result of the regulatory sandbox was a government backed competition to find projects to reduce the number of counterfeit prescriptions. Of the projects presented, first place was awarded to a blockchain solution that specialised in the narcotics industry (Polanik, 2019). The network generated from the project allowed for a private blockchain between doctors, pharmacies, and supervisory authorities in a joint digital administration of prescriptions. The association of pharmaceutical manufactures stated that for these solutions to be successful in the future an encryption must be achieved to ensure that the data is protected (Polanik, 2019).

A recent project that occurred earlier this year was a COVID-19 Digital Health Passport consortium led by IBM (Insights, 2021b). German press released the Ubirch, a blockchain cybersecurity firm, had won a 2.7-million-euro tender. The initiative enabled a blockchain network to verify a citizen's health data. The project allowed users to store data on a mobile phone. A hashing function is created when a QR code is created (Insights, 2021b, p. 2). Previously mentioned, a trial is currently being run out of New York to verify health records at venues. Ubirch has deployed this effort at Frankfurt, Berlin, Hamburg and Dusseldorf airport (Insights, 2021b, p. 2).

Supply Chain
Due to the German government's close connection with its business landscape, it helps create plenty of opportunities for government backed innovations. In March of this year, the German Federal Cabinet adopted a bill that would create a new supply chain act for Germany (Grunert and Portge, 2021). At the centre of this act is the compliance of human rights along the supply chain. This ensures that when German organisations interact with suppliers, environmental and social standards are being maintained (Grunert and Portge, 2021). This verification allows for the potential Blockchain opportunities. The core component of this act that will help pave the way for blockchain technology is risk analysis (Hillemann, 2021). To perform a risk analysis, historical data must be collected to verify each block. The storing of that historical data sets up perfectly for a blockchain network (Hillemann, 2021). This will help create an efficient data stream. Smart contracts can be seen as a vital asset to this implementation because of its role in analysing complaint claims.

Germany also presents many current blockchain projects that are disrupting the supply chain industry. A study was performed analysing various large-scale companies that are incorporating blockchain technology in their methodology. Of those GS1 and Bayer have successfully integrated a blockchain in their practices. GS1 evaluated the traditional system of pallet tracking and mapping and was able to incorporate digital copies that allowed users to easily map out and track pallets (Teodorescu and Korchagina, 2021). Similar to many other healthcare industries, Bayer was able to implement a blockchain to track pharmaceuticals along the supply chain. Bayer was able to do this by registering timestamps and user identification information along route points. The immutable ledger component of the blockchain prevents any alterations of the stored data which is essential in tracking pharmaceuticals along the supply chain (Teodorescu and Korchagina, 2021).

Finance & Transactions
During the official release of the Blockchain strategy document in 2019 issued by the German government, officials set forth an impending future on the innovative technology. The German government understood the importance of its development and recognized how the technology has found its first practical application (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019). They then stated that within the next 5 years, there will be a need for a binding legislative framework that protects investors. The government recognized the urgency of this framework and stated it is, "A precondition for positive developments." The following year, the German government issued the regulations relating to crypto-assets, ICO's, and utility tokens mentioned in the regulatory environment. By laying the framework for blockchain technology's most practical application, it sets each individual industry up for success. Immediately following the passing of these regulations, the cabinet then passed new legislation to completely eliminate paperwork in securities

transactions (Jafar, 2020). This passing of legislature allowed for one of the oldest banking institutions in Germany, Hauck & Aufhäuser, to launch its first crypto fund (Ferreira, 2020). Dr. Holger Sepp, board member of Hauck & Aufhäuser, stated that this action has now created an innovative investment opportunity for consumers who are interested in securing new cryptos in an inexpensive and safe way (Ferreira, 2020).

Energy Sector
The redevelopment of the energy sector with blockchain technology is one of the biggest initiatives set forth by the German blockchain strategy. This industry was one of the main focal points of the regulatory sandbox and funded projects initiative. Within the strategy, the federal government stated, "In this regulated environment, no universally-valid statements can be made. Rather, it is important to learn from individual applications. The Federal Government will continue its project funding." This notes how essential it will be to fund projects to understand and research the best applications of the technology. In order to understand this framework within the industry, the federal government plans to examine the following opportunities (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019):

- → The federal government's 7th energy research programme studies the aspects of digitization that are relevant to the energy transition. This involves making it easier for start-ups to take part in the programme.
- → Within the framework of smart service welt II, energy-sector blockchain applications are used for learning in practice. These application examples range from a blockchain-based virtual large-scale storage unit for operators of photovoltaic facilities, via energy trading using blockchain, through to blockchain-based peer-to-peer trade.
- → The 'SINTEG' funding programme, showcasing intelligent energy, uses five large showcase areas to test sample solutions for a digitised energy sector.
- → The Copernicus project 'ENSURE - New Network Structures' likewise gives consideration to blockchain technology used in the energy transition.

Along with these initiatives the federal government is also piloting a blockchain-based link-up energy facility to a public database (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019). The government has already enacted a pilot program gathering results from blockchain based registration helped by the smart-metre gateway. Upon good results from the pilot program, the German government launched a project with non-profit organisation Energy Web in 2020 (Insights, 2020b). Most recently, the German ministry for Economic Affairs and Energy launched the three-year project to investigate use of blockchain in energy trading (Jones, 2021). This project was able to launch after the Federal Government established a cross-technology piloting laboratory to test specific applications under real-life conditions (Federal Ministry of Finance and Federal Ministry of Economics and Technology, 2019). This initiative allowed for the energy sector to work alongside society and public authorities to gain insight on technical assessments.

Ireland

Market Update: 15/5/2022

In early May, Ireland's tax and financial body, Revenue, announced the expansion of further guidance on cryptocurrency and regulations. They announced that individuals who purchase products or services with Crypto will now have to declare each purchase which will then be subject to a Capital Gains Tax (Ihle, 2022). While this may prevent future purchases in the future, the government has provided clearer guidance on how to approach crypto.

There is no new maturity grade needed as the regulatory policy update from the EU provided in the previous international market update laid out this occurrence.

Market Update: 22/3/2022

Please reference Germany: Market Update for EU Regulatory Framework update.

In April of 2021, the Irish government transposed the 5AMLD European Union directive which extended anti-money laundering and countered the Financing of Terrorism obligations to entities that provide services in the virtual asset industry (Central Bank of Ireland, 2022). This requires registration with the Central Bank for AML/CFT purposes. On-going AML/CFT Obligations require firms to act as "designated persons" and to comply with the requirements listed on the Central Bank of Ireland website (Central Bank of Ireland, 2022).

Since the research was conducted, a newly created chart of the blockchain ecosystem was created by the non-profit organization, Blockchain Ireland. Careful charting of the ecosystem allows the government to plan out research and development in various sectors (Blockchain Ireland, 2022a). Currently, there are more than 150+ open crypto/blockchain roles. The ecosystem is rapidly expanding as more tech organizations are setting up headquarters in Dublin (Blockchain Ireland, 2022b). This includes ConsenSys, CoinBase, Kraken, Crypto.com, Ripple, etc. Major financial institutions such as MasterCard, CitiBank, Fidelity (and more) are creating junior and senior roles within the industry as well. This is attracting massive talent from across the globe.

Previous Regulation Ranking: 3/5

Updated Regulation Ranking: 3.5/5

Due to the advancements and quick adoption of Ireland and the EU. it has allowed the Irish government to adopt new policies with ease. AML/CFT is an important regulatory policy to add and there are a few other strategies/regulations in place. The EU has allowed for easier adoption between participating countries.

Previous Ecosystem Ranking: 3.5/5

Updated Ecosystem Ranking: 4.5/5

The Ireland blockchain/crypto ecosystem is rapidly growing with new organizations expanding their headquarters to the nation. Remote working possibilities has allowed for even further opportunities to be opened within the country. This has attracted international talent from all over the world. Along with this rapid expansion, Blockchain Ireland has been able to help track open positions within the field and was able to help chart out the ecosystem. Being able to chart out the ecosystem allows for government entities to track development and identify key research opportunities when developing a strategy. With Ireland being an international Techhub, blockchain organizations are quickly moving to join the industry to

reak the tax benefits previously laid out in the research.

Strategy
The Irish federal government has made small strides in normalising blockchain usage within the business landscape. The government has yet to issue a roadmap or a national strategy. They have administered a discussion paper that discusses their hesitation and warnings regarding virtual currencies and blockchain activity (Department of Finance, 2019). This does not communicate a positive mindset to the Irish community. While there is no national strategy for blockchain, the country is committed to innovation and even administered a national artificial intelligence strategy. This was released in 2021, and mentions the smart contract nature of blockchain technology (Department of Enterprise, Trade and Employment, 2021).

There are few government bodies that monitor cryptocurrency and blockchain technology. This is because of how immature the technology is within the ecosystem. These include:

- → Industrial Development Authority (IDA) - An agency that acts in accordance with provisional industry development acts and serves the government in providing future directives regarding enterprise and innovation (IDA, 2021).
- → Central Bank of Ireland (Central Bank) - The central bank of Ireland is the safeguard for monetary and financial stability for the country (Central Bank, 2021a).
- → Irish Revenue - The monetary authority that oversees taxation of currency, securities, and more (Waine, Jennings and Lawless, 2021).

Regulatory
Ireland currently categorises cryptocurrencies as "Crypto-Assets" and they are currently permitted in the country (Waine, Jennings and Lawless, 2021). Instead of new regulations or amendments being created, crypto-assets are regulated under current legislation. The government has even issued statements regarding their hesitancy to develop a framework for the assets. They have been tagged as using a "wait-and-see" approach where they observe international and EU authority actions before implementing their own (Waine, Jennings and Lawless, 2021).

While the Irish government is hesitant in implementing a regulatory framework, the Irish Revenue office has released a tax and duty manual for cryptocurrencies (Revenue, 2021). They apply taxation based on the parties and activities involved in the transaction or transfer. The document states that these "crypto-assets" are subject to Income tax, Capital Gains Tax, and VAT in transactions (Revenue, 2021).

There is currently no regulatory sandbox within Ireland. Instead the Central Bank has created an innovation that administers support and advisory for firms innovating in the financial services sector (Central Bank, 2021b). Since it is an innovation hub, they aren't able to provide the same framework that a regulatory sandbox can deliver.

Ecosystem

E-governance & Digital Identity
Currently the E-Governance & Digital Identity is entirely privatised. One organisation that is innovating in the digital identity space is Aid:Tech. While the organisation is a digital finance organisation, they are using blockchain technology to create a digital ID to enable disbursements. This helps with instant verification so that transactions and processes can be made immediately (AID:Tech, 2021). Beyond Digital Identity, there is very little action towards E-Governance.

Healthcare
The healthcare industry has very minimal applications with blockchain technology. The entire industry is completely conversation based when discussing the possible applications of blockchain (The Irish Advantage, 2018). There have been many news outlets, consulting firms, and consortiums that have expressed a need for this space.

Supply Chain
The supply chain industry is a privatised industry as well with no government involvement. An application that has seen considerable success in this industry is Moyee Coffee. This organisation is utilising blockchain technology to give consumers the ability to verify each step of the supply chain. This is creating a transparent window towards the production and the transport of the products they are using (Moyee, 2021). Similar to the e-governance and digital identity industry, there really isn't that many organisations in the space utilising the technology.

Financial Services
The financial services industry is the most mature of the core industries in Ireland. There are many organisations using blockchain technology but without guidance from the federal government. An organisation disrupting the space is Circle. They are using blockchain technology to create an international payment and transfer platform (Circle, 2021). They have seen so much success that in 2018, Circle raised 118 Million euros in funding (Taylor, 2018).

Energy
There are very few entrants in the energy sector within Ireland. Even though the ecosystem is small, Solo Energy has seen considerable growth and success in the blockchain space. Solo Energy uses renewable energy battery storage (Solo, 2021). In 2020, Solo Energy partnered with SMS to create a smart flexigrid that enables a blockchain network for peer-to-peer energy (SMS, 2019). Again, similar to most industries within Ireland, the energy ecosystem is very small and has yet to see large amounts of growth.

Luxembourg

Please reference Germany: Market Update for EU Regulatory Framework update.

In Luxembourg, cryptocurrencies can be sold tax free after six months of possession

Strategy
The Luxembourg government has not issued a national strategy or roadmap for blockchain technology, but federal authorities have expressed their commitment to understanding the technology and its use cases. The government has even gone as far as issuing a statement saying that they will be the pioneer in blockchain technology for the EU (CSSF, 2021). Even though there is no official document stating their intended strategy, ILNAS, a Luxembourg agency, published a standardisation report in 2018 discussing the technology and its potential use cases (ILNAS, 2021).

In Luxembourg, there are few government entities that monitor blockchain and cryptocurrency activity. They consist of the following:

- → • Ministry of Finance - The highest level of government bodies that monitor the financial services sector.
- → • Commission de Surveillance de Secteur Financier (CSSF) - Administers regulations regarding the financial services sector (CSSF, 2021).
- → • Luxembourg Inland Revenue (ACD) - To implement regulation and legislation regarding direct taxation (ACD, 2021).

Regulatory
Luxembourg takes a very proactive approach to cryptocurrencies. Cryptocurrencies are permitted within the country and are classified as “Dematerialized Securities”. In 2019, the government amended laws to allow securities to be maintained in a digital decentralised format such as blockchain or distributed ledger technology (Pascual, Holle and Petit, 2021). This directly considers the digital aspect of the currency and does not mould its definition to fit within current legislation.

For taxation purposes, a cryptocurrency is only taxed when the currency is disposed of. The dematerialized security definition that was brought forth for cryptocurrencies allow it to be taxed as an intangible asset (Pascual, Holle and Petit, 2021). The tax associated with this intangible asset is income tax. This can be broken down into three categories: corporate taxpayers, individual taxpayers, and Luxembourg partnerships (Pascual, Holle and Petit, 2021). In some cases cryptocurrencies can be subject to VAT, but that’s entirely dependent on the nature of the transaction.

Luxembourg also has a very unique stance towards regulatory sandboxes. The Luxembourg government views not having such an environment as “sustainable.” This is because it forces the startup culture to understand the current environment of the business landscape (Pascual, Holle and Petit, 2021). It forces them to use real life applications rather than being in an environment where some aspects may not be possible. This can be seen as less welcoming, but instead creates a proving ground for startups.

Ecosystem

E-Governance & Digital Identity
E-governance and digital identity has proven to be Luxembourg’s most mature use case for blockchain technology. The ministry of digitalisation announced that Luxembourg will have its first public sector blockchain (Luxembourg Blockchain Lab, 2021). This will enable all departments to utilise the blockchain for various purposes. While use cases aren’t available to the public eye, the government is being very proactive in utilising the technology.

Healthcare
Beyond e-governance and financial services, Luxembourg doesn’t fully utilise blockchain technology within the healthcare industry. Currently there are few organisations that tap into the technology in this industry. One company that has seen success utilising the blockchain network is Medilogisitics (Luxembourg Blockchain Lab, 2021). They partnered with Blockcorp to generate a blockchain based project called eCertificate to track pharmaceuticals through a blockchain network (Blockcorp, 2021). This also taps into the supply chain industry.

Supply Chain
The supply chain industry isn’t an area of focus for the Luxembourg government. There is very little usage of blockchain technology within the industry. Besides the Medilogistics provided above in the healthcare section, there are very few occurrences of the technology. DHL, an international organisation however, is using Luxembourg as an HQ to innovate with the technology (DHL, 2021).

Financial Services
While E-governance & digital Identity are seen as the most mature application of blockchain technology, the financial services sector is the main area of focus for the country. LHoFT has released a Luxembourg blockchain map that highlights major players in payments, wallets, exchanges and more (LHoFT, 2021). The ecosystem is quite big and has seen many entrants.

Energy
Similar to the supply chain industry, the energy sector seems to be the industry with the least amount of blockchain applications and entrants. Luxembourg has companies innovating in sustainability but none within the energy sector.

Netherlands

Please reference Germany: Market Update for EU Regulatory Framework update.

There are no other significant advancements within the Netherlands market in regulation or strategy since the initial research was performed. There are no new maturity grades needed for this market.

Strategy
A federal government entity has not issued a national roadmap or strategy. The government has taken a step back to rely on public coalitions and consortiums to guide the government towards a blockchain future. One of those entities is the Dutch Blockchain Coalition (DBC, 2021). They are a government backed public coalition that acts as a joint venture between the government, knowledge institution, and industry. In 2018, the DBC released a vision document that laid out the next steps in the pre-competitive phase (DBC, 2018a). This included orienting the government with the technology, exploring the many use cases it has to offer, researching ways to implement the projects, and experimenting with those projects in the public world. There are three main entities that govern blockchain technology and cryptocurrencies in the Netherlands. These include:

- → Central Bank of the Netherlands - Central institution that helps regulate financial services to protect the consumer (Wasinger, 2021).
- → The Dutch Tax Authority - Administers guidance and regulation regarding the taxonomy of currencies and finance (Business.gov.nl, 2021).
- → Dutch Blockchain Coalition - The central steering committee that acts as a government guide towards blockchain project creation (DBC, 2021).

Regulatory
Currently, under Dutch law, cryptocurrencies are classified as an intangible fixed asset rather than a digital currency. They are seen as inventory or other investment for taxation purposes. Due to this nature, they do not qualify as legal tender, cash equivalent, or any other form of currency (Röell and Godlieb, 2021).

Since cryptocurrencies are classified under intangible fixed assets, inventory, or other investment, they are subject to capital gains tax and income taxes for businesses. This is because they are generally classified as property (Wasinger, 2021). Individuals that express ownership of this property are subject to a capital gains tax. Businesses that transact with the cryptocurrencies are subject to an income tax but due to various classifications it creates confusion (Röell and Godlieb, 2021).

Instead of a regulatory sandbox, the Dutch government utilises an InnovationHub which acts as a soundboard for future innovation projects. The soundboard is a support system where companies can express ideas and receive consultant POVs and advice to facilitate the projects (Netherlands Bank, 2021). Along with InnovationHub, the Netherlands have the first Blockchain Development Campus in the world. This is specifically utilised by organisations looking to innovate with the technology. It helps foster growth and develops maturity for the industries (Finextra, 2016).

Ecosystem

E-Governance
The general ecosystem is very strong across all industries. Part of the blockchain vision document that the DBC released was a project to produce a Self-Sovereign Identity (DBC, 2018b). The DBC is actively pursuing plans to deliver a SSI into the dutch marketplace. Their vision is to partner with an already deployed digital ID company to facilitate this application (DBC, 2018b). This search for a partner led to DigiD. They are going to be helping create this application for the Dutch Government.

Healthcare
Another industry where the government is currently leading a project is in the healthcare industry. Due to its hyper proactiveness, the industry is very mature due to how involved the government is in the area. Currently, the government is leading a project where the healthcare system can gain legal certificates for DLT usage. Pels Rijken is the first institution to gain an official legal certification to allow for blockchain technology within business practices (Finextra, 2016).

Supply Chain
The supply chain industry does not see government involvement, but instead consortiums are leading the way to help innovate the industry. The Dutch Logistics consortium released a statement in 2016, saying that they will fund a project experimenting with blockchain technology to help with supply & chain financing (Sok, 2016). This project would involve TKI Dinalog to merge the tech within business practices.

Singapore

In late 2021, the MAS placed an Investor Alert on the popular cryptocurrency exchange, Binance. The alert came after Singapore residents failed to have appropriate licenses under the Payment Service Act which was enacted in 2019 (McHugh, 2022). The MAS then issued new laws regarding curbing advertising and promotions of digital assets.

In January of 2022, the Monetary Authority of Singapore issued guidelines that discouraged the general public to partake in trading digital assets or cryptocurrencies (McHugh, 2022). The MAS further noted that they are expecting industry participants to implement tests to help ensure that customers understand the risks associated with actions within digital currencies.

In February of 2022, the MAS released the Explanatory Brief for Financial Services and Markets Bill 2022, which further enhanced regulation related to Anti-Money Laundering and Counter-Terrorism for virtual asset service providers (Monetary Authority of Singapore, 2022).

There are no new maturity grades needed within the Singapore market as they are a leading government body that has excelled in fostering a blockchain ecosystem.

Strategy
Currently, there is not a national blockchain strategy or roadmap that's issued by the federal government. While this may be the case, the government is still very active in the blockchain world. In 2020, the national government invested $8.9 MM into the Singapore Blockchain Innovation Programme (SBIP, 2021). SBIP is a national programme that was created by the federal government to oversee blockchain technology and its applications within the country. SBIP works in conjunction with the Infocomm Media Development Authority due to its innovative disruption in the economy (Infocomm Media Development Authority, 2021).

To oversee blockchain activity there are many governing bodies that observe its activity. From taxation, regulation, to industry acceptance the government takes a big role and addresses who monitors what. The following list breaks down each governing body and their individual role:

Singapore Blockchain Innovation Programme (SBIP) - Programme that helps administer guidance for blockchain activity (SBIP, 2021).
Enterprise Singapore (ESG) - Government agency that helps grow the enterprise industry in Singapore (ESG, 2021).
Infocomm Media Development Authority (IMDA) - Government authority that helps all connect innovation to the public media (Infocomm Media Development Authority, 2021).
National Research Foundation (NRF) - Government foundation that administers research for projects lead by government authorities.
Monetary Authority of Singapore (MAS) - The monetary authority of the Singapore government oversees all regulations regarding currency and monetary action (MAS, 2021a).
Inland Revenue Authority in Singapore (IRAS) - Administers taxation regulation and legislative frameworks regarding the transactional fees associated with currencies in Singapore (Dutta, 2021a).

SmartNation Singapore - A government agency that specialises in transforming Singapore through technology (SmartNation, 2021).

Regulatory
It is permitted to hold and trade cryptocurrencies within the country of Singapore. While this may be the case, it is not considered legal tender (Dutta, 2021a). The MAS is the sole regulator for cryptocurrencies within Singapore. They classify cryptocurrencies as securities. Instead of applying the current legal framework to these securities, the MAS has amended current legislations so that cryptocurrencies have their own definition (Dutta, 2021a).

Within Singapore, stable coins are the only cryptocurrencies that are subject to taxation. This is because they are categorised as goods within the goods & services tax. Since the MAS has helped reclassify the definitions of digital payment tokens, they are not subject to any capital gains tax. This is largely in part to the fact that Singapore has no capital gains tax in general (Dutta, 2021a).

Singapore offers two innovative methods for administering guidance within the blockchain and fintech space. The MAS has generated a regulatory sandbox that is similar to all other markets (MAS, 2021b). Unlike most though, the MAS offer an express option which fast tracks approvals for future implementation (MAS, 2021b). Along with the regulatory sandbox, SBIP offers an innovation hub that utilises POV/POC consultation for organisations looking to apply the technology (Shu, 2020).

Ecosystem

E-Governance & Digital Identity
E-Governance has been an essential piece to Singapore's government. Since the mid 1990's, the government led an initiative to lay the framework for a completely digital government (Ke and Wei, 2004). This consisted of fully digital websites that hosted each department's information. While they were localised and fragmented, they became the first digital integration that citizens can access on the web. By 1999, Singapore launched its first E-citizen portal, which was way ahead of its time (Ke and Wei, 2004). In 2000, Singapore then jumped to its infusion stage where the government developed an action plan that conceptualised the future of information communication technologies. To do so they needed a strong support system, a centralised funding and common infrastructure, and a customer centric system

(Ke and Wei, 2004). By 2001, they were able to customise various e-service agencies to create one unique vision so that they can be viewed as one government (Ke and Wei, 2004). This strong foundation created allowed for future opportunity and innovation. Now, Singapore uses Smart Nation. Smart Nation is a government agency that is helping guide the transformation of Singapore through technology. Smart Nation identifies innovative tech that will help ease processes in the future. Smart Nation is currently using Blockchain technology through its OpenCerts initiative (Smart Nation, 2021a). This platform allows the government to issue and validate tamper proof certificates.

Blockchain technology has also been the centre of attention regarding digital identity. Based on the 2020 Blockchain ecosystem in Singapore, there are a total of 15 organisations that use blockchain technology for digital identity and credential verification (Infocomm Media Development Authority, 2021). In 2020, the Government developed a blockchain based digital health passport to manage medical records for COVID-19 (Yu, 2020). Besides OpenCerts and the Digital Health Passport, there are no government backed initiatives that utilise blockchain technology for digital identity. Currently the Government uses National Digital Identity, which verifies authenticity through 2-step verification (Smart Nation, 2021b).

Healthcare
As previously mentioned, the Singapore Government tapped into local organisations SGInnovate and Accredify to develop a Digital Health Passport to manage health data for the COVID-19 pandemic. Since the pilot was launched, it verified more than 1.5 million discharge memos (Yu, 2020). This proved to be a successful pilot that was funded by the government. It shows the gap in healthcare that blockchain could help fill. When looking at the 2020 blockchain ecosystem, the Info-communications Media Development Authority accredits two healthcare organisations that use blockchain technology in their current practices (Infocomm Media Development Authority, 2021). These consist of White Coat and Medilot. White Coat is a telecommunications-based healthcare application that allows citizens to communicate with GPs. It uses blockchain technology to send and receive private information (White Coat, 2021). White Coat generated funding through the global blockchain accelerator tribe. MediLOT is an advanced healthcare platform that helps patients, organisations, and developers to access an electronic health record. This unique tool uses blockchain and artificial intelligence to help predict solutions (MediLOT, 2021). While these two developers were listed on the blockchain ecosystem report of 2020, there are already more start-ups joining the space.

Supply Chain
According to Info-Communications Media Development Authority, at the end of 2020 there were 18 total supply chain organisations innovating with blockchain technology (Infocomm Media Development Authority, 2021). One of the first applications that was seen in the supply chain space in Singapore was from a startup organisation called DiMuto. DiMuto launched a blockchain tracing platform that tracked the transport of durians from Thailand to China (Collen, 2019). While this was one form it gained interest from the Singapore government. In 2020, government agencies established a $8.9 million fund that will help explore the use of blockchain in order to verify creditworthiness of farmers across the country (Ellis, 2020). While this was just one example of a government backed initiative, there are many other private organisations that continue to shape the supply chain with blockchain technology. Ranging from instant cargo bookings for the airline industry all the way to tokenizing livestock, Singapore organisations are rethinking how we can tackle blockchain in the supply chain industry (Infocomm Media Development Authority, 2021).

Finance & Transactions
Fintech is the largest growing industry in Singapore. At the end of 2020, the info-communications media development authority claimed that over 45 current financial services institutions were using blockchain technology. Along with that list, 35 more were using blockchain technology for decentralised finance (Infocomm Media Development Authority, 2021). Through this government recognized list, it shows how deep rooted blockchain technology is within the financial system. The largest government led project in the financial industry was led by the Monetary Authority of Singapore. This initiative was called Project Ubin. This project was to provide MAS with a first-hand experiment to bring light to the potential benefits of blockchain technology (MAS, 2020). The overall goal of the phased project was to develop a process to clear and settle payments with blockchain. The initiative started in 2016 and partnered with major financial institutions such as Bank of America Merrill Lynch, Credit Suisse, DBS Bank, JP Morgan, OCBC, R3, Singapore Exchange and many more. The 5 phased experiments concluded in 2020 (MAS, 2020). The experiment ended with a plan to test out multi-currency payment and delivery systems. JPMorgan and Telemask are continuing to test the network to understand learnings for future developments.

Energy Sector
Singapore is home to one of the first actual renewable energy marketplaces that has passed testing and experiment stages. In 2018, SP group launched one of the world's first blockchain based energy trading certificate platforms (SP Group, 2018). The platform enables local and international organisations to purchase renewable energy certificates. At the time of the launch, City Developments Limited and DBS were the first to purchase the certificates (SP Group, 2018). SP Group connects buyers with sellers of renewable energy. This helps organisations reach their sustainability targets. While this is one organisation that is creating waves across the world, the info-communications media development authority notes that there are two other organisations that are innovating with blockchain technology in the energy sector (Infocomm Media Development Authority, 2021). Similar to SP Group, T-RECs.ai is offering a similar renewable energy certificate trading platform. The other government recognized organisation is a peer-to-peer energy trading organisation called Electrify. These organisations are innovating the energy sector industry in Singapore.

Switzerland

There are no other significant advancements within the Swiss market in regulation or strategy since the initial research was performed. There are no new maturity grades needed for this market as they are a leading government body that has excelled in fostering a blockchain ecosystem

Strategy

There is currently no government issued roadmap or national strategy within Switzerland for Blockchain Technology. Switzerland, however, is the blockchain leader within the financial services sector and has more applications than any other market. Since there is no government issued roadmap, there have been other advancements that portray a strategy towards blockchain activity. Switzerland was the first nation to administer Initial Coin Offering guidelines and how to approach them (FINMA, 2018). Along with these guidelines, the federal government released the DLT act, which ensures blockchain activity and regulations are fit within society (Flühmann and Hsu, 2021).

Due to Switzerland's early adoption to cryptocurrency, there are few organisations that look after blockchain activity. They consist of the following:

- Swiss Financial Market Supervisory Authority (FINMA) – FINMA holds all regulatory and authoritative power regarding cryptocurrency, currency, and monetization. They facilitate and administer regulations regarding any actions and activities regarding potential currencies (FINMA, 2018)
- Federal Tax Administration (FTA) – The FTA is the federal tax authority of Switzerland. They

administer guidance on tax frameworks for all assets on currencies (FTA, 2021).

Regulatory

Switzerland has the most systematic approach to cryptocurrencies out of any international market. They have clear classifications for each type of cryptocurrency. Currently, they offer classifications for Payment, Utility, Asset, and Hybrid Tokens. These definitions and classifications were generated form the ICO guidelines previously mentioned (Flühmann and Hsu, 2021).

Because of this clear understanding of each of the various types of cryptocurrencies, the FTA is then able to provide unique policies for them. Unlike any other nation, the FTA provides a wealth tax, where cryptocurrencies must be converted to Francs. They are also subject to income and legal entity tax (FTA, 2021). Due to the wealth tax, cryptocurrencies are not subject to capital gains (Dutta, 2021b).

While it is not typically referred to as a regulatory sandbox, The Federal Council created an authorization exempt area where businesses can test and experiment new innovative applications (FINMA, 2021). Along with this sandbox, Switzerland is also the first nation to create a FinTech license which allows for the public to fund projects with a maximum ceiling amount (FINMA, 2021).

Ecosystem

E-Governance & Digital Identity

Currently, there are many blockchain based projects being actively applied in the field of e-governance and digital identity. Many of these projects are being worked on in small cantons and cities within Switzerland. As previously mentioned, the Canton/City of Zug is the “Valley of Crypto” and is home to many of these projects. In November of 2017, Zug offered its residents to gain a digital identity that is linked to the Ethereum blockchain (Stadt Zug, 2020). This blockchain based application gives users the ability to have a digital safe deposit box, generates an unchangeable crypto address that is linked to the digital locker, and allows usage of the certification portal (Stadt Zug, 2020). By laying the framework for this digital identity, it has opened future opportunities for Zug. For instance, following the launch of the blockchain based digital identity application, Zug then produced a survey amongst those registered on the acceptance of e-voting. After gathering the data from this report, over three quarters of individuals said they would accept e-voting if it were implemented (Stadt Zug, 2018).

Along with Zug, Geneva is making strides to incorporate blockchain technology in e-governance. Geneva launched a project following the blockchain innovation strategy that would allow for electronic processing and archiving of official documents on a blockchain network (Digital Geneva, 2019). This blockchain based system would allow the general public to order digital extracts online and verify that the extract has been issued by the government.

Healthcare

Switzerland is a top innovator in terms of incorporating blockchain technology in the healthcare industry. Besides Estonia, Switzerland is one of a select few countries to incorporate blockchain across many different facets of healthcare. Previously mentioned, Innosuisse, an innovation promotion agency, is supporting many projects when it comes to blockchain technology. The key areas where funding is being allocated is biotechnology, MedTech, and blockchain health (Sobotkowski, 2019). Currently, there are three areas that are disrupting the healthcare space. These consist of a distributed peer-to-peer blockchain platform that connects institutions with individuals, a medical device tracking system, and a biopharmaceutical tracking system.

One innovative platform that’s helping protect individual health information while making it easier for users to connect with institutions is SANA. SANA essentially allows digital governance of personal data allowing the transfer of information to be secure and easy (SANA, 2021). The platform allows users of all types (patients, administration, doctors, etc.) to effectively use the platform on a tamperproof network (SANA, 2021). SANA is approved by FINMA and is now listed as a secure token offering which allows any person to contribute towards future projects.

In 2017, the European Union issued a medical device regulation that requires all medical devices to have a unique registration number. This allowed for easier tracking across the supply chain. Select hospitals within Switzerland worked in conjunction with Anandic System Medical and ITRIS medical to facilitate a blockchain backed system to trial their orders. Xatena joined the process to create an infrastructure (Med-Tech, 2020). This blockchain allowed institutions to track medical devices without having to worry about fraudulent activity.

Like many other countries, incorporation of blockchain technology within the pharmaceutical industry has become a standard practice. While the standard pharmaceuticals don’t require refrigeration, the health industry is leaning in the direction of issuing biopharmaceuticals which require refrigeration when being transferred. A high-tech firm by the name of SkyCell has created a blockchain enabled refrigerated air freight container that is designed specifically for the needs of biopharmaceuticals (Hampstead, 2018). With the COVID-19 outbreak, biopharmaceuticals have an increased need for a device like the offering of SkyCell. With the groundbreaking device in 2018, SkyCell has led to many pharma blockchains companies.

Supply Chain

Many pharma organisations are relying on blockchain technology to track the history of prescriptions and other medical devices throughout the supply chain. All this information can be accessed above. Switzerland is also home to many private, public and government backed organisations that are disrupting the supply chain industry with blockchain technology. Currently, there are 15 supply chain startups that are utilising blockchain technology. All ranging from tracking raw materials, transportation services, connection tracking, e-bike sharing, product counterfeiting, etc. (Tracxn, 2021).

The use of blockchain technology is continuing to see growth within this industry and many major companies are looking to adopt similar strategies. For instance, defence contractor, Lockheed Martin, has adopted blockchain for supply chain management. In April of this year, Lockheed Martin announced the partnership with SyncFab and will provide Lockheed Martin with a secure platform that connects original equipment manufacturers to Swissmen members all over Switzerland (Bourgi, 2021).

Finance & Transactions

As previously stated throughout this market analysis, Switzerland’s financial industry is the cornerstone for innovation and economic drive. The Swiss government has ensured that the financial industry is well equipped to tackle any problem that may be addressed in the near future regarding cryptocurrencies and blockchain technology. This information can be found within the regulatory environment section stated above. Due to its extensive regulatory environment within the finance industry, many major institutions have had ongoing efforts to implement blockchain technology. In 2020, the fintech and financial industry grew tremendously. For example, SIX, the principal stock exchange, announced that they will be launching a new digital asset offering for banks and financial institutions in partnership with Custodigit (Fintechnews Switzerland, 2020). SIX also launched the first blockchain based trading platform called SDX in early 2021. With that launch, they have gained many partnerships with ventures from Singapore and many other financial institutions. This is solely due to the Blockchain Act that went live in February of 2021. The Blockchain act allows

for recognition of blockchain based companies through registration rights, regulation on crypto-based assets, and the creation of a new authorization category for trading facilities and exchange platforms (Allen, 2020) (Gesley, 2021).

Energy Sector
The energy sector for Switzerland has mainly remained in a testing and project phase in terms of blockchain applications. The breakthrough disruption that blockchain technology has enabled in the energy sector is the yearlong trial test for a town's electrical grid. The project was launched in 2019 and was completed in the first quarter of 2020 (Ali, 2020). For exactly one year, the community of Walensdtat traded locally produced power on a microgrid. This project was funded by the Swiss Federal Office of Energy and was entitled Quartierstrom. The utility provider of the town, Electricity Works Walensdtat, purchased any surplus energy and supplied those that could not meet demand (Ali, 2020). While results showed that the blockchain adaptation could be intensive, the amount of engagement within the platform was exceptionally high (Ali, 2020). People were more drawn to the movement of energy than initially expected. While this is the first actual successful application of blockchain technology within the energy sector in Switzerland, there are proposals currently being worked out for a larger number of participants with updated tech and smarter algorithms.

United Kingdom

In January of 2022, the UK government strengthened the rules and regulations on misleading cryptocurrency adverts (HM Treasury, 2022). The aim of this action is to protect consumers from misleading claims. Adverts will be brought into line with other financial advertising to ensure that they are clear and fair to the general public.

In late 2021 and early 2022, the Financial Conduct Authority of the UK has been issuing licences to operate as crypto firms within the UK. This licence/approval will be a requirement for running a UK-based digital asset business from April onward (Oliver and Noonan, 2022). These guidelines became very apparent after the FCA issued a statement regarding the partnership (partial acquisition) between Binance and EQONEX. The FCA released a statement saying that they have the authority to allow digital asset businesses to operate within the UK (FCA, 2022).

Market Update: 15/5/2022

As of April 4th, 2022, The Treasury has asked the Royal Mint to create an NFT to further push the United Kingdom ahead of other international markets in terms of innovation and technology adoption (Partington, 2022). Rishi Sunak, the chancellor of the exchequer asked the institution in an effort to take a forward-looking approach to the future.

Shortly after the request from Rishi Sunak, John Glenn, announced in April that the UK Government has confirmed that they would officially bring the issuing or facilitating the use of stablecoins used as a means of payment into the UK regulatory perimeter (Race, 2022). This is a major milestone for blockchain and crypto from a regulation standpoint.

The United Kingdom is also looking to expand its efforts from a policy and ecosystem standpoint as conversations are beginning to take place to provide tax incentives for crypto startups and investors (Levingston, 2022). This could potentially make way for larger funding rounds for organisations in the startup phase of their company lifecycle. This comes as the EIS and SEIS are encouraging and incentivising investors to back new companies (Levingston, 2022).

Previous Ecosystem Ranking: 4/5

New Ecosystem Ranking: 4.5/5

The United Kingdom is continuing its efforts to serve as a breeding ground for new crypto/fintech startups. The tax incentivisation plan and conversation within government policy are evidence that they are aiming to lead the space and become a hub for innovation.

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Strategy
In 2020, the British Blockchain Association partnered with the Centre for Evidence-Based Blockchain to deliver a 10-15-year roadmap for blockchain technology within the United Kingdom. The roadmap sets forth a step-by-step recommendation on how to deliver excellence in Blockchain Applications. From recommending a "quadruple helix" ecosystem to avoiding redundancy with evidence based policy making, this roadmap sets the UK up for a bright blockchain future (BBA, 2021).

Along with Governing bodies that monitor cryptocurrency and blockchain activity. The UK is home to one of the world's only governments appointed cryptocurrency Task Forces. The following bodies oversee this framework:

- UK Financial Conduct Authority (FCA) - The FCA is the lead government body that oversees and administers regulations regarding the financial services sector within the UK (FCA, 2021).
- UK Cryptoassets Task Force - Government appointed body that administers guidance to help other departments and the public understand cryptocurrency activities (Davis, Maxson and Moyle, 2021).
- Authority HM Revenues and Customs (HMRC) - The HMRC is the governing body that regulates taxation. They handle all tax matters including person, business, transaction, etc... (HMRC, 2021a).

Regulatory
Cryptocurrencies are currently permitted within the UK. The Cryptoassets Taskforces categorises cryptocurrencies as "Cryptoassets." Within this categorization they have algo created definitions regarding exchange tokens, security tokens, and utility tokens (Davis, Maxson and Moyle, 2021).

These clear definitions allow for the FCA to interpret them and provide a clear taxonomy that the HMRC utilises when engaging with the public (Davis, Maxson and Moyle, 2021).

This creates the foundation for a clear taxonomy. While this may be the case, some cryptocurrencies are looked at in a case-by-case system. This is due to the rights and structure of the cryptoasset (HMRC, 2021b). Individuals are typically taxed through CGT or income. For businesses, the taxed used mainly consists of VAT, but differs based on each token used in the transaction (GLI, 2021).

The United Kingdom is home to the world's first regulatory sandbox (FCA, 2021). The FCA was the first to administer such a programme and has sparked a following amongst all developed nations in the world. The sandbox was started in 2015 and was to allow businesses to test innovative propositions in the market, with real consumers (FCA, 2021). After ongoing tests with the sandbox, the FCA has released statements saying that organisations that join the sandbox receive more funding than those who don't (FCA, 2017).

Ecosystem

E-Governance & Digital Identity
Digital Identity and E-Governance has seen some major strides in the UK. Previously mentioned, the UK is a member of the Digital Nations which forces them to think technologically when implementing new ways of working. While this is forward thinking, the UK has seen much controversy in this industry and talks regarding digital identity have become very political. In 2016 the UK launched Gov.uk Verify which was a digital identity system that allowed its users to access personal information in a secure location. This digital database was supposed to ease processes across many departments and streamline various uses. Since 2016, the government has invested 200 million pounds in Verify and had an overall goal of reaching 25 million users by 2020 (Glick, 2021). Since that initial launch in 2016, the HM Revenue & Customs department sparked internal struggle by using another core digital identity system. This clash has created cross departmental struggle and has created many problems for the GDS and their vision to have a universal digital identity programme (Glick, 2017).

In May of this year, the government decided to abandon Verify due to, "Overelaborate expectations and cost" (Wintermeyer, 2021a). Shortly after this decision, a financial services bill was passed in parliament allowing the usage of a Distributed Digital I.D. System. This is the first system of its kind in the UK to be backed by the government. With the launch of Verify in 2016, the Government released a blog regarding their hesitations using a distributed ledger technology like blockchain. Now, the government has grown tremendously allowing the use of a distributed system to secure citizen's identification. This could very well be the first step to incorporating smart contracts, hashing, and blockchains in the future (Wintermeyer, 2021b).

Healthcare
Many countries are looking to utilise blockchain technology to organise health records, facilitate prescription orders, and decentralise various other medical information. The UK is one of the first countries to utilise Blockchain technology in the midst of the coronavirus pandemic (Kahn, 2021). In January of this year, the UK government called upon UK firm, Everyware and US organisation, Hedera, to keep a digital record of temperature sensitive vaccines (Browne, 2021). Everyware's digital tracking systems combined with hederas encrypted blockchain network to develop this hallmark solution. The NHS facilitated this usage and showcased a modern solution on the world stage.

Along with this most recent blockchain disruption, Shivom, a data sharing & analytics marketplace is reshaping how healthcare professionals observe clinical data. The company has generated over 22.9 million pounds of funding after one round of funding and a small grant (Beauhurst, 2021). Shivom disrupts this industry by streamlining the time it takes for physicians to gain access to personalised reports and statistics regarding conditions and treatments (Shivom, 2021). This use case has shown that with access to more data, users have the ability to receive data faster and more efficiently.

Supply Chain
The UK has disrupted the supply chain industry with blockchain technology from pharmaceuticals to luxury goods. Many big consulting firms are helping facilitate this disruption by providing strategic consulting. DHL partnered with Accenture to bring forth a serialisation prototype to track pharmaceuticals across the UK (Trueman, 2019). In recent years, the pharmaceutical industry has been plagued with black-market medications and fraudulent activity that results in lives being lost. Along with this, the pharma industry was due for an innovative strategy because of how vital it is to provide the right person with the correct medication (Trueman, 2019). While this area taps into the healthcare industry, it is important to understand that the transport of these medications is vital.

Beyond pharmaceuticals, the supply-chain industry in the UK was changed for the better after the entrance of Everledger. Everledger is a blockchain platform that creates transparency for high-value products. This includes diamonds, wine, art, etc. It enables artificial intelligence and the Internet of Things to secure digital records. Everledger uses blockchain technology to verify each step in the supply chain process. Each block consists of evidence from origin, ownership, and characteristics of the product (Everledger, 2021). Everledger is currently the third most funded blockchain company raising a total of 23.5 million pounds (Beauhurst, 2021). Everledger's technology and platform is backed by many different companies around the UK and is recognized for its industry innovation.

Finance & Transactions
The financial industry in the UK has seen the most advancements of blockchain technology usage of any industry. Since the creation of the regulatory sandbox in 2016. There have been numerous waves of cohorts looking to disrupt the financial industry using distributed ledger technology/blockchain technology. As previously mentioned, the creation of this regulatory sandbox has allowed businesses the ability to test innovative products and services within a government-controlled setting (FCA, 2017). It has then led to organisations transitioning out of the sandbox ensuring they have the permissions they need. The industry has seen entrants from organisations looking to disrupt bonds, insurance, exchanges, transactions and so on. It has also lead to the creation of marketplaces using distributed ledger technology. The highest funded blockchain backed organisation is Blockchain.com. Blockchain.com is one of the largest online crypto wallets that enable users to instantly purchase a range of currencies using their debit or credit card. They have raised 356 million pounds in funding and has successfully completed two acquisitions (Beauhurst, 2021).

Beyond exchanges, there are other companies reshaping the financial industry. Nivaura is using blockchain technology to develop a software that helps digitise and automate capital market flows (Nivaura, 2021). They are the highest funded organisation that's performing these kinds of actions. This helps streamline bond issuance and organises data management. This is just one example of the diverse financial landscape for the UK in blockchain technology. The financial industry has proven to be one of the most mature business landscapes for blockchain technology to enter in the UK.

United States

As of May 4th, California signed an executive order on cryptocurrency which will embrace Blockchain Technology within the state and spell out a road map on regulatory and consumer protections (Khorram, 2022). The announcement comes after the Biden administration issued an executive order on digital assets in March of this year. This is the first state body to act on the national executive order and lays the groundwork for other states to follow.

Previous Strategy Ranking: 4/5

Updated Strategy Ranking: 4.5/5

This is the first step in developing a national regulatory framework for cryptocurrency across the US. As more states decide to lay out a framework for cryptocurrency and blockchain, a more cohesive strategy will be the result. The executive order takes meticulous detail on how it will protect the consumers and when they aim to accomplish the order.

Market Update: 22/3/2022
After ongoing discussions regarding the definition of certain digital assets, In March of 2022, President Biden signed an executive order on Ensuring Responsible Development of Digital Assets. This was the first Whole-of-Government Strategy to Protect Consumers, Financial Stability, National Security, and Address Climate risks.

The executive order calls for measures to:

- Protect U.S. Consumers, Investors, and Businesses
- Protect U.S. and Global Financial Stability and Mitigate Systemic Risk
- Mitigate the Illicit Finance and National Security Risks Posed by the Illicit Use of Digital Assets
- Promote U.S. Leadership in Technology and Economic Competitiveness to Reinforce U.S. Leadership in the Global Financial System
- Promote Equitable Access to Safe and Affordable Financial Services
- Support Technological Advances and ensure responsible development and use of Digital Assets
- Explore a U.S. Central Bank Digital Currency (CBDC)

Previous Strategy Ranking: 3/5

Updated Strategy Ranking: 4/5

The United States government previously did not have a national strategy in place to help guide cryptocurrency and blockchain development in the future. The newly signed executive order ensures a future dedication by the US government to the asset class/technology. While the order doesn't dive into a specific roadmap, it details what the focus of the government is going to be.

Strategy
The United States Government has not released any roadmap or guidance regarding cryptocurrencies or blockchain technology. While there isn't any government issued guidance there have been bills to outline a path for the technology (Nelson, 2020). This was brought forth because of an outrage from political members and public consortiums. The Chamber of Digital Commerce even brought forth an action plan for the US to utilise, but still has seen no action (CDC, 2019).

The US has many governing bodies that oversee financial services, monetary activity, taxation, and securities. These governing bodies help with overseeing cryptocurrency and blockchain activity. They consist of the following:
Securities and Exchange Commission (SEC) - Responsible for overseeing and administering regulations regarding security and exchange activity (Dewey, 2021).
Commodities and Futures Trading Commission (CFTC) - Responsible for evaluating commodities in a trading and exchange scenario. This includes cryptocurrencies (Dewey, 2021).
Internal Revenue Service (IRS) - Responsible for all taxation regarding currency and monetary services (Dewey, 2021).
Federal Trade Commission (FTC) - Responsible for preventing anticompetitive, deceptive, and unfair business practices (FTC, 2013).
Office of Comptroller of Currency (OCC) - Ensure that national banks and the associations within the US operate in a fair and safe manner having access to financial services (OCC, 2019).
Financial Crimes Enforcement Network (FinCEN) - Enforcement body that evaluates financial crimes within the US (Dewey, 2021).

Regulatory
Cryptocurrencies within the United States are permitted and typically categorised as an "Investment Contract" or a "Security." In order for a cryptocurrency to be permitted, they must be registered with the SEC (Dewey, 2021). While there is national guidance discussing the allowance of cryptocurrencies by the federal government, each individual state has the ability to invoke other regulations regarding them (Dewey, 2021).

The IRS has come forth and stated clear guidance for how cryptocurrencies must be taxed. They stated that they will be taxed as property instead of currency. This means that individuals and businesses must keep records of activity regarding cryptocurrency activity in order to pay taxes on capital gains and more (Little, 2021).

The United States is one of the few markets where multiple regulatory sandboxes are allowed. Previously mentioned, each individual state can administer guidance based off of their interpretation of the federal law (Dewey, 2021). This allows them to enable different environments for regulatory sandboxes (Hemphill, 2021).

Ecosystem

E-Governance & Digital Identity
E-Governance and Digital Identity has become an increasingly important topic within the US government. In 2020, congress introduced the "Improving Digital Identity Act of 2020" (Foster, 2020). This was introduced to the government as the COVID-19 pandemic exposed the governments' lacking digital identity programme (Magrath, 2020). Due to the increase of unemployment during the global pandemic, US citizens began to apply for federal unemployment which enabled fraudsters to take advantage of the digitally weak system. The "Improving Digital Identity Act of 2020", if passed, would bring forth a singular vision to tackle digital identity for the entire government (Magrath, 2020). While the government has not brought forth a specific strategy, this initial start has led to the entrance of organisations pushing forth their ideas. IBM for instance is bringing forth an alpha product that verifies credentials and creates a decentralised identity system. This system builds on top of standard combined with the decentralised identity foundation and world wide web consortium (IBM, 2021). While there are no actively pursued projects, the "Improving Digital Identity Act of 2020" has started the discussion.

Beyond Digital Identity, E-Governance has played a backseat role in terms of issues being addressed by the US Government. Access to digital data allows for the government to create opportunities in e-voting, healthcare, and tax returns. Adoption to this form of data has proven to be very difficult by the US as well as other governments (Chadwick, 2003). More notably, the US saw this increasing issue during the most recent election. Former President Trump criticised the Federal Election Commission saying that there was voter fraud within the postal system. The head of the federal election commission responded saying there is less than a .0009% chance of voter fraud in a US election according to a survey in 2017 (Reality Check Team, 2020). This begs the question if proper digital data collection is needed for future elections or processes.

Healthcare
The healthcare industry within the US creates a unique opportunity to be disrupted by blockchain technology. Due to its complex system of private and government issued practices, it is due for a reformation. While there are many entrants who are reshaping smaller aspects of the healthcare industry, the US is still very immature in terms of its digital adaptation. In comparison, Estonia is leading the innovative front by fully utilising blockchain technology to organise billing, data, and prescription information digitally (Thomas, 2021). The Medicaid, Medicare, and Healthcare Reformation within the US presents many areas for opportunities with Blockchain technology. A decentralised system has proven to benefit enrollment efficiency, eligibility, claim payments, and data management (Thomas, 2021). The government's slow adaptation to digital changes and reform has forced privatised companies to take initiative. One company that showed initiative to disrupt the industry was SimplyVital Health. Simplyvital Health is a decentralised data platform that has proven to improve medical practices. Simplyvital uses a decentralised database to provide healthcare providers access to a patient blockchain. This gives them access to vital medical information quickly and efficiently (Daley, 2021). Following their launch, the SEC quickly filed an administrative proceeding saying that SimplyVital violated registration proceedings (SEC, 2019). This is just one example of how a digitally immature government could hinder innovation and disruption.

Most recently, New York is trialling an IBM COVID-19 Blockchain App that verifies a vaccination or a negative test result. The app provides a pass that provides participants with a QR code in which venues can scan to confirm a citizen's health status. The Blockchain based app is called the Excelsior pass and has been piloted at venues such as Madison Square Garden who are increasing fan attendance.

Supply Chain
The supply chain industry is another industry that has yet to be completely disrupted by blockchain technology in the United States. In order for a complete disruption, government involvement is needed to navigate vague processes regarding data protection and information.
That being said, many larger corporations are paving the way for digital technology to improve practices. Walmart, one the US' largest wholesale retailers, utilises blockchain technology to increase transparency in the food supply ecosystem. This enables them to utilise a Hyperledger network that allows employees to track products for its origins (Sharma, 2020).

An organisation on the complete opposite end of the market that's utilising blockchain technology to improve supply chain management is Ford Motor Company. Similar to Walmart, Ford Motor company uses Blockchain technology to trace its supplies of cobalt. This is due to how important cobalt is to car batteries. Ford Motor Company partnered with IBM to utilise a blockchain network to trace when and where its mined and then track where it goes (Sharma, 2020).

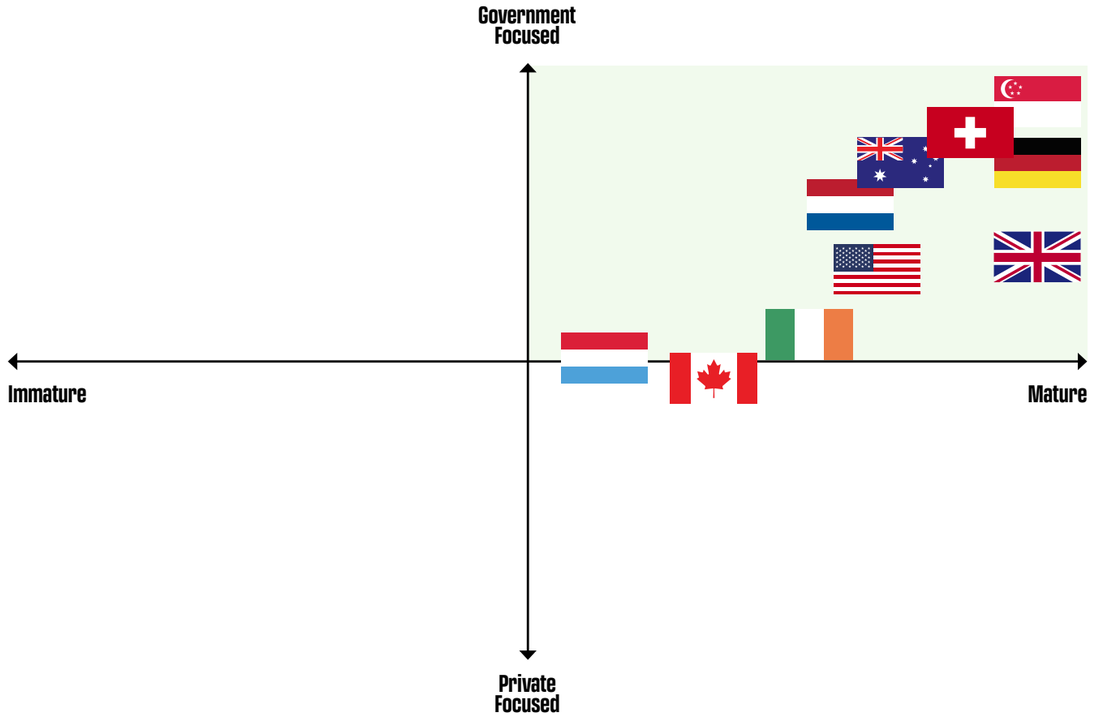
Finance & Transactions
With the increase in crypto exchanges and digital assets in the US, the Finance and Transaction industry is the most mature industry to employ blockchain technology. Many of the top financial institutions are deploying teams surrounding fintech and blockchain technology to provoke innovation. JPMorgan, Citi, Wells Fargo, US Bancorp, PNC, Fifth Third Bank, and Signature Bank are using blockchain technology in some capacity (Graffeo, 2021). While the detail for such usage is kept under wraps, notable events have occurred. For instance, PNC was the first US bank to join the Ripple network (Graffeo, 2021). Many of these institutions are looking for commercial opportunities for blockchain technology and cryptocurrencies. According to Bank of America, there is a consensus that all future applications of the technology would hold until there is regulatory clarification regarding custody services (Graffeo, 2021). Many of these organisations are using blockchain technology to facilitate payments, settlements, fundraising, securities, loans, and fraud protection (CB Insights, 2021).

Along with these financial institutions paving the way for blockchain usage, crypto exchanges have proven to be a highly lucrative form of an exchange. Previously mentioned, Coinbase has facilitated over $150 billion worth of exchanges since 2012. Coinbase is also one of the most active crypto exchanges in the entire world holding tokens such as Bitcoin, Ethereum, and Litecoin (Coinbase, 2021). Along with being a user facing platform it has also provided business to list assets, start a brokerage account and more (Coinbase, 2021). Beyond cryptocurrencies and small use cases, the financial industry is waiting upon government guidelines to diver further into the field in blockchain technology.

Energy Sector
The US has seen disruptive engineering programs to facilitate innovation in the energy sector. Blockchain technology is at the center of this disruption. Previously mentioned, the energy sector is looking to revolutionise how we utilise sustainable energy. This could come in the form of redistributing energy through peer-to-peer transactions. This transaction can occur when there is a surplus of renewable energy being produced by a user. US engineering programs are trying to influence the world and revolutionise the industry through its projects and programs (Zhao et al., 2019). These US based programs are tapping into various blockchain practices such as peer-to-peer transactions in a decentralised energy network, smart contracts to enable IOT, and shared charging piles with increasing transparency (Zhao et al., 2019). For example, Brooklyn Microgrid is the first applied engineering program of energy blockchain in the world (Zhao et al., 2019). Brooklyn Microgrid has completely eliminated the middleman and has allowed users on the grid to sell excess energy to other users. This process is facilitated using a smart meter in conjunction with a blockchain network. Filament, a powerline program is using blockchain smart contracts to enable an IOT system. When a powerline breaks down, the IOT system automatically orders maintenance to that area and alerts the cause of the issue. Finally, a shared charging pile program was started in the US to allow users to share charging stations and earn revenue. This program enables the Ethereum network to allow transactions to occur at idle charging stations. All of these programs can be found within the research facilitated by Zhao et. al. (Zhao et al., 2019).

Due to the privatised nature of the energy sector within the US, it has allowed for many organisations to innovate in small ways. Consulting agencies such as PWC, Deloitte, IBM, etc. have issued strategies for how to best innovate in this industry. While these strategies are being developed, the government has yet to clearly define a set standard for regulations and processes within this industry.

Appendix H
International Market Positioning Map

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