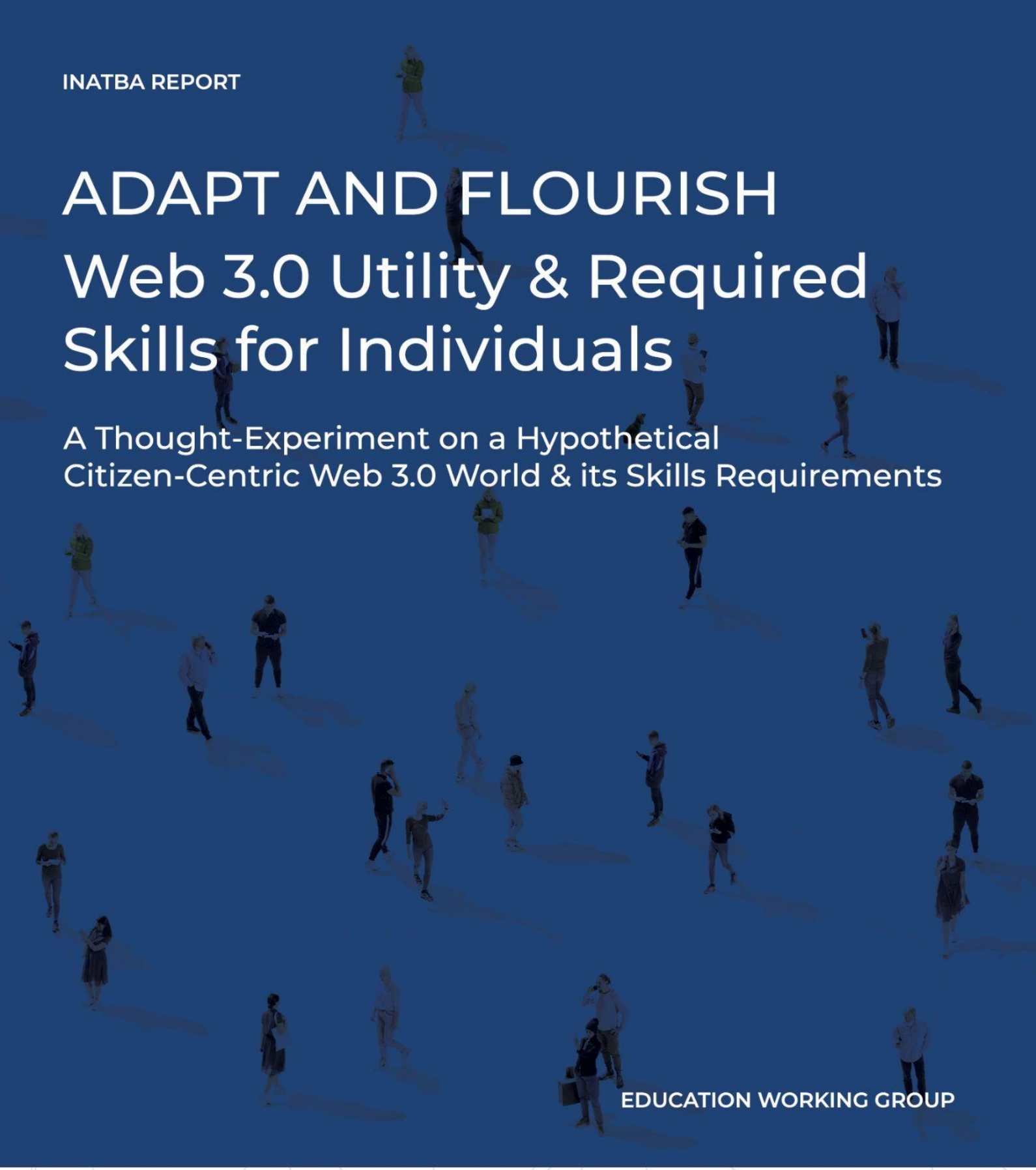
INATBA REPORT

ADAPT AND FLOURISH
Web 3.0 Utility & Required Skills for Individuals

A Thought-Experiment on a Hypothetical Citizen-Centric Web 3.0 World & its Skills Requirements



EDUCATION WORKING GROUP

INATBA
International Association
for Trusted Blockchain Applications

DISCLAIMER:
The goal of this paper is to conduct a reflection and create awareness. In light of this, the following experimental thought is purely hypothetical and does not reflect any actual plans or actions. With the objective of focusing on skills, in our dissertations we have decided not to include any legal consideration or discussion on current frameworks. We do not take any responsibility for any potential misuse or misinterpretation of this thought. Please note that this thought does not have any legal standing, and we do not intend to encourage or condone any activity that violates legal or ethical norms. We urge you to consult with relevant legal or ethical experts before making any decisions based on this experimental thought.

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1. Why This Paper?

"Thoughts without content are empty, intuitions without concepts are blind." Immanuel Kant

Our very complex world needs thoughts and ideas to develop the necessary concepts on how we as a society want to shape the digital transformation. Today, in 2023, we are already seeing a widening gap between those who can use technology and those who cannot. The resulting asymmetry will trigger upheavals in society inspiring fantasies of domination coupled with a kind of imperialism in digital elites. It is important to counter this phenomenon and to keep developing offers that are suitable for reducing the gap (or asymmetry) while defending democratic values in the digital world as much as in the analogue world. The authors of this paper are convinced that this can be done through education and training.

Therefore, in the following sections we will classify the diverse terms such as Web 3.0, Metaverse, Blockchain Technology etc. and particularly emphasise two perspectives: the citizen in the context of Web 3.0 as well as decision-makers. We believe that placing these terms in the context of digital transformation supports an understanding of the overall context. The way we live our lives as individuals is increasingly shaped by digital transformation which in the long run will affect every facet of our lives.

Changes in the nature of work and jobs have already been seen: The COVID-19 pandemic has caused a massive acceleration of digital transformation and the modalities of economics. As highlighted in Schilirò (2021) "these transformation concern technologies and new lifestyle behaviours rather than short-term trends" (p 2).

The evolution of this phenomenon can be compared with the evolution of the World Wide Web. It all began with Web 1.0, also referred to as Syntactic Web, where the user was only able to read the information provided by content producers and no interaction was possible. Then the unidirectional interaction was fixed when the Social Web (or Web 2.0) came to life: Now users could read and write. The environment was made such that now communication with other users is possible and we are all used to this paradigm.

The next step in front of us is the Web 3.0[1]. In this environment the read-write function will be expanded to a read-write-execute function. This will open the door for many new business models as well as the way we interact with each other. To have access to the fullest, a common understanding is required, otherwise a digital divide[2] may arise between those who understand Web 3.0 and can use it for their own benefits and those who can't. Yet this is exactly what Web 3.0 can offer to society: far better connectivity, financial inclusion as well as better access to trade and public services. Blockchain technology will play an important role and provide a huge range of opportunities. In this paper we will give a brief

[1] For further information on the definition of Web 3.0 in the context of this paper, see Chapter 2.4.
[2] For further information on INATBA Education Working Group's position on blockchain and the digital divide, please refer to the paper "Blockchain Education: A Prerequisite for Socio-Economic and Technological Advancement.

overview about the technology AND also how blockchain technology can lift the benefit of the digital transformation for the individual as well as for the society.

1.1. Motivation

Web 3.0 and blockchain technology, as the infrastructure on which Web 3.0 technologies are built, must be accessible and useful for all – as INATBA's Education Working Group highlighted in the paper "Blockchain Education: A Prerequisite for Socio-Economic and Technological Advancement"[3], knowledge is the key to preventing an even deeper digital divide by adding a new layer of exclusion in society. Such knowledge should not only be offered to students through education but also to all members of society.

Our target audience focuses firstly on citizens/individuals. We see them (and us) as actors in the functioning of the global society and economy. This paper wants to point out to individual citizens how blockchain can be of value to them and which skills they need to acquire to profit from the new blockchain setting. We all need to understand the tools offered by this dynamic digital development. With the use of PPBs – public permissionless blockchains – the authors of this report believe in allowing more democracy without dependencies on big tech giants and their services.

As a secondary audience, this paper also targets public and private business-oriented decision-makers (policymakers, legislators, boards, investors, managers, C-level), universities and research centres to acquire an awareness of the thought experiment in this paper and integrate its understanding in the current exploration of how to make the global digital economy sustainable in the next decade.

The goal of this paper is to conduct a reflection and create awareness of what possibilities a hypothetical public permissionless blockchain environment can offer to the individual/citizen and what high-level skills the individual will need to acquire to profit from that public permissionless environment.

In light of the above, and with the objective of focusing on skills, in our dissertation we have decided not to include any legal consideration or discussion on current frameworks, even though we acknowledge that our discourse on a public permissionless blockchain society indeed has legal implications and generates regulatory questions.

With the same logic, we have decided not to focus on the technical challenges of implementing blockchain into business and operational processes (e.g. scalability issues, smart contract validity and implementation etc.) nor propose solutions to such issues, even though we appreciate that the world we imagine in our reflection is only going to become a reality when we solve the technical challenges. Instead, we preferred pointing out what are the opportunities available to citizens and organisations.

[3] INATBA, (2021), "Blockchain Education: A Prerequisite for Socio-Economic and Technological Advancement", p.5. Available at: https://inatba.org/reports/blockchain-education-report/.

By focusing the thought experiment only on a hypothetical public permissionless environment, we exclude any potential interactions with private or public permissioned environments. We consider that such blockchain environments are mainly associated with corporate activities. As such, we imagine a hypothetical world in which the decision and execution centre lies with the individual and not with the corporations.

1.2. Research Gap: Our Hypothesis

The authors of this paper believe public permissionless blockchains (PPBs) enable a transition from centralised to decentralised socio-economic models with a focus on the individual instead of institutional actors as the centre of decision-making and execution. The PPBs infrastructure allows individuals to transact directly from person to person without the help of a third party. This not only implies less friction and more flexibility for these interactions and transactions but also requires more individual autonomy, accountability and responsibility.

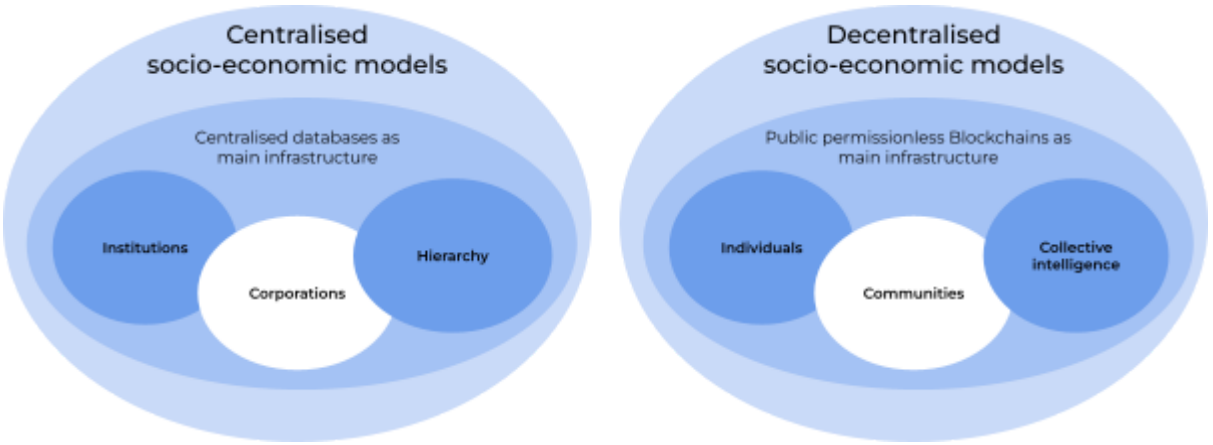

Figure 1: High-level design of centralised and decentralised socio-economic models

We build our thought experiment based on existing papers and research (e.g. Chaise[4] [5]). Our hypotheses are:

- PPBs propose a freely accessible transaction infrastructure that allows us to execute our socio-economic exchanges autonomously without relying on a third executing party[6].

[4] CHAISE is a seminal reference in terms of the definition of skills needed by the blockchain industry. The overall approach of CHAISE focuses on the current needs of the industry and defines blockchain skills in the function of the existing corporate and economic environment. With this paper, the Education WG wants to shift the focus onto the individual, and the control and autonomy blockchain brings to a citizen's socio-economic interactions and transactions. With this paper, the Education WG wants to answer the question of how blockchain can serve the individual and what skills individuals would need for their own sake and for their autonomy in the environment that requires them to take on control. (https://chaise-blockchainskills.eu/de/strategy/).
[5] See also appendix "ESRI CHAISE Infosheet".
[6] The consequences of this shift from an "assisted" execution of transactions to autonomous executions enable innovation in our socio-economic operational and value-creating models.

- PPBs seem so appealing because they enable securely our daily participation in the socio-economic environment (e.g. all kinds of transactions, be it the signature of a work contract, the purchase of a train ticket or the publication of your book).
- The borderless character of PPBs allows for this socio-economic transactional autonomy not only to innovate but also to create global network effects.
- PPBs allow for individuals as market participants to become more easily accessible and for information to be more freely available, which should foster advancements in their functional efficiency.
- Web 3.0 and blockchain technology must be adaptable for all – knowledge is the key driver to prevent an even deeper digital divide (that can be seen currently and will lead to a new layer of exclusion in society[7]).
- Web 3.0 will change the paradigm towards the individual that self-manages themself, which will include participation in the socio-economic fabric as well as their data, identity and assets, transitions from an institutional setting into an individual self-sovereign and self-managed setting. It also requires the individual as a citizen and an economic agent to acquire a skill set that allows them to navigate and function properly in this new environment.

1.3. Objectives and Structure of the Work

Chapter 2 will introduce terms and used theories. We believe that it is important to understand the evolution of blockchain technology. After launching the Bitcoin blockchain infrastructure in 2009 we could see that this public permissionless approach was too complex at the beginning for many applications. With the help of permissioned blockchain infrastructure it was possible to understand the working mechanism. Now we are at the edge of being able to swap the lessons learned to public permissionless blockchains.

Chapter 3 will cover the framework we are going to apply within this paper. In this chapter we will explain the public permissionless blockchain in distinction to permissioned blockchains. Along with the shift towards public permissionless blockchains a bunch of new skills and requirements are introduced. We want to set the stage for a better understanding of what is required to adapt and flourish as an individual in this environment.

Chapter 4 will integrate the framework into a thought experiment for the individuals while integrating the terms in a useful way as well as by using our framework.

[7] Since many aspects and vocabulary of blockchain technology are not self-evident even for a well-informed digital literate, if not properly addressed, the evolution of blockchain could introduce a new layer of exclusion that goes beyond the one we are aware of today. For further reading, please refer to INATBA Education WG paper “Blockchain Education: A Prerequisite for Socio-Economic and Technological Advancement”.

Chapter 5 is dedicated to applying the framework from the perspective of organisations. In this chapter we include companies as well as governmental bodies.

Chapter 6 explores the skills needed to thrive in a public permissionless blockchain world.

We conclude our approach in Chapter 7, which deepens the gained understanding from the perspective of society. Here we address the importance of digital literacy and ethical awareness. We will describe what we believe is going to happen when a society is ignoring the necessity of digital education.

Remarks and commendations will be given in Chapter 8.

In Chapter 9 we highlight existing use cases as well as applications to widen the deeper understanding for people who are not on a daily basis observing the success and impact of blockchain technology.

1.4. Research Approach

The approach in this paper will focus on existing knowledge. On the one hand, this is linked to the existing knowledge that we consider to be the foundation. Access to this knowledge should be encouraged through this report. On the other hand, we will incrementally expand this existing foundation with our thought experiment. Therefore, this report is not a concluding sequence, but rather an interim status in Q2 2023.

When reading, please bear in mind that we have by no means included a complete list of available references and that other sources could have been used for each individual chapter. Digital transformation is very dynamic and so is knowledge creation.

2. Definitions and Theories

This chapter explains the definitions and theories we use to develop the framework which will be outlined in chapter three. Regarding the definitions, we will see that there are many available to describe just one term. We will explain which term we think is suitable for the purpose of our paper. But we also want the reader to know that in a different context our chosen definition might not work. Therefore it is required to understand the necessity of proper definition in the specific context.

2.1. Blockchain

ISO[8] defines blockchain as a distributed ledger with confirmed blocks organised in an append-only, sequential chain using cryptographic links, and states that blockchains are designed to be tamper resistant and to create final, definitive and immutable ledger records.

Through these features and through crypto-economic incentives and theoretical principles[9] blockchain introduces a foundational set of building blocks for our societal and economic organisational, operational and value-creating models, which can avoid resting on centralised trusted parties like institutions and corporations.

2.1.1. Public Permissionless Blockchains

As we have said before, our main focus is PPBs for reasons we want to consider in this space. One of the most interesting aspects is regarding the participation. PPBs are those distributed ledger technology (DLT) systems that are accessible to the public for use not requiring authorization to perform any particular activity. Any citizen can participate. This is possible because there are no administrators and the PPB allows the users to participate in joining the network, operate a node, contribute to the code, send and receive transactions and participate in the consensus process and validate the data.

2.1.2. Permissioned Blockchains

Unlike PPBs, permissioned blockchains are not freely accessible. Many of them have security control layers to restrict access or privileges only to persons previously determined by the blockchain owner.

[8] https://www.iso.org/standard/73771.html.
[9] Zikas, V. (2020) Research vignette: Cryptography and game theory for blockchains, Simons Institute for the Theory of Computing. Available at: https://simons.berkeley.edu/news/research-vignette-cryptography-game-theory-blockchains (Accessed: January 23, 2023).

2.1.3. Direct Peer-to-Peer Transactions over the Internet

Peer-to-peer (P2P) networks are part of the blockchain infrastructure. The blockchains are managed by a P2P network of computers often called nodes, scattered around the globe. Each node in such a system stores the copies of all transactions according to the applied software protocol. The P2P network communicates without intermediaries or even a central administrator. Therefore, every node has the same rights and obligations to perform the same tasks. In a public permissionless blockchain anyone can become a node but also just simply use the infrastructure.[10]

2.2. Direct Ownership & Self-Management

To implement ownership in a digital ledger, two basic concepts must be taken into account: both "owner" and "owned" must be digitally uniquely identified, and an ownership relation from the first to the latter must be coded into the ledger, otherwise you can not prove your direct ownership over any object or prove you are the person you say you are through self-management.

Identification refers to any physical or non-physical object or person in the real world[11]. Blockchains provide a native way to uniquely identify actors or objects in the ledger, namely the concept of "blockchain addresses". These are unique sequences of characters associated with a public and private key pair, where the public key is manipulated, usually through hashing techniques, to recover such a pseudo-anonymous and unique sequence of characters of predetermined length called "address", while the private key is used to prove the ownership of a specific address since only the owner of the key pair knows and can use it[12].

2.3. Self-Sovereign Identity (SSI)

Self-Sovereign Identity (SSI) is a model which gives individuals the power to self-manage and in this sense own and control their digital identities without relying on third-party providers. In contrast to centralised identity management we are used to, we can decide with whom we share our data and remove access at any time.

Blockchain technology is transparent with respect to the procedures used to issue addresses and to prove ownership, in the sense that the software for address generation and manipulation is already included in the blockchain, and generally a user must only perform simple operations on a laptop or mobile phone application to use them. Since we are working in a world of PPBs, one thing to keep in mind is that each owner can generate as many addresses (key pairs) as s/he wants and that one same specific address can be used in many different blockchains as long as they represent compatible address standards.

[10] De Filippi / Wright (2018), p. 2.
[11] https://doi.org/10.6028/NIST.SP.800-63-4.ipd.
[12] https://ethereum.github.io/yellowpaper/paper.pdf; "Mastering Bitcoin: Programming the Open Blockchain" 2nd Edition, Kindle Edition by Andreas M. Antonopoulos.

This is the case, for example, for the public Ethereum main net and the public Ethereum testnet, such as Ropstein, Goerli, Rinkeby etc. The difference between the usage of the same address in different blockchains is determined by the ledger-blocks history in that specific blockchain for what concerns that address. As a consequence, the address alone is not enough to uniquely identify "owner", "owned", and "ownership", but also the blockchain where it is used must also be taken into account. As a simple example, one can use a testnet to fill up with "Ether" an address in the Ropstein blockchain asking for them to an Ether "faucet", but when the address is used in the main Ethereum net the Ethers owned on Ropstein disappear[13].

It is worth pointing out that "owned" entities are not necessarily objects of the real world. Still, they can be digital entities as well, such as digital assets, digital artworks, or, more generally speaking, simply "files" representing any digital content. The interesting point here is that even if such entities are digital and in principle, can be recorded and can exist directly in the same ledger containing the "owner" and the ownership relation, in many cases, these are recorded and maintained "out-of-chain", namely outside of the digital ledger, in different digital storages. Thus they can be referred to, using digital identifiers, in the very same way as other entities whose existence is out-of-chain (e.g. real-world assets or objects) are referred to[14].

For what concerns "owners", first of all, it may be interesting to state that digital identity has evolved since its origins. We can briefly identify these steps:

Centralised identity (administrative control by a single authority, 1990). In the early days of the internet, centralised authorities became the issuers and authenticators of digital identity, creating a real network under their power. This granting of digital identity control to centralised authorities suffers from the same problems caused by state authorities in the physical world, where users are locked up in a single authority that can deny their identity or even confirm a false one. With the exponential growth of the internet, one major problem arises linked to centralised identity: the multiplication of identities in circulation for a single user, leading to losing control of each of them[15].

Federated identity (administrative control by multiple federated authorities, 2000). In the early 2000s, there was a big step forward for digital identity. Several commercial organisations sought to go beyond centralised identity, bringing digital identity into a new world. They envisioned a federated identity, which allowed users to use the same identity across multiple websites. However, this placed the federation members at the centre of digital identity management, which made it almost as centralised as traditional authorities.

User-centric identity (individual or administrative control over multiple authorities without requiring federation). Also, in early 2000, a project laid the foundations for a new type of digital identity. It proposed to build a "persistent" online identity, where every individual should have the right to check their identity online. From

[13] Use for example the Metamask wallet (https://metamask.io) on an Ethereum-like blockchain.
[14] Marchesi, L., Marchesi, M., & Tonelli, R. (2020). ABCDE–Agile block chain DApp engineering. Blockchain: Research and Applications, 1(1-2), 100002; and https://www.w3.org/TR/did-core/.
[15] Torres, Jenny, Michele Nogueira, and Guy Pujolle. "A survey on identity management for the future network." *IEEE Communications Surveys & Tutorials* 15.2 (2012): 787–802.

this, other projects were born aimed at consolidating the work on digital identity based on decentralisation, defined as "user-centred identity", where users are placed at the centre of the identity process. Once implemented, user-centric methodologies tend to focus on two elements: user consent and interoperability. By adopting them, a user can decide to share an identity from one service to another.

With blockchain technology, as explained above, addresses may be used to define digital identities but one of the most interesting paradigms for managing user-centred digital identities is the SSI model.

Given these premises, standards must be defined on how to match blockchain addresses to unique identifiers and how to define ownership relationships among them. We directly refer to already existing consortiums and organisations which developed standards for identification in a decentralised digital world.

One major resource to accomplish these tasks is Decentralised Identifiers (DIDs). In short, a DID is a type of identifier that allows a digital identity to be verifiable and decentralised. A DID can identify any subject (a person, an organisation, an object, an abstract entity, etc.) that the DID manager decides to identify. Using this standard, anyone can create a digital identity and assign it to its own decentralised identifier, which is nothing more than an address used to know what identity it represents. A DID should point to a "DID document" that contains information about authentication methods to prove ownership of that DID and other attributes[16].

A DID document should contain these elements as standard:

- a Uniform Resource Identifier (URI) to uniquely identify the protocols that allow parties to read the document;
- a DID that identifies the subject of the DID document;
- a set of authenticators (e.g. public keys) used for authentication;
- a timestamp indicating the date and time the document was created;
- a timestamp indicating the date and time of a possible update;
- a proof of cryptographic identity (e.g., digital signature);
- a variable that indicates the status of the document (active, suspended, revoked).

The World Wide Web Consortium (W3C) worked to adopt DIDs as a web standard so that nowadays (since 19 July 2022) DIDs can be officially used to identify resources on the web. As taken from the W3C description:

"*Fundamentally, Decentralised Identifiers are a new type of globally unambiguous identifier that can be used to identify any subject (e.g., a person, an organisation, a device, a product, a location, even an abstract entity or a concept). Each DID resolves to a DID document that contains the cryptographic*

[16] https://www.w3.org/TR/did-core/.

material and other metadata for controlling the DID. The foundational pillars of the DID specification are: 1) DIDs do not require a central issuing agency (decentralised), 2) DIDs do not require the continued operation of an underlying organisation (persistent), 3) Control of DIDs, and the information they are associated with, can be proven cryptographically (verifiable), and 4) DID metadata can be discovered (resolvable)."[17]

Notably, DID ownership can be verified by means of cryptographic primitives so that it is not associated with a provider but is in possession of the owner, putting web users in control of their personal data and consent.

At the very end, a DID is a string of plain text composed of three parts concatenated by two columns of symbols, each carrying its own information:

- a scheme, the did URI scheme identifier;
- the identifier for the DID method[18];

the DID method-specific identifier.

This example of DID is reported from the W3C definition:

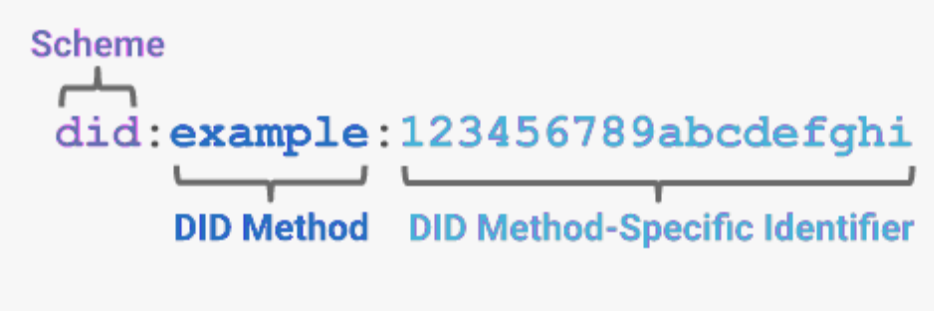

Figure 2: Example of a decentralised identifier[19]

We do not discuss here the specifics of DIDs but refer to the W3C standards for the technical details[20].

2.4. Web 3.0

The web dominated by platforms and large internet corporations is to end with Web 3.0, which is organised in a decentralised way and managed by its users. This definition differs (at least a little) from the one by Tim Berners-Lee, who coined the term Web 3.0 but meant a semantic internet[21]. Since some technology

[17] https://www.w3.org/2022/07/pressrelease-did-rec.html.en.
[18] https://www.w3.org/TR/did-core/#dfn-did-methods.
[19] Ibid.
[20] For further detail, see https://www.w3.org/TR/did-core/#dfn-did-methods.
[21] Semantic internet represents an evolutionary stage of Web 2.0 in which the information disseminated by people on the net is not only understood by people but can also be read by machines and evaluated by them. Information is provided with descriptions and given a clear meaning. Through this semantics and the linking of meanings, information can be related to each other and evaluated by machines. The goal of the semantic internet is to make the mass of information available on the internet more accessible to users and to make it easier to manage. Relevant content is easier to identify in the semantic internet.

experts and internet visionaries see a decentrally managed internet as a basis for the semantic web as well, the different meanings of "semantic web" and "decentralised online ecosystem" have developed for the term Web 3.0 (Web3). We understand the differences and will apply the term Web 3.0 to a decentralised online ecosystem. Blockchain technology will play a massive part in this ecosystem since it allows actual value and assets to be shared in a trustworthy and transparent manner without the need of third parties.

The thought experiment in this paper only focuses on public permissionless blockchain as it imagines a hypothetical Web 3.0 world in which these blockchains are the ones that are used. The reason resides in the direct link between the sovereignty of the individual citizen and the public permissionless nature of a blockchain: only public permissionless blockchains allow for the autonomous and independent management of one's identity, data and assets.

2.5. Decentralised Autonomous Organisations (DAO)

Resnick stated, "Organised without an organiser, coordinated without a coordinator".[22]

A DAO is therefore a blockchain-based system that enables people to coordinate and govern themselves mediated by a set of self-executing rules deployed on a public blockchain, and whose governance is decentralised (i.e., independent from central control).[23]

While some argue that Bitcoin is effectively the first DAO (Buterin, 2014; Hsieh et al., 2018), the term is today understood as referring not to a blockchain network in and of itself, but rather to organisations deployed as smart contracts on top of an existing blockchain network.[24]

2.6. Lifelong Learning and Required Skill-Set for Individuals

The evolving environment we are in makes us aware that there is more than "just" a technical understanding. The digital transformation forces us to quit our comfort zone and move out to explore all the facettes. This requires many things, not only from an individual but also from a society. And there is no right or wrong – we need to allow ourselves to fail in order to understand. To gain knowledge is essential whether it is about the new AI tools like ChatGPT, Dall-E, etc., or the benefit and use of a public permissionless blockchain.

To get the access it may be of use to understand the term "digital competence".

[22] Resnick (1996), p.1.
[23] Hasan / Filippi (2021), p.2.
[24] Ibid, p. 3.

According to DigComp[25], a European Research Center, we can define "digital competence" as a combination of knowledge, skills and attitudes. It includes "confident, critical and responsible use of, and engagement with, digital technologies for learning, at work, and for participation in society."

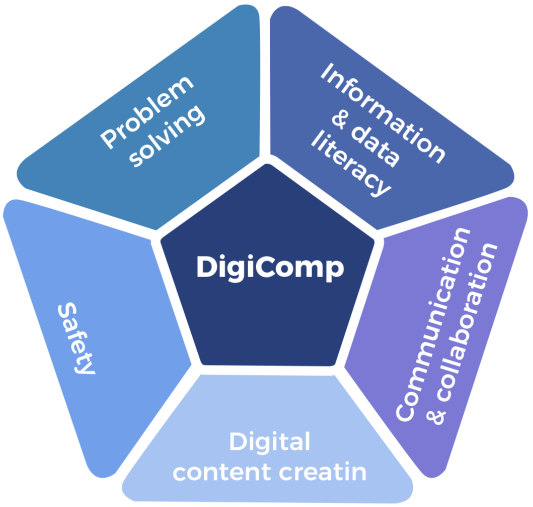

Figure 3: Required skill-set according to DigComp

DigComp is describing very well what they see as a required skill set. But we also have to consider that the concept of Lifelong Learning (LLL) has changed since it was introduced in the 1960s. At that time it espoused many causes. According to Denis Kallen "[i]ts legitimations range from simple corrections to educational and social policy to all-embracing innovatory or even revolutionary inspirations [...]".[26] Benasso et al. continue to argue that a narrower discourse links the concept with further training, professional development and economic growth.[27] So we can say that the concept of LLL for individuals will have effects on the society as well as the society benefiting as a whole if individuals are willing to learn.

Our framework, presented below, addresses what we consider to be the important aspects of LLL in a wide variety of facets. Even if we cannot give a conclusive answer as to which skill-set must always be acquired for everyone, our approach should nevertheless inspire.

[25] https://joint-research-centre.ec.europa.eu/digcomp/digcomp-framework_en.
[26] https://www.cedefop.europa.eu/files/etv/Upload/Information_resources/Bookshop/130/8-9_en_kallen.pdf.
[27] Benasso et al (2022), p.2.

3. Framework

„Don't play what's there, play what's not there.“ Miles Davis

In this chapter we are going to describe the framework we propose to foster a better understanding of how technology, especially blockchain technology and Web 3.0, can help to build up a more inclusive world.

3.1. Preliminary on Blockchain for Individuals

Public permissionless blockchains (PPBs) have the potential to empower the individual by placing socio-economic transaction infrastructure directly under its decision sphere. This paper describes the possibilities that a hypothetical Web 3.0 made up of only PPBs could offer to citizens and what high-level skills and capacities citizens would need to be enabled to live, work and navigate this environment. For the purpose of this paper, the hypothetical Web 3.0 will be limited to the digital and internet environment that only aggregates all the available PPBs, together with the applications that are built on top of them.

The internet and its use for the exchange of data and information, the execution of transactions, and the management of our ownership of assets and identity depend on databases held and managed by third parties. Our use of the internet depends on the correct functioning of these third parties. Blockchain protocols transfer the ownership and maintenance of data, assets and identity databases to a public and permissionless network of computers in which anyone can participate and use to manage and direct ownership of one’s assets, data and identity.

On a more abstract level, therefore, blockchain can be seen as an alternative to the traditional transaction and ownership infrastructure in a society and an economy. Let us first look at the traditional transaction and ownership infrastructure and then explain how blockchain is an alternative.

In order for the economy and society to function and transact efficiently, a legal recognition of property and a trusted infrastructure that registers who owns what assets, data or certificates is needed. The basic data structure for this ownership registration is very simple: the identification number of the asset, data or certificate is linked to the identification number of the individual who is the owner. Additionally, the owner can authorise a transaction that transfers the ownership to a new owner by using a digital signature.

Traditionally, this infrastructure consists of databases managed and owned by legally recognised third parties. For example, your driver’s licence is registered in a government-managed database that links the number of your driver’s licence to your identity number. Or the ownership of your house is registered in some official real-estate database. Or the money that you own is registered in a bank’s database.

For a transaction – a transfer of ownership – to be registered in your name in the adequate database, you need the service of the managers of the corresponding

database. This socio-economic transaction infrastructure is composed of many databases and corresponding managers.

As mentioned, blockchain is an alternative database infrastructure for registering ownership and related transactions. Instead of being managed by third parties (and having to trust them doing it "right"), the blockchain database is managed by the collective of its users. The trust in the PPB databases stems from a combination of the following elements: open-source blockchain protocols, cryptography, P2P, immutability, the open and permissionless participation in the collective verification and approval of the database content and the reward and sanction scheme which forces the database writers to write only honest transactions (as they otherwise would lose the monetary investment they made in becoming a database-writer).

Within the realm of blockchain types, one must distinguish first the public or private character of the content of the blockchain database and second the permissionless or permissioned aspect of the participation in the blockchain content creation and verification. A continuum exists between private permissioned blockchains and public permissionless blockchains. Good examples of the latter are the Ethereum and Bitcoin blockchains, and of the former, Hyperledger and Corda.

This paper focuses on public permissionless blockchains as they allow citizens to participate freely in their maintenance and use as a transactional infrastructure[28].

3.2. Requirements

The following table gives an overview of our idea of a framework and what we see is required as individual skills to profit from the capabilities of a – hypothetical – public permissionless blockchain infrastructure:

[28] In contrast, private permissioned blockchains are mainly used and owned by corporations and focus on its implementation within the context of specific business and entrepreneurial models. Often, they still replace an existing intermediate with their own business logic.

		Utility of a Public Permissionless Blockchain Infrastructure									
		Direct Peer-to-Peer Transactions Over the Internet	Direct Ownership & Self-Management of One's Assets, Data & Identity	Tokenisation of Everything	Financial Inclusion through Decentralised Finance	Change Management	Driver of Transformation	Flexible & Adaptable Networks & Organisations	New Organisational Structures	Adaptive Self-Organising Networks	Governance
Primary Required Skills for Individuals	Decentralised Mindset & Thinking	X	X	X	X						
	Individual Autonomy, Independence & Decision-Making	X	X	X	X						
	Responsibility & Accountability	X	X	X	X						
	Critical Thinking & Research Skills		X	X	X						
	Regenerative Mindset	X	X	X	X						
	Emotional Intelligence & Empathy					X	X		X		X
	Entrepreneurship					X	X	X	X	X	X
	Trial & Error Culture						X	X	X		
	Alternative Business & Operational Models Development Skills					X	X	X	X	X	X
	Crypto-Economics & Organisation Design					X	X	X	X	X	X
	Cooperation & Teamwork					X	X	X	X	X	X

Figure 4: Primary required skills for individuals to profit from capabilities of a public permissionless blockchain environment

What we can see in this template is on the one side the required skill-set needed as an individual. This can be seen as skills you can learn and train. At the same time we see the requirements towards the blockchain infrastructure. Each individual therefore has to apply their skill-set and competencies in this environment if they want to survive.

To read this template this example might be helpful:

The skill “Decentralised Mindset” refers to the idea of not having some sort of control or “central drive” in our complex world[29]. We want to encourage people to allow more elements of randomness.

But the change in this kind of thinking seems to be very drastic for many people. We all have a strong cognitive disposition to centralised approaches because we are so used to it. Over centuries mankind was taught that there is a “God-like entity” and that there is a centralised figure (queen, king or bishop, etc.) who sets the rules and controls it in the name of God. Even today, we accept social systems which are controlled by a central authority[30].

To open up this we, as a society as well as an individual, have to overcome the tradition of centralised systems and learn from nature how swarms can work and live together without having a centralised authority (e.g., bird swarm).

If we can create this decentralised mindset then the technology can provide us with a decentralised environment, called the DAO (Decentralised Autonomous Organisation).

All the other elements of this template will be explained further on or are already introduced.

[29] https://web.media.mit.edu/~mres/papers/JLS/JLS-1.0.html retrieved on 22.01.2023.
[30] E.g. Meta (or Facebook) is a centralised platform which orchestrates the community on that platform by an algorithm only known by Facebook. Facebook decides what a user sees and what not – we as user have faith in Facebook that it is all (somehow) good in the system.

4. Personal Everyday Utility

Blockchain introduces a foundational set of building blocks for our societal and economic organisational, operational and value-creating models.

Traditionally the organisational and operational infrastructure of our societies and economies rests on centralised trusted parties like institutions and corporations. Blockchain proposes an operational and organisational infrastructure that is decentralised and trustless through crypto-economic incentives and game theoretical principles.

The consequences of this shift are far-reaching as the centres of initiative, execution, responsibility, and accountability can now rely on an open, freely accessible infrastructure enabling direct peer-to-peer socio-economic interactions.

4.1. Direct Peer-to-Peer Transactions over the Internet

Traditionally, individuals rely on third parties for the execution of the majority of their socio-economic transactions: we give instructions to our banks to execute payments, we rely on institutions to manage our credentials, and companies channel our economic value creating contributions.

Public permissionless blockchains allow these centres of execution to be freely usable and available to the individual.

Under the emerging technological innovations, the traditional monetary system is transitioning into a digital monetary system that adapts continuously to meet the evolving people's needs.

Satoshi Nakamoto's groundbreaking 2008 white paper "Bitcoin: A Peer-to-Peer Electronic Cash System"[31] inspired a small group of crypto-enthusiasts to create the Bitcoin network. This white paper and its blockchain technology-based proposal attempted to address some issues with real-world money, such as: "double spending", security and immutability of transactions, democratic open access, and alternative to inflationary printing of new money.

With technological advancements in payments, we now have branchless mobile banking solutions, geolocation of customers, peer-to-peer transactions, group lending, and crowdfunding, among others.

In recent years, peer-to-peer (P2P) payment services have become increasingly popular among consumers. P2P services are used by 84% of consumers; among users, 44% use P2P services on a weekly basis. P2P payments are spearheaded by PayPal (84%), followed by Venmo (49%)[32].

P2P or person-to-person interactions occur directly between peers in a system, such as when exchanging information or engaging in transactions. In the

[31] https://bitcoin.org/bitcoin.pdf, retrieved on 19.01.2023.
[32] https://www.lendingtree.com/personal/peer-to-peer-services-survey/.

blockchain sector, this term has come to describe a disruptive economic model known as a P2P sharing economy, where mechanisms enable value transfers without a middleman, such as banks, by using blockchain-based smart contracts.

Challenging traditional financial and legal systems and institutions, P2P infrastructures – enabled by blockchain technology – are revolutionising microfinance to provide more affordable and accessible financial services (e.g., interest-free P2P lending). Adopting a P2P model at a macroeconomic level may enable greater financial transparency and efficiency, reduce transactional fees, and enhance real-time, ubiquitous connections between customers and sources of funds.

4.2. Direct Ownership and Self-Management of One's Assets, Data and Identity

Identification is a right and it is crucial to obtain financial inclusion and access services, opportunities and protection.

Yet, still today, estimates show that there are 850 million people globally without official proof of their identity, who are excluded from accessing basic services and opportunities exactly because they cannot prove their identity.[33]

This lack of proper identification has resulted in a difficulty in accessing financial services, receiving financial support, applying for a job, obtaining phone services, and medical care. Beyond access to basic services several people are denied their right to participate in elections. Most of these people live in lower income economies, but several millions of disadvantaged people live in higher-income countries. Not having access to a proper ID is the result of several barriers: onerous documentary requirements, the need to travel long distances, and lack of trust.[34]

At the same time, according to the UNHCR, there are currently over 53.2 million internally displaced people, 4.6 million asylum seekers and 27.1 million refugees[35].

Relying on Self-Sovereign Identity instead of traditional identity systems could solve some of their access problems. Being it "portable" it could be used independently with biometric data and information to access different services, allowing people to decide which data to share and with whom whilst being able to remove access at any time and not providing unnecessary information.

This requires devising an identity management system that minimises the control of one entity over the personal information of the population, without relying on a third party, meaning not having a single point of failure while at the

[33] https://documents1.worldbank.org/curated/en/099705012232226786/pdf/P176341032c1ef0b20adf10abad304425ef.pdf.
[34] https://documents1.worldbank.org/curated/en/099705012232226786/pdf/P176341032c1ef0b20adf10abad304425ef.pdf.
[35] https://www.unhcr.org/en-us/figures-at-a-glance.html.

same time ensuring that privacy of people is protected, which is especially important when we are talking about fragile individual.

A truly decentralised solution would enable people to maintain full control over their personal data, without a central database and a centralised authority, without publicly disclosing any sensitive data about the individual, still ensuring that one individual cannot register multiple times for an identity.

Such a system would be based on blockchain-based attestations, claims, credentials, and permissions, which are portable along an individual's life. Even though this type of identification would not depend on any government or organisation, credentials and attestations could anyways include government-issued identification and biometrics as one of many facets of an individual's identity.[36]

Even though we are still far from understanding how to design a digital identity system that provides full control and autonomy to the individuals, we believe that blockchain is an enabling technology for such a system and there are several experimentations and projects trying to address these needs through the use of such paradigm, both for vulnerable people in lower-income and higher-income countries, as EBSI[37] is doing for the European citizens. For a description of use cases, please refer to chapter nine.

4.3. Tokenisation of Everything

Blockchain tokenisation is the operation of introducing a digital identification of an object, like an asset, a right, a data set or an identity, in the ledger of the blockchain.

One can distinguish the tokenisation of fungible and non-fungible objects. Fungible tokens are tokens that are equal to one another, and one token represents an equivalent representation of the object as another. A non-fungible token, aka NFT, is a token that represents a unique object and that cannot be exchanged as equivalent with another token.

As anything can bear a digital representation in the form of an identification number, anything can be tokenized on a blockchain: from a financial instrument to a physical good, from a book to a contract or from a corporation to an individual.

Consequently – with the tokenisation of anything on a blockchain – anything can also become the object of:

- direct ownership and self-management on the internet;
- a person-to-person transfer or transaction.

[36] https://www.frontiersin.org/articles/10.3389/fbloc.2021.616779/full.
[37] https://ec.europa.eu/digital-building-blocks/wikis/display/EBSI/Home.

4.4. Accessing Borderless Markets and Networks

A public permissionless blockchain infrastructure depends on the network of nodes, which are freely maintained by participants globally. As long as governments allow access to the internet, in principle, no geographical limits exist on the extent of the infrastructure and the use of its functionalities.

Blockchain proposes for the first time in history a global "standardised" infrastructure for the direct transfer of ownership of anything between anywho, or for that matter – also – anything, as the Internet of Things allows for the existence of objects as participants in transactions.

This global standardised and borderless infrastructure also creates borderless, permissionless networks on which marketplaces of all kinds can develop and exist. For the first time in history, the open nature of the Internet and its free transfer of information is replicated in a global transaction system allowing anyone to transfer the ownership of anything freely to anyone, anywhere in the world.

4.5. Financial Inclusion through Decentralised Finance

A hallmark of Web 3.0, decentralised finance or DeFi, holds a promise of promoting fairer and more democratic financial services. It can be thought of as creating a secure pipeline directly between the transaction parties without the involvement of banks or governments. DeFi distinguishes itself from the traditional financial system in that it is self-custodial, permissionless, programmable, transparent, immutable, and interoperable. The unique features of DeFi applications allow consumers to control their assets more directly through personal wallets and consumer-centred trading platforms rather than institutions. In some ways, DeFi may contribute to redesigning the financial sector, freeing it from current constraints and allowing consumers more open credit offerings.

To guide the respected reader more in detail through this topic we added a deeper insight in chapter nine "Use Cases".

5. Professional Utility: New Organisations and Networks – Effects for the Individual

If you address the question of networks and organisation, you inevitably end up with the topic of leadership. What does leadership mean in the 21st century, and what impact does leadership have on the organisation and networks? Since the advent of the next level of digitalisation, triggered by the pandemic, it has become clear that the traditional models of organisation and networks seem outdated and they certainly are. Which technologies are so mature today that they can be integrated into processes without major complications to make them more efficient? What are the implications of these changes for leadership, organisation and networks?

Even though COVID-19 has done much to change operational processes as an accelerator, a home office is now considered the new normal. Generations Y and Z[38] no longer accept traditional hierarchical approaches between management and staff even before the pandemic, the need for further change cannot be underestimated. The changes coming our way need to be viewed from the perspective of both companies and employees. Recognising and learning new skills, understanding new technologies and their limitations, and adapting work processes and organisations will enable digital transformation. On the other hand, people remain stuck in a status quo[39] because change promotes insecurity.

If we first look at the traditional, pyramid-shaped organisational concepts, we can see that the decision-making levels taper off towards the top, i.e. become much smaller. This means that top-level managers make decisions that do not necessarily correspond to the reality of the executive level. This leads to frustration and the supposed question of meaning. Helmold states that employees need a sense of purpose for what they do in order to add value to the company.[40] Generation Y and Z expect answers from the employer. In addition, the Western industrial nations face the challenges of a lack of young skilled workers, demographic change, and the need for digitalisation and technological developments. This means that the demands on managers and management styles are changing, as a company's survival in the market will depend on this. The focus is on creativity and innovation and less on efficiency and profit. Traditional organisational structures such as line hierarchies or target management will be replaced by flexible organisations in decentralised team structures. This change leads to autonomous, self-determining teams and thus enables much greater freedom of action but also responsibilities of each individual team member.

To meet these requirements, "change management" must be addressed if a comprehensive, cross-divisional and far-reaching change in terms of content is to

[38] Generation Y holds the birth cohort between 1980 and 1994, and Generation Z is the birth cohort between 1995 and 2010. These generations are far more influenced by increasing digitalisation than previous generations. This causes a so-called change in values, which is also reflected in the demands of a job.
[39] Behavioural economics speaks here of the status quo bias, i.e., the tendency against change (cf. e.g. Haucap, 2014, p. 8).
[40] Helmold (2022), p. 9.

be brought about to implement new strategies, structures, systems, processes and/or behaviours within an organisation.[41]

Managing digital transformation and using new technologies does not depend exclusively on financial resources in companies and public administrations. In addition to a "mind shift", it is important to simplify the processes in planning and implementation and to address the clear allocation of competencies and responsibilities in order to ensure a faster ability to act and adapt.

In addition, and this report would like to explicitly point this out, it is important to illuminate the opportunities and possibilities that open up through the turn/transformation to Web 3.0. Similar to the technical level[42], many concepts have been thought up but have only been implemented to a limited extent because the thinking still prevails that work wants to be organised by a central authority. But is that the case? Visionaries see networks and their structures as a way to redistribute work. In this context, networks do not end in a larger company. Rather, every computer in the world can be understood as a part of the overall organisation that performs proportionate work tasks, regardless of where this computer is located (local allocation) nor to which company a computer user (or even further thought, a smart device) belongs. These organisational boundaries no longer exist because work can be divided into work packages and anyone who wants to earn an income looks for the project to contribute their skills and interests in exchange for payment. The prerequisite for such a working world, which carries out the work that arises without hierarchies, is transparency within the decentrally organised networks. Transactions such as the processing of (partial) projects are regulated via smart contracts (self-executing computer programmes). The rules for these smart contracts can be set up in a general and universally valid way (with worldwide validity, so to speak) or per project within the project team that has come together. These rules formulated via smart contracts are the backbone of the team. The chapter "New Organisational Structures" goes into more detail on this approach and explains the “Decentralised Autonomous Organisation”, or DAO for short.

It can be seen that transparency, decentralised networks, traceability of transactions, etc. are predestined for blockchain solutions, as mentioned properties are inherent to a blockchain. At the same time, the increasingly complex work tasks can be solved faster and more efficiently in a network that spans the globe.

Concerns about competitive disadvantages, loss of reputation, loss of the current status quo, etc. are highly human. Still, we are amid an epochal upheaval of previous certainties (from climate change, broken supply chains triggered by a pandemic, exacerbated by wars also in Europe, the return of high inflation rates to the use of quantum technology, etc.). To assume that this will not affect how we work and learn is naïve. Change is happening. It is worthwhile to look at the existing concepts, some of which are visionary, to re-evaluate and reclassify them

[41] Ibid, p. 175.
[42] On the technical level, we can see that cryptography, data storage, and the concept of digital currencies did not only become a reality with the launch of Bitcoin but that these concepts were already conceived in the 1950s, but were not yet feasible due to a lack of technical capacities.

in the context of Web 3.0. The following theories can be understood as suggestions to follow this necessary transformation process.

5.1. Change Management and Leadership

The digital transformation is not limited to a company's technical IT equipment. Rather, it is accompanied by a change in management style, at least as long as companies are known and familiar to us in their previous form. The consulting firm Capgemini[43] already identified influencing factors in 2015 that managers should pay attention to:

- Networking: understanding and using the importance of networks.
- Communication competence: adapted.
- Changing how we work: Outsource routine work and focus on value-creating innovation processes.
- Influence: flat hierarchies and involvement of project teams.

Changes in leadership style are comprehensive and impact the mission, vision, strategies, structures, systems, processes and behaviours within the organisation / the company.[44] To understand this comprehensive change in the company and the attitude to continuous development as change, the people must be involved.

In the 1940s, the psychologist and social scientist Kurt Lewin assigned typical characteristics to change processes based on two kinds of forces: on the one hand, so-called retarding forces, which are concerned with maintaining the status quo, and the accelerating forces that support change and break with existing structures.

According to Lewin, these forces are necessary for an organisation but must be balanced. In the change process, this balance is shifted in favour of the accelerating forces. In Lewin's model, this shift takes place in three phases:

- **Unfreezing:** here the accelerating forces take over and prepare the changes by initiating appropriate awareness.
- **Changing:** After the consciousness is established, the changes are carried out, new things are tried out, ways of reacting are formed, and solutions are generated. The former status quo no longer exists.
- **Refreezing:** According to the concept, this is the process of getting used to the new situation. The newly created and implemented structures stabilise the structure and a new equilibrium is established (until the next change push takes place).

[43] Crummenerl / Kemmer (2015), p. 3.
[44] Helmold (2022), p. 175.

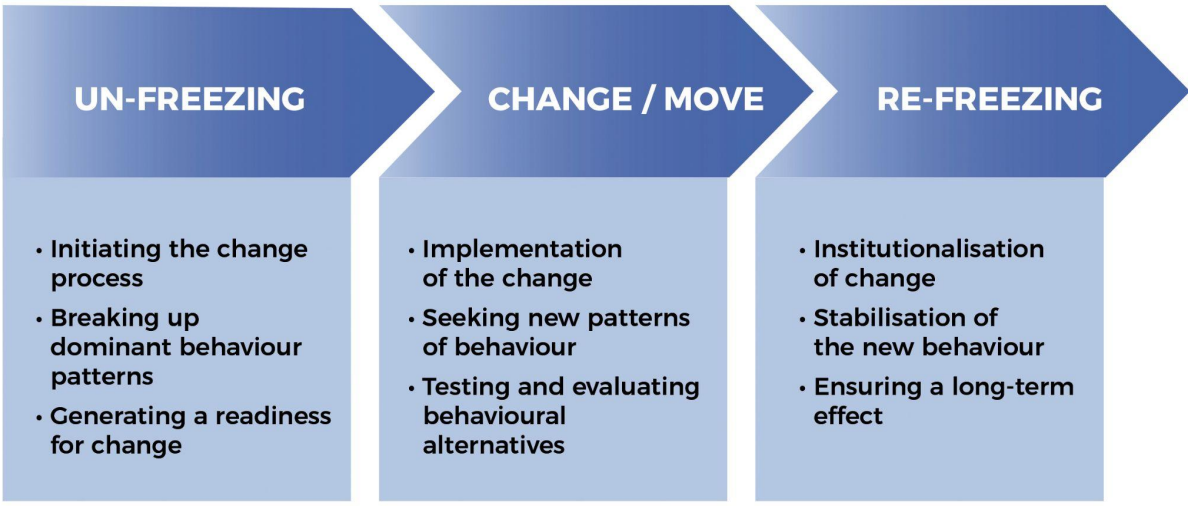

Figure 5: Three-phase model of change according to Kurt Lewin

Even if this theoretical approach is considered outdated nowadays, as the pressure to change and optimise is almost constant, it is accompanied by a discussion about minimising resistance. This in turn is significant in the transformation to the world of Web 3.0. Here again, many resistances are recognisable that have to be overcome.

Change management is not to be understood as a singular event, but rather as an ongoing, progressive, all-encompassing process. Further developed models to do justice to this permanent change are very often based on the assumptions of Kurt Lewin, such as Kotter's 8-step model or Krüger's five-phase model.

The “complexity of dynamic systems” model is also based on the findings of the scientists mentioned, but in contrast to Lewin, for example, the circumstances for change occur unplanned and tend to be more spontaneous. This is considered a reference to a dynamic system and members of such systems are a central part of the (inner) structure. If one dares to think of such a dynamic system beyond fixed corporate structures and using the possibilities of Web 3.0, then work tasks will be distributed in a completely different way. The first practical implementation possibilities can be concluded from Bergmann's New Work approach.

5.2. New Work Theories as a Driver of Transformation

In the context of research on leadership styles, the social philosopher Frithjof Bergmann developed the “New Work” model and dedicated himself to the relationship between people and work. “New Work” refers to the sustainable change in the world of work in contrast to “Old Work”, which reflects the traditional leadership style of “command and control”. The driving idea of New Work, a concept for the new way of working in the digital age, is the goal of positively influencing motivation, self-fulfilment and creativity and thus serving, among other things, to strengthen the culture of innovation in the company.

Bergmann observes at the time how automation in the automotive industry is bringing a wave of redundancies and work itself is being reorganised.[45]

One aspect of "New Work" is agility on different levels. Agile companies react to constantly changing market conditions by questioning themselves and their process structures and accepting change. As a sub-aspect of "New Work", agility is understood more as a mindset and less as a fixed definition. In 2001, software developers got together and wrote a manifesto.[46] These developers noticed that with the classic approach of hierarchical levels, responsibilities and bureaucracy, they could not (or could not) do justice to the complexity of the demands placed on them. Flexibility is needed to identify sources of error in the actual production process, not a sequential approach in which a development team only advances to the next phase when the previous one has been completely and satisfactorily completed.[47] That is too time-consuming.

In contrast, the agile approach is different, based on iterative development plans, where the result is improved with each iteration.

From this understanding, starting with software development, the knowledge of agility has found its way into company management. So it is no longer just about software development, but agility in its multidimensionality can help to optimise the production and manufacturing process across corporate functions. Agility can be located in the following contexts:

- **Agile teams:** Teams organise themselves independently and project-related and work together both virtually and in presence.[48]
- **Agile approach:** Sequential approach is replaced by an iterative way of working in which the design is not predetermined, but can be flexibly adapted and further developed through the iterative approach.[49]
- **Agile methods:** To support the agile approach, methods such as Scrum (Schwaber/Sutherland 2020), Design Thinking (HPI Academy o. J.) or Crystle Clear (Agilest o. J.) have been established and proven.[50]
- **Agile organisation:** These self-learning organisations place customer needs and expectations at the centre of the action. Classic hierarchies are replaced by innovative leadership principles and the team is given the necessary freedom.[51]

These demands from the New Work concept, lead to a new form of self-organisation. The aspect that is becoming more important for an increasing number of people, also as a consequence of the extensive resaerach literature in this area, is that work should be sustainable and have as little or no harm to the environment and society.

[45] Bergmann (2017), p. 10.
[46] Beck et. al (2001).
[47] McCormick (2012), p.3.
[48] Lemke (2020), p. 20.
[49] Kupiek (2021), p.11.
[50] Please note that we are indicating those we consider to be the most important methods.
[51] Kollmann (2020), p. 28.

This “revolution” can be triggered from two directions: Top-down, i.e. from management through clear guidelines, or bottom-up through suggestions from individual employees.[52] The goal must be to interweave both approaches in order to integrate as much top-down as necessary (= guidelines) and as much button-up (= restructuring of the employees actually involved as well as their suggestions from day-to-day work) as possible. In the medium term, this can lead to flexible and adaptable networks and organisations.

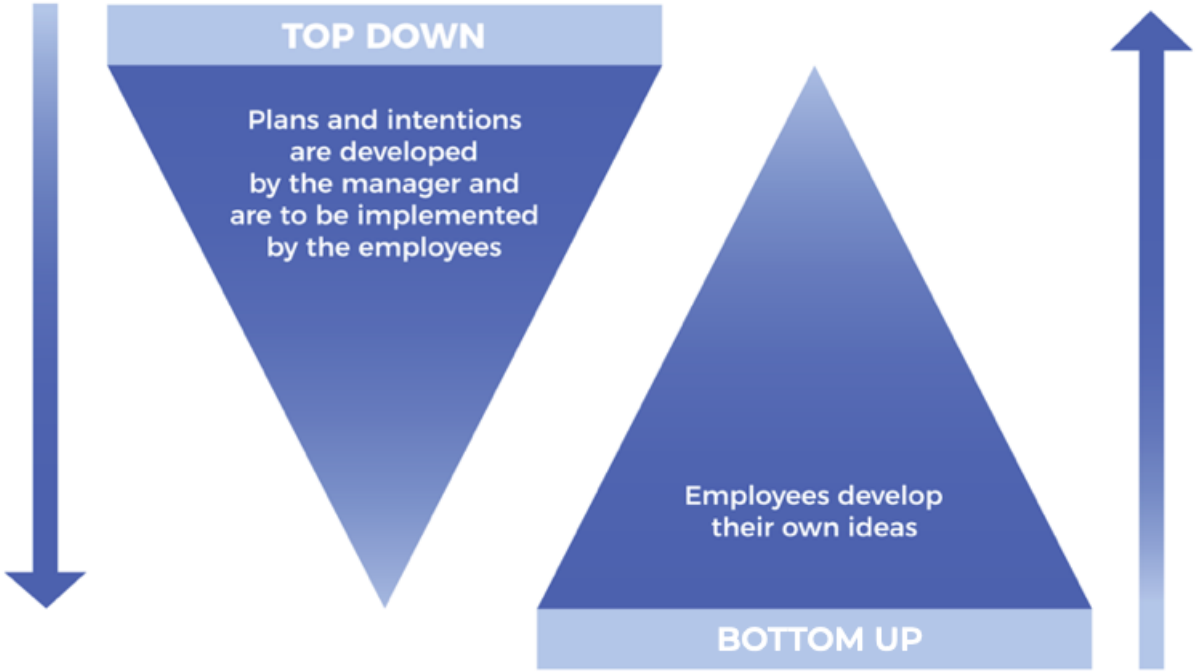

Figure 6: Top-Down Bottom-Up-Approach

5.3. Flexible and Adaptable Networks and Organisations

The way we want to work today and in the future must be considered from two perspectives: That of the individual as an employee and that of the company as an employer.

In order to understand the motivation of the individual to change the way things have been done so far, it is good to look again at what an individual can offer in today's world of a division of labour: One's own (life) time and qualification in exchange for financial means (= salary). In a digital world, this no longer has to mean using my labour exclusively for one company, but rather making my

[52] Companies should not underestimate the power of the bottom-up: when employees no longer feel comfortable, they quit. With more employees leaving the labour market than young workers entering it, especially in industrialised nations, this leads to an intensified competitive situation for companies in the labour market. Companies that ignore the demands for meaningful work will take much longer to fill their vacancies.

working time available to different companies on a project or hourly basis.[53] What sounds on the one hand like a flexible way of working that allows employees to choose their own tasks can, on the other hand, lead to the so-called income precariat. If there are no fixed ties to companies and everyone works as freelancers, everyone has to struggle to find work in the global competition. Since the cost of living varies greatly around the world, a Central European is in competition with someone from an emerging country. Social systems, such as health and pension funds, have to be serviced by the employee (and not, as in the case of employment, by the employer). All this may be unproblematic when one is young, but as one grows older, the view could shift – if society does not build up a fair distribution with the support of and through technology.[54] With our thought experiment, we want to provide some initial thoughts on such a distributed world of work.

In order for employers (or project sponsors) to find the right employees, they also have to deal with the trends and wishes in the labour market in order to find suitable answers. Kollmann points out that companies need so-called digital skills, i.e. knowledge about digital business models as well as the corresponding knowledge of how to deal with digital technologies and processes.[55] In addition, they need qualified employees who have sufficient self-motivation to manage this digital transformation. Traditional organisational structures are no longer sufficient to meet these demands. As a communication structure, these traditional structures support too much "giving orders (manager/supervisor) and receiving (employee)". This works less and less well in an increasingly complex and highly dynamic working world. In addition, western industrialised nations are confronted with demographic change, with a greater outflow of employees on the labour market than inflow (see baby boomer generation).[56] Change and adaptation are thus necessary to maintain a raison d'être as an organisation.

So, what could the new world of work look like that, on the one hand, does not create a new precariat among employees as order-takers, but on the other hand, enables enough meaningful work? How must the institution "employer" adapt to meet these demands? Which technologies can support both sides? One noticeable step in the world of work is the increasing automation of routine processes. This allows more freedom for the individual to work creatively and innovatively.

A look at the concept of self-organising, autonomous organisations can give an initial idea of what is already feasible today.

5.4. New Organisational Structures

In addition to the classic process and organisational structures that are being questioned in the course of the digital transformation, it is worth taking a look at

[53] The associated questions of the confidentiality of information, among other things, will not be considered further here for the time being.
[54] We leave the discussion of what exactly fairness is to the philosophers at this point.
[55] Kollmann (2022), p. 39 ff.
[56] https://www.destatis.de/EN/Press/2022/08/PE22_330_13.html and https://www.j2t-recruiting.com/post/the-impact-of-baby-boomers-retiring, retrieved on 17.01.23.

autonomously self-organising associations of individuals and groups, or DAOs (Decentralised Autonomous Organisations). These associations of self-managing groups network via blockchain technology and manage a budget of tokens/cryptocurrencies without fixed hierarchies. This makes conventional management models obsolete because companies, projects or simply "only" tasks can be managed within this network. Innovative ideas or new approaches to work can be presented and voted on within this network. Pre-defined rules as a computer programme (smart contracts) enable each participant not only to participate in the network but also to be completely transparent about the rules. This achieves the goal of automated administration, controlled via a corresponding app.

In the internet/blockchain community, DAOs are often compared to listed companies. Shareholders as shareholders own the company and in the ideal world, the shareholders decide at the annual general meeting which decisions are to be operationally executed by the board appointed by the shareholders. Depending on the type and amount of shareholding, shareholders may have more or less voting rights. This analogy picks up the concept of the DAO, according to which each shareholder of the DAO contributes more or less voting weight according to his or her amount of so-called governance tokens. These governance tokens form the backbone of the DAO, as they legitimise the holder of such tokens to vote within that DAO. In addition, each token holder can put forward their own proposals and call for a vote. Thus, through their investment in a DAO, token holders have the right to vote and thus the possibility to influence the projects and the way they work. The idea of participation is distributed equally among all token holders and thus represents an interesting alternative to conventional organisational structures.

5.5. Central Planning vs Adaptive Self-Organising Networks

The demands on organisations are changing with the same dynamism as technologies evolve and are used in companies. The driver of all changes (both on a technical and business level) is digitalisation, to which companies must react quickly in order to remain relevant in the market. This new flexibility-focused organisation needs to engage employees across projects and departments.

Figure 7: Digital Organisation Requirements

The figure illustrates the complexity of the transformation of organisations in order to remain fit for the future:

An organisation must undergo digital transformation at all levels. Digital structures and processes are based on the use of new technologies and the adaptation of the existing infrastructure (not only IT infrastructure). To take advantage of all potentials and opportunities, a digital strategy must be developed to fulfil visions and missions. The management style has to evolve in order to be able to adapt to the changing framework conditions (employee recruiting, employee management, use of new working models, etc.) and to remain interesting as a potential employer. The change from traditional working with, for example, 5-day office work to a self-determined working environment in which it does not matter whether the employee is physically on-site or connected from another place in the world (remote working) requires a completely new culture of communication.[57] Similarly, the way of working will change, as the use of digital tools will enable new and more efficient ways of working together. These are all never-ending processes – everyone needs to evolve and learn.

[57] There is still a lot of "upward" capacity here. It can be read in August 2022, for example, that a tech company like Apple is again requiring its employees to do the work that arises from the office three days a week after the pandemic has ended. This can be understood as a step backwards in terms of the flexibilisation of working time and world. It will be interesting to see how the employees react to these demands: stay or quit...

5.6. Knowledge Transfer and Lifelong Learning[58]

Putting learning and knowledge at the centre of an organisation helps people to cope with digital transformation. Not least, therefore, there is also talk of “learning organisations” in order to establish a sustainable learning process that makes it possible to react adequately to constantly changing environmental conditions.

The often underestimated resource, the collective knowledge of all participants in a company or network, is actively used. Ways to transfer knowledge, as well as structures for active knowledge management, are important prerequisites for managing the transformation process. For this, it is not enough to build up and maintain awareness, but a certain skill set appears necessary. In the literature, the first approaches are visible that no longer distinguish between “hard” and “soft” skills[59], but rather the understanding is growing that both components are necessary to be able to manage a company or a project successfully.

The insights from the New Work approach can have a supportive effect when it comes to, among other things, effective and associated collaborative working. This can be extended by the component of (today's) learning. Brought together, the active exchange of knowledge of individual employees within projects and beyond can lower the barriers of the unknown (knowledge) to such an extent that the fear of change is relativised and the phase of “resistance” is ideally hardly pronounced.

In an ideal world, diversely structured teams would work on and off projects agilely. The knowledge of the various team members is shared and jointly expanded, for example, in the course of peer learning[60]. Knowledge asymmetries level out over the course of a project so that, in the long term, hierarchical levels hardly develop. Flat hierarchies are good drivers for the working atmosphere, as people are placed at the centre. The professional activity of the individual is filled with meaning because teamwork, according to the New Work approach, enables a high degree of flexibility in work. It becomes less and less important where the team members are (whether in the office, online at home or any other place in the world). It must be said, however, that this does not apply to activities that require a presence at the workplace (which is the case of Blue Collar Workers).

With lifelong learning, it is natural that employees are encouraged to learn and develop their performance potential through a constant desire and appetite for further learning and training. Competences are not limited to formal areas of responsibility of individual employees. When organisations/networks allow lifelong learning, change and transformation are continuous and occur from within.

[58] Lifelong Learning is the process and appetite of discovery, developing, understanding, accumulating and gaining knowledge, skill, aptitude, experience and behaviours.
[59] Rovida / Zaffei (2021), S. V.
[60] The term "peer learning" can be understood as cooperative learning that is not only about sharing knowledge but also about exchanging experiences. In this way, for example, young employees can take away the fear of digitalisation and the related technologies from older employees more easily than, for example, a seminar can because it is an exchange at "eye level".

5.7. Governance: The Membrane Between Inside and Outside

The concepts of business management and organisation described above are familiar. The use of existing technology is a matter of course. On the other hand, what is unusual is rather the complexity of the possibilities, both at the technology and corporate-social levels. Governance should provide the legal and factual regulatory framework, based on state laws, to guide an organisation and to ensure that this organisation does the "right" thing. In addition to this general understanding of what governance means, blockchain-based governance has also emerged over time.[61] In this report, we distinguish between these two definitions and first consider "only" the general approach before explaining the blockchain-based interpretation.[62]

In revolutionary terms, the general understanding of governance as a meta-level, as we understand and discuss it today, is not current. There is no need for a supervisory structure in an organisation. Tomorrow's (working) world organises itself and "self-imposes" the rules of cooperation. The public interest in compliance with governance rules is now determined by the public itself. Compliance with the rules is orchestrated, or some might say "monitored", via, e.g. smart contracts. It is up to each individual to take their "amount" of work, e.g. to pay for their own upkeep. Each individual works cooperatively with others without the need for a company as an identity provider. The focus is on the individual's own responsibility. Organisational forms give way to temporary associations, and the focus is on cooperation rather than competition. This is possible today through the expanded use of technology (e.g. DAOs).

To be fair, this utopia will still need a long time to realise on a broad scale, and perhaps for a good reason. Not all work can be done through self-organising networks to ensure a smooth process. Nevertheless, even in the existing organisational structures and the need for change towards, e.g. new work concepts or similar, the question of adjusting governance arises. Governance rules have been developed to create trust and legitimacy, among other things, and this works internally as well as externally and is permeable like a membrane.[63]

If one takes the generally valid definition of governance in the sense of monitoring (of processes) and how this monitoring is carried out (centralised, hierarchical-monopolistic with trust in the administration, efficient because centralised)[64], the question arises as to how compliance with rules can be improved through the use of technology. How can internal structures be optimised via the use of, e.g. blockchain-based concepts? What conditions are necessary to move processes from a more hierarchical to a participatory mode of operation?

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[61] Fitzner (2022) S. 10 ff.

[62] https://www.governanceinstitute.com.au/resources/what-is-governance/, retrieved on 19.01.2023.

[63] If a company is involved in a scandal, this has an immediate impact: the stock market value, if the company is listed, will fall. This increases the cost of raising capital. Reputation suffers because of the scandal and trust from stakeholders is lost. Turnover decreases, and a negative downward spiral begins. These initial external effects have an internal impact on the employees' trust in the company.

[64] OECD (2015), *G20/OECD Principles of Corporate Governance*, OECD Publishing, Paris, https://doi.org/10.1787/9789264236882-en.

Blockchain governance uses the principles of blockchain technology. It is organised in a decentralised way, enables participants to participate through different mechanisms and is based on transparency. The majority-managed blockchain database has the potential to replace centralised, hierarchical systems with distributed verification systems. The inherent trust in centrally organised systems (you have to trust the system per se that everything will be fine) is replaced by the way blockchain technology works. This leads to programmed, transparent and traceable digitised processes that either do not allow deviations from the desired state or immediately post an error message. This will also work internally and externally again, supported by a much greater consensus than the conventional systems since "one" no longer refers to only one data set.

5.8. Social Impact Goals Are Essential Considerations for Blockchain-Based Organisations

New thinking about the impact of blockchain technologies and their implementation are occupying educationalists, entrepreneurs and decentralised organisations in recent years. Several publications[65] have demonstrated the importance of including social impact in blockchain organisations' development and maturation. The United Nations (UN) innovation frameworks[66] provide an opportunity to take action in this direction.

The UN sees great potential in blockchain technology as a means to achieve rapid solutions for achieving the SDGs (Sustainable Development Goals), described as a blueprint for a better and more sustainable future for all. In the past few years, a plethora of projects and initiatives have emerged, focusing on improving sustainability and delivering positive social and environmental impact with the help of blockchain and DLT. Many of these projects convene diverse actors to work collaboratively in tackling some of the most important challenges we face today, including climate change, modern slavery, pandemics, poverty, irresponsible sourcing, inequality in education and health, food waste, fraud and corruption.

Institutional innovation is not only imperative in procuring socio-economic growth but also in facilitating the transfer of digital knowledge in a holistic way. Many of the startups and projects are considered rebels because of the lack of access or governmental acquaintanceship which would allow them to leverage their innovations and solutions in public and cross-border services and benefit the global society.

This "single truth without single source" data architecture enables entire networks of participants (peers) to co-create and inspect the entire uninterrupted chain of events, records, and transactions, and achieve end-to-end transparency and consensus. Hence, blockchain is essentially in harmony with e.g. SDG 17, which establishes the need for creating partnerships to achieve the goals.

[65] Schenker, I (2019). Blockchain in Trade Facilitation: Sectoral challenges and examples. https://unece.org/fileadmin/DAM/cefact/cf_plenary/2019_plenary/CEFACT_2019_INF03.pdf.
[66] https://www.uninnovation.network/.

6. What Skills Do Individuals Need in a Web 3.0 World of Public Permissionless Blockchains?

The traditional institutional and corporate structures often put the individual in a subdued and consequently often non-participative position.

The decentralised setup of Web 3.0 and a public permissionless blockchain infrastructure has the potential to give individual citizens more autonomy in how they direct their everyday socio-economic interactions. The traditional infrastructure allow individuals to navigate their socio-economic environment more independently. To profit from this new setting, individuals will need skills that support autonomy, independence and responsibility.

Central to this autonomy, independence and responsibility is digital literacy. Digital literacy refers to the digital skills used to navigate everyday life, learn, work and live. These skills enable individuals to interact with ease with a range of technologies, from the basic to a range of more advanced ones. These skills cover digital literacy, use and analysis of data and knowledge of cyber security – staying safe in a digital environment. Each individual needs to have the capacity to use a range of digital devices, applications and software in their day-to-day lives, work, education and training. These skills will enable individuals to communicate, collaborate and share information. There is a concern, however, that there is a growing digital divide worldwide, which is a key area for governments, industry, and the wider community to address. Our paper does not address this issue in detail and is the focus of other interventions.

In this chapter, the INATBA Education Working Group focuses on broad categories of skills that it considers essential for individuals to navigate a public permissionless Web 3.0 environment. Focusing on high-level key skills, we are not presenting an exhaustive list of every possible skill.

We distinguish two levels of skills: skills for everyday utility and skills for professional utility. The skills for everyday utility focus on those capabilities that allow the individual to use the Web 3.0 infrastructure in her/his everyday socio-economic interactions for personal utility. The skills for professional utility focus on the use of the Web 3.0 infrastructure and tools to generate socio-economic or entrepreneurial value, either by creating Web 3.0 applications or by contributing to the functioning of those Web 3.0 applications.

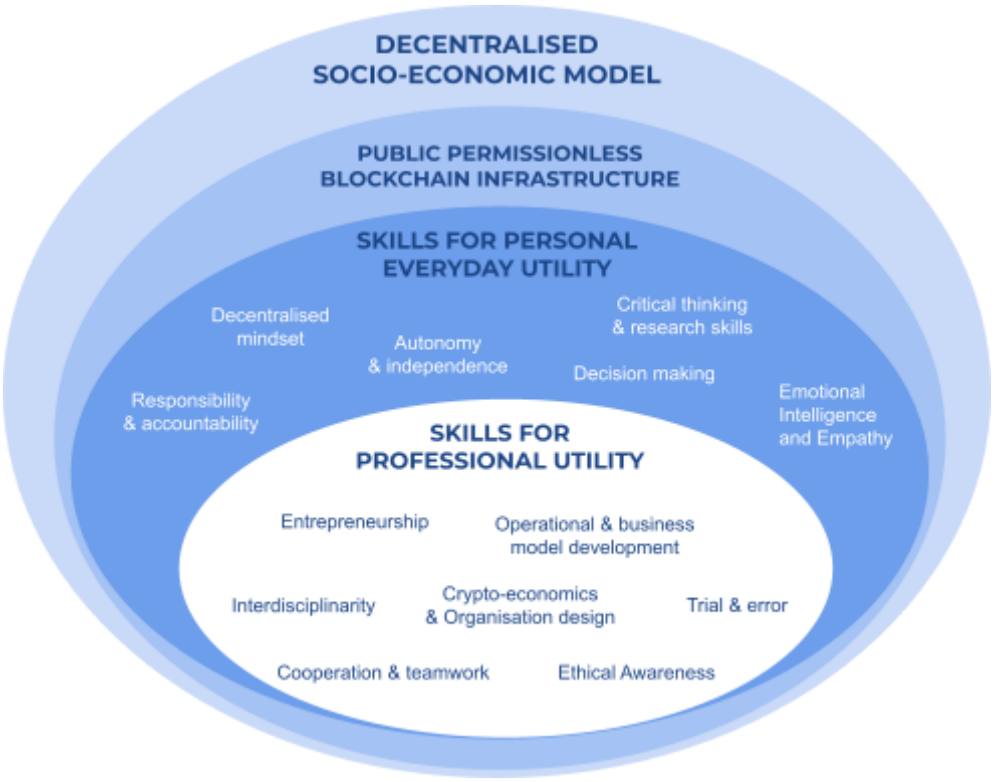


Figure 8: High-level skills for individuals required to enable a decentralised socio-economic model

6.1. Skills for Personal Everyday Utility

To use Web 3.0 for personal utility in one's socio-economic interactions, individuals need to understand the operational and organisational logic of Web 3.0 and be capable of using the public permissionless infrastructure.

Some of the functionalities that individuals need to be able to use are, for example, borderless direct peer-to-peer payments, self-sovereign management of assets and data and the use of explorers to navigate the Web 3.0 marketplaces.

6.1.1. Decentralised Mindset and Thinking

As citizens, our existence in the socio-economic fabric is modelled by organisational and operational centres. This setup offers the comfort of caretaking and assurance. Though, this centralised mindset can also limit us in terms of creativity and initiative.

A public permissionless blockchain setting offers less of a channelling of our transactions and initiatives. Still, it demands a decentralised mindset in which each individual has the freedom to determine how to interact with that network of nodes that executes your instructions.

As a participant in a global borderless and decentralised socio-economic transactional infrastructure, a citizen has more freedom to handle their

socio-economic interactions but also renounces to be “taken care of” by centralised trusted parties.

The centralised third parties holding your data and the proof of your ownership of your assets, data and identity are replaced by an environment that allows the individual to handle her or his ownership directly. This requires the individual to change their mindset radically, abandoning the service-consuming context and adopting an infrastructure user’s attitude.

The decentralised mindset requires the citizen to understand the foundational nature of the public permissionless blockchain infrastructure and its relation towards that infrastructure. It’s the citizen who interacts directly with the socio-economic transactional infrastructure and not a service provider who takes care of that interaction for you.

6.1.2. Individual Autonomy, Independence and Decision-Making

In our states today, we see social standardisations ranging from democratic to autocracies and dictatorships in which an individual has no right to exist. What counts here is the totality and not the individual. Therefore, from our point of view, a lot of courage and trust is needed in a society that allows individuality. We also believe that this can be learned, both for the individual and for society as a whole.

The current transactional infrastructure is traditionally managed by third parties like official institutions and corporations. Each proposes services and solutions that are compatible with their organisational objectives and might miss objectives that individual users of their services would like to realise.

With the paradigm shift away from service consumers towards infrastructure users, individual citizens naturally will have to consider the aspects that institutions and corporations decided upon previously. Instead of evaluating available service propositions, the individual will have to adopt autonomous and independent thinking and decision-making to come to a conclusion on the way to use the transaction infrastructure available to them.

6.1.3. Responsibility and Accountability

Responsibility and accountability are the other side of the medal (see 6.1.2. Individual Autonomy, Independence and Decision-Making). They can’t be seen as silos because we believe one goes with the other. The great thinker Immanuel Kant is credited with the following words: “The freedom of the individual ends where the freedom of the other begins.” Therefore, we have to take responsibilities and accountabilities into consideration if we don’t want to wake up in a dystopia.

In a world where only public permissionless blockchains exist and are used for everyday operations and transactions, we have to ask ourselves how accountability comes into play and whom to hold to account not only for what

raises immediate issues, for instance, when fraudulent transactions occur but also more generally since the way the technology is used by others (autonomously and independently) has an impact on our internal values.

Literature defines accountability as a construct which needs a "relationship of responsibilities" between a principal and an agent to ensure its establishment, and it requires explanations and justifications for any decision made[67].

However, public permissionless blockchains do not need those traditional elements to have accountability itself. They eliminate hierarchical structures. Therefore, there is no principal or agent, but various mechanisms ensure that accountability still exists.

Tyma et al. (2022)[68] highlight how in such systems, consensus mechanisms (in which trust is placed) construct accountability alongside transparency and immutability: the visibility of processes and the fact that what is registered in blockchain cannot be "unwritten" leads to more self-control and self-observation, forcing people to review their actions.

In public permissionless blockchains, the network transactions remain transparent to all, as well as the underlying technology that is primarily an open source and used by people as a result of their individual choice (see previous section on autonomy and independence). As a result, individuals are responsible and accountable for their actions and cannot impose sanctions on anyone but themselves.

Autonomous and independent decision-making can't be isolated from the responsibility and accountability that is attached. Individuals will have to change their mindset from an indirect to a direct responsibility and accountability of their transactional decisions.

The hypothetical world made up of only public permissionless blockchains and used as a basis for the thought experiment in this paper puts the individual citizen in the driver's seat for, for example, the decision on the remuneration of the coffee farmers based on one's daily morning coffee.

As the supply chains for everyday consumer products might shorten considerably through a freely accessible public permissionless blockchain infrastructure and adequate Web 3.0 interfaces, the individual takes the driver's seat in choosing products and corresponding business models and revenue sharing.

The possibility for a public permissionless blockchain infrastructure to be more transparent on the nature of alternative supply chains for daily consumption products allows the citizen to make a more informed decision and be aware of its socio-economic and environmental consequences. Individuals will become more directly responsible and accountable for the societal and ecological results.

[67] Mulgan, R. (2000), p.87.
[68] Tyma, B. et all (2022), pp. 1625–1655.

6.1.4. Critical Thinking and Research Skills

The independent and autonomous decision-making that this hypothetical world of public permissionless blockchains enables imposes on the individual citizen to be informed before taking action.

Using the example of product consumption again, the transparency that comes with supply chains that exist on top of public permissionless blockchains allows for the individual to access previously unavailable critical information needed to be aware of the socio-economic and environmental impact of one's consumption decisions. This also means that the individual can move from an accepting attitude towards a critical attitude.

Critical thinking and research skills are required for the citizen to execute informed and conscious transactions on the public permissionless blockchain infrastructure. Instead of undergoing decisions made by third parties possibly based on profit motives that don't necessarily optimise the impact for all stakeholders, individuals now have the possibility to assess the consequences for the larger context.

From investing in cryptocurrency to using blockchain applications, searching and verifying information from various sources is of utmost importance in this space. Citizens need to become active learners rather than passive recipients of information sourced by others. They need to be able to question ideas and seek to determine whether such arguments and findings represent the entire picture.

The skill of gathering objective information, analysing opposing views, setting personal objectives and coming to individual conclusions will be required for the individual citizen to be sufficiently equipped to take on their role as a responsible and accountable participant in the determination of the socio-economic and environmental context we live in. On the measurement side, it becomes necessary to know at least the basic elements of data science[69].

6.1.5. Regenerative Mindset

As stated by Josie Warden, "a 'regenerative' mindset is one that sees the world as built around reciprocal and co-evolutionary relationships, where humans, other living beings and ecosystems rely on one another for health, and shape (and are shaped by) their connections with one another".[70]

The biomimicry nature of this mindset invites pushing beyond sustainability (do no harm, off-setting negative impact) into a new paradigm that seeks to create positive externalities. Positive externalities apply to a mindset by going beyond the rhetorical triangle of Ethos (Credibility and Ethics), Pathos (Emotions and Feeling) and Logos (Logic and Reason) and into Praxis (Attitudes and Actions). Within the framework of a regenerative mindset, we can look at ethos as learning and praxis as crypto-economics.

[69] Giudici, P. (2018). Financial data science, Statistics and Probability letters, 136, pp. 160–164.
[70] Warden, J. (2021) "What does 'regenerative' thinking mean?" (Accessed: January 24, 2023).

Regenerative Learning is learning that begets more learning. It goes beyond the common notion of lifelong learning, focusing on the exponential fly-wheel effects of compounding deep thinking with adventurous practice. It is learning that is platonic (humble intelligence) and infinite in theory (Infinite game theory[71]). Peer-learning environments foster regenerative learning and align with Web 3.0 principles, as proposed by Kernel[72], a peer-to-peer Web 3.0 educational community.

6.1.6. Emotional Intelligence and Empathy

Daniel Goldman first coined the term emotional intelligence in 1995 – the mid-nineties. Emotional intelligence includes emotional self-awareness and self-management, empathy and managing relations well. Some will argue that emotional intelligence is more important and perhaps a better predictor of success than intelligence. In a time of rapid digital transformation, technological innovations like blockchain will transform individuals' lives and key industries at an accelerating pace; there is a continuous innovation cycle. While technology and machines will become more efficient and better at a whole range of tasks, emotional intelligence enables the individual to relate to colleagues in a completely different and more effective way; listening, empathising, identifying and analysing emotions and responses.

6.2. Skills for Professional Utility

In the previous section, we described the skills individuals would need to use and profit from Web 3.0 for their utility. In this section, we imagine what skills the individual would need to create socio-economic value and build socio-economic applications on top of the public permissionless infrastructure.

An in-depth exploration of all the skills needed by different professional figures is not the object of this paper, for which we refer to the studies of the CHAISE project[73]. We broadly describe here the ones that we believe to be central in the new set-up of the world shaped by public permissionless blockchains and Web 3.0 culture. In such a world, personal utility is intertwined with the professional utility since, as pointed out in Chapter 5.3, organisational boundaries no longer exist. In reality, we witness the emergence of project sponsors and project contributors.

6.2.1. Entrepreneurship

The freely accessible infrastructure of the public permissionless blockchains constitutes a fertile ground for new applications and operational or business models. For this possibility to be exploited at its fullest potential, individuals may

[71] https://en.wikipedia.org/wiki/Finite_and_Infinite_Games.
[72] https://www.kernel.community/en/start/principled-people#kernel-principles.
[73] CHAISE: Blockchain Skills for Europe, https://chaise-blockchainskills.eu/.

want to acquire entrepreneurial skills to support them in realising their ideas or their desire to engage in the field of blockchain value creation.

Being able to transform entrepreneurial objectives into an operational combination of existing and possibly new elements and mastering the capacity to lead, cooperate and execute those ideas are skills that can only benefit the creative individual.

Entrepreneurship requires that the individual moves away from an execution role and adopts an ownership attitude in which responsibility is taken for the realisation of objectives and the resolution of obstacles. Independence and self-confidence, together with adequate knowledge, all help the individual to be self-sufficient in his or her role as an entrepreneur.

6.2.2. Trial and Error Culture

To foster innovation within the realm of public permissionless blockchains and unlock the economic and societal value enabled by the decentralised infrastructure, participants need to adopt a trial and error culture.

The novel terrain that the decentralised infrastructure of Web 3.0 puts in front of us needs active exploration to mature and come to conclusions on the process and logical feasibility of implementations.

A trial-and-error culture allows the Web 3.0 space to explore actively and develop a fundamental understanding of the elements and their dependencies that constitute the operational and value-creating processes of the decentralised infrastructure.

By adopting a generalised trial-and-error culture, the individual should thrive in an environment where a negative result is just an intermediary conclusion and an input for improvement and advancement.

6.2.3. Alternative Business and Operational Models Development Skills

A decentralised infrastructure of public permissionless blockchains and its Web 3.0 environment proposes a new paradigm and realm of possibilities for socio-economic interactions. The novelty of this decentralised realm requires value-creating participants to be cognizant of the discoverability of previously unknown operating and business models.

Understanding basic principles in the constitution of operational and business models and the capacity to be creative with the composition and enrichment of those elements with novel decentralised aspects will be an essential skill for the space to exploit its potential.

An example of such a novel element that seems to have a potential for new ways of creating value and cooperating is the utility token: a token for payment of as well the project-internal services or products as the services or products the

clients pay for. The capacity of such a token to align the interests of all project contributors with the interests of the clients seems to constitute a novel element in the self-organising aspect of networks.

6.2.4. Crypto-Economics and Organisation Design

Organisational design consists of the process of structuring and engineering an organisation in such a way that its goals and objectives are realised in an efficient manner. It involves the creation of adequate procedures and processes for decision-making, allocation of resources and the production of services and products.

Crypto-economics studies the design of economic systems and organisations that use blockchain to implement governance, operational and production processes through the use of value-representing tokens that incentivises decentralised actors to interact with each other without the need for intermediaries or traditional corporate structures and can be used to design new kinds of systems, applications, or networks. Crypto-economics brings together the fields of economics, game theory, psychology, and computer science and leverages them in the creation of decentralised marketplaces and applications.

Both crypto-economics and organisational design deal with creating systems that align participants on the realisation of value-creating objectives and goals. The decentralised nature of blockchain, as well as the possibility to program objectives in crypto-tokens, allows for considering new ways of realising organisational goals. The basics of economic incentives and game theoretic aspects that make up the pillars of the trustless character of public permissionless blockchains constitute the ingredients for organisational innovation.

Crypto-economics and organisational design are fields that individuals and participants in Web 3.0 need to master to deploy new ways of realising entrepreneurial objectives and goals and deploy the innovation potential that comes with the new paradigm.

Regenerative crypto-economics[74] is a subset of crypto-economics, which itself is a subset of economics, which itself is a subset of the study of social systems.

Kevin Owoki describes[75] regenerative crypto-economic systems as “systems that satisfy human needs, create positive externalities (& are net positive) and create balance (& find equilibrium)”. Regenerative crypto-economics can sometimes be resilient or sustainable, but it cannot be extractive.

As stated by Kevin Owoki, “by focusing on the individual decision-making & strategic interaction between different participants in a digital ecosystem, and by viewing them through the lenses of game theory + mechanism design, we can

[74] Owoki, K. (2022). *Greenpilled: How Crypto Can Regenerate the World. The term was given popularity by Kevin Owoki (founder of Gitcoin) under the “GreenPill” meme in Feb. 2022 at EthDenver 2022 https://greenpill.party/.
[75] Owocki, K. et al. (2022) Greenpilled: How crypto can regenerate the world. Blurb. p.24.

discover powerful new ways to fund, design, develop and market applications and digital assets"[76].

6.2.5. Cooperation and Teamwork

The peer-to-peer engagement of Web 3.0 enables the creation of ecosystems that cross enterprise boundaries. In this world, not only participation in a project is open to everyone, but it is designed so that the more people take part, the more success everyone obtains. This allows organisations to deliver products or services that they would otherwise not have the technological capabilities to deliver on their own, nor the end customer understanding to imagine[77].

An ecosystem mindset enables companies to move beyond what's traditionally possible allowing for co-creation in a climate of trust also because blockchain permits the traceability of contributions and promotes their elaboration and combination[78].

In the Web 3.0 world, companies might become or could be substituted by communities of professionals who share the same vision and therefore support each other, share advice, form partnerships and build together projects with scalable and sound business models. We will see a gradual shift from the current hierarchical structure towards the DAO model, which is collaborative and horizontal.

In light of that, strong teamwork and cooperation skills are of utmost importance to thrive: people with the ability to work cooperatively with others, engage in constructive discussions, and contribute to responsibilities, can serve as better assets in collaborative environments.

[76] Ibid.
[77] World Economic Forum: Ecosystem (https://widgets.weforum.org/blockchain-toolkit/ecosystem/index.html).
[78] Kondrateva, G. et al (2022), p. 9.

7. What Is In It For the Society?

7.1. Digital Literacy

Digital literacy refers to an individual's ability to find, evaluate, and communicate information through typing and other media on various digital platforms. Buckingham suggests that this implies a "rounded, humanistic conception that is close to the German notion of Bildung".[79] It goes beyond "skills" and "competencies".

In our digital world it is not enough having somehow computer skills, or the inherent value of learning with computers. We as the authors believe it is of utmost importance to increase the user's ability to operate with software tools as well as to have a mutual understanding of blockchain technology[80]. This includes basic skills that are required to participate in the digital world and do the requested operations (it starts e.g. with the ability to set up oneself a digital wallet). We are not talking about the ability to use software features such as word processors and spreadsheets nor the ability to save data, copy and paste and so on. This was classified as Level 1 by the British government in 2003 and their "Skills for Life" survey.[81] Level 2 adds the search for and collection/assessment of information using search engines, databases etc.

Obviously, this is not enough when we are talking about blockchain technologies and Web 3.0, for which it is necessary to know at least their opportunities and risks[82].

As we highlighted in our previous paper[83], the lack of education and training on blockchain could cause a new type of digital exclusion that goes beyond the concepts that we understand now as "digital literacy" and "digital divide" that could affect a vast majority of the population.

Economies that are on their way to transforming themselves into the direction of Web 3.0 need to have high-skill individuals for their growth and overall welfare. Only with well-educated individuals we are able to keep our standards and to design a prosperous, innovative society. The impact of the knowledge economy is having a profound impact on all of us.

[79] Buckingham (2015), https://www.idunn.no/doi/pdf/10.18261/ISSN1891-943X-2015-Jubileumsnummer-03 retrieved on 07.02.23
[80] For further information on INATBA Education Working Group's position on blockchain and digital literacy, please refer to the paper "Blockchain Education: A Prerequisite for Socio-Economic and Technological Advancement", p.5.
[81] Department for Education (2003) The Skills for Life Survey, http://doc.ukdataservice.ac.uk/doc/7239/mrdoc/pdf/7239_2003_skills_for_life_survey_research_report.pdf retrieved on 07.02.23.
[82] Giudici, P. (2018) Fintech risk management: a research challenge for artificial intelligence in finance. Frontiers in artificial intelligence, 2018,1,1.
[83] For further information on INATBA Education Working Group's position on blockchain and digital literacy, please refer to the paper "Blockchain Education: A Prerequisite for Socio-Economic and Technological Advancement", p.5.

7.2. Ethical Awareness

Digital transformation is now a way of life. As we move from Web 1–Web 2 to Web 3.0, a new wave of emerging technologies like blockchain has given rise to a range of ethical challenges. We can think immediately about GDPR – the use of personal data and artificial intelligence as examples that individuals encounter in their daily lives. All new technologies like blockchain bring to the fore ethical concerns that are critical to be aware of and to address.

Ethics is a set of moral principles that guide our decision-making and behaviour. Central to individuals' ethical compass are their values, which need to be understood and identified. From behaviour to decision-making, our values define us. While businesses and organisations often develop ethical codes, it is the individual who works with others within their own moral code and respects the rights, values and beliefs of others. In today's society, individuals often use the perceived ethical stance and behaviour of the employer, together with the impact of their industry, to decide whether they will or can work in that particular environment. Clearly, ethical businesses and organisations rely on ethical individuals, ethical leaders and ethical governance and integrity.

Ethical aspects are difficult to measure; however, recent research shows how this can be made possible, within the context of the recent proposals to regulate artificial intelligence in finance[84].

[84] Giudici and Raffinetti, Shapley-Lorenz eXplainable artificial intelligence. Expert systems with applications, 2021, 167, 114104.

8. Summary and Recommendations

One of the most pressing challenges facing individuals as well as companies and society today is a) how to manage data and b) how to rely on digital technologies in a trustful way.

With this report we want to introduce a broader audience to get a feeling about the change caused by digital transformation and powerful technologies like blockchain.

In order to understand the impact we first described definitions and methods to display how we are going to use them.

The transformative impact of blockchain technology on us as individuals as well as on our society is having a huge impact on the economy and the way we live. In a world where data and transactions are secured by public permissionless blockchain intermediaries become irrelevant. This is accompanied by an increase in individual responsibility.

With our thought experiment, we have set out what effects can be expected on the way we work. A public permissionless blockchain environment will improve the efficiencies of our workplaces: Smart contracts stand for autonomous transactions – repetitive work needs no longer human interaction. Monitoring these processes can easily be done in the public permissionless blockchain environment. The on-the-job productivity will improve.

As more and more data is collected about every single minute of every person's day, our privacy can get easily compromised while interacting with the modern world. To prevent fraud and/or hacking attacks we not only recommend the implementation of public permissionless blockchains but also recommend lifting the education by:

- Creating an understanding of the current knowledge status quo for every group in society (pupils, students, business people /including manager and leader/, government, etc.) to derive a plan for action;
- Mitigating the fear of the dynamic in blockchain technology;
- Building an understanding what blockchain technologies are about (besides crypto);
- Building the understanding that only highly trained people can contribute well to a high skill economy (unskilled jobs are vanishing in the developed countries);
- Etc.

As a society, we are increasingly reliant on digital technologies in our day-to-day lives. A public permissionless blockchain is a game changer with a significant impact. We the authors want citizens to participate in the change.

9. Examples / Use Cases

9.1. Financial Inclusion Through Decentralised Finance

A hallmark of Web 3.0., the growth of decentralised finance, or DeFi, is a promise of promoting fairer and more democratic financial services. It can be thought of as creating a secure pipeline directly between the transaction parties without the involvement of banks or governments. DeFi distinguishes itself from the traditional financial system in that it is self-custodial, permissionless, programmable, transparent, immutable, and interoperable. The unique features of DeFi applications allow consumers to control their assets more directly through personal wallets and consumer-centred trading platforms rather than institutions. In some ways, DeFi may contribute to the redesign of the financial sector, freeing it from fractional reserve constraints and allowing consumer credit offerings at scale. DeFi can also contribute to financial inclusion in a boundless way, enhancing accessibility and the usage of financial services for those who do not have a banking account, as most of the DeFi products and services available today are analogous to those offered in conventional finance.

In a survey conducted by Global Findex 2021[85], the top reasons people remain unbanked are lack of money, perceived costs of accounts, and distance to financial institutions.

The lack of a bank account or access to financial and services products has serious economic and social effects, particularly for developing nations and emerging markets. DeFi may contribute to financial inclusion by allowing access to these services to anyone with internet and computer/mobile access. However, financial inclusion through DeFi may go beyond the initial goals of reducing poverty and empowering underprivileged communities when considering the effects on liquidity, consumption, investment, interoperability, and fees.

The scholarship[86] defines financial inclusion through three major dimensions:

- **Access**, understood as providing financial services by physical means (such as bank branches, ATMs, building societies, credit unions, and post offices) and remote means (such as mobile money apps, internet banking, and online payment services);
- **Usage**, which refers to a consumer's demand for financial products and services, regardless of whether they engage with the formal financial system; and
- **Efficacy**, meaning the standards of financial products and services.

DeFi enhances accessibility empowering the communities that need it most to achieve financial inclusion. It gives people from all walks of life access to these investments, making it a great way for those new to investing to start exploring what they've been missing out on. DeFi borrowing and lending have opened up

[85] https://www.worldbank.org/en/publication/globalfindex/Report.
[86] Sapre, N. (2021). pp. 176–177.

access to loans for people who otherwise would not have them[87], and who are persuaded to use predatory loan instruments such as payday loans.

DeFi lending is likely to be more accessible to underserved customers than traditional lending based on credit ratings. For instance, decentralised lending has the significant advantage of enabling borrowers to access very competitive financing instantly. It also provides lenders from all over the world with an opportunity to compete and make bids. Using smart contracts and oracle technology, lenders can validate transactions, and perform account management procedures almost instantly, which ultimately saves them time and money.

People who access DeFi services are not required to provide any personal information as they remain anonymous. This poses numerous legal and risk assessment challenges, but one way around this dilemma is for borrowers to post collateral as a cryptocurrency or an asset before accessing loans from lenders such as individual traders and institutional investors. By doing so, the system stays trustworthy and stable.

However, this exclusive intermediation based on the collateral system also means questioning the fulfilment of DeFi's promises of democratising finance and providing equitable access to financial services. Access to DeFi services, such as borrowing, becomes limited when collateral is required since they only benefit those who already own assets. In addition, crypto collaterals may limit the potential appeal and functionality of some of these services outside of the virtual world. Having these issues in mind, achieving the potential of DeFi to reshape the real-world economy is primarily contingent on the tokenisation of real-world assets, harmonising regulatory frameworks, and integrating compliance rules, such as adopting a digital identification system.

In terms of usage and efficacy, as one may note, the most common DeFi products and services available today are analogous to those in conventional finance. It may be useful to distinguish between the product or service categories, listed below:

[87] Start-ups like Dharma are in the front of the new consumer DeFi access movement.

DeFi Services	Stablecoins and protocol tokens Exchanges Credit Insurance Derivatives Asset management Oracles Vaults Wallets Data storage Identity management Alternative dispute resolution
Financial Incentive System	Lock-up yields Liquidity mining Airdrops Yield farming Liquidation fees
DeFi Inclusive Strategies	Lending Payments Investments Utility access

Figure 9: DeFi products and services categories

By allowing customers without a bank account to engage in the financial system, DeFi is expected to increase financial inclusion. Furthermore, DeFi may enable greater competition in the open banking and finance sectors. As an example, encouraging consumers with little income to invest enables micro-investment, an activity that both promotes individual well-being and contributes to macroeconomic growth. It is worth mentioning that over 60 million blockchain wallets are in use as of December 2020[88]. As new blockchain wallets and crypto products and services become available to the market, the number of users

[88] https://www.blockchain.com/charts/my-wallet-n-users.

continues to grow, demonstrating that decentralised digital currency has permeated beyond the technological fringes into the traditional finance system.

Following are some practical use cases to start exploring DeFi applications:

Aave: Aave is a decentralised non-custodial liquidity market protocol that enables the borrowing and lending of cryptocurrency. Users deposit digital assets into "liquidity pools", which become funds that the protocol can lend out. Originally built on the Ethereum blockchain, it has expanded to other six chains, and with $5.8 billion in TVL it's one of the biggest and most successful DeFi projects.

Folks Finance: Folks Finance is a non-custodial DeFi protocol built on Algorand that provides a full set of DeFi tools for managing digital assets. With $57 million in TVL, more than 10,000 unique wallets connected to the app since the launch on mainnet, and $600 million in volume transferred, Folks Finance has become the leading Algorand DeFi app, offering lending and borrowing, farming options, swaps and advanced features such as auto-leveraging and composable swap transactions, accessible through an intuitive and simple UX.

GoodGhosting: GoodGhosting is a DeFi social savings application that uses blockchain technology to encourage individuals to participate in the digital asset ecosystem and build their wealth more efficiently. The app gamifies savings by offering higher interest rates when other users become more passive savers, aligning entertainment with responsible investing objectives. GoodGhosting aims to make decentralised finance accessible and engaging for all, especially in developing countries where access to traditional bank accounts is limited but access to mobile phones and the internet is high. The platform is built on both the Celo and Polygon blockchains, allowing for easy and secure storage and tracking of users' savings in an environmentally friendly way.

9.2. Building and/or Contributing to DAOs

Decentralised autonomous organisations or DAOs offer an open, permissionless, non-hierarchical, borderless and blockchain-based governance and production environment for communities to cooperate on the realisation of specific missions.

The open accessibility of DAOs allows anyone to explore them, join them and contribute to them according to one's personal values, ambitions, expertise and objectives.

This new decentralized approach is what Japan's Prime Minister has suggested as a way for the country to organise its population, envisaging the usage of DAOs to re engage the Country's rural regions[89]. This might never happen, but the fact that DAOs where mentioned in the House of Representatives, is a milestone in the introduction of this sort of instruments in our day-to-day life and makes the public permissionless world we are imaginining in our "thought experiment" look somewhat more likely.

[89] Schreckinger, B. (2023). Available at: https://www.politico.com/newsletters/digital-future-daily/2023/02/06/japan-contemplates-the-distant-future-and-regaining-its-tech-mantle-00081447 (Accessed: 02/05/2023)

There already exists a plethora of DAOs with the most diverse visions and missions. Some of the categories in which currently existing DAOs can be subdivided[90] are Art & Culture, DAO Tooling, DeFi, Gaming, Greater Good/Political, Infrastructure, Investments, Media & Communications, NFTs, Physical Assets and Work & Funding.

To start exploring and potentially contributing to DAOs, the following platforms are a good starting point:

- **Deepdao** (https://deepdao.io/organizations) is an aggregator that lists thousands of DAOs;
- **Tally** (https://www.tally.xyz/explore) is a DAO voting and governance system which also lists the DAOs that use tally as a tool. Discovery on tally complemented with additional research is a good way to explore existing DAOs;
- **Snapshot** (https://snapshot.org/#/) is a DAO governance voting tool allowing also to discover DAOs;
- **Guild** (https://guild.xyz/explorer) is a membership management platform that also allows finding a first high-level description of existing DAOs. Further exploration should be complemented with additional research and resources;
- **Commonwealth** (https://commonwealth.im/communities) is a governance and community management protocol, allowing also for the exploration of the DAOs that use Commonwealth.

To discover the inner workings of a DAO, you'll have to form an idea of the DAO's:

- **Conversation history:** platforms of choice could be a.o. Discord[91], Discourse[92], Commonwealth[93], Telegram[94] or the DAO's webpage;
- **Decision history:** platforms of choice could be a.o. Snapshot, Tally, Sybil[95], Aragon, DAOHaus.

In order to start contributing to or even building DAOs, you will have to familiarise yourself with a wide range of concepts like DAO onboarding, token-gating, on-chain and off-chain voting, community consensus building, community management, proposal formulation and management, organisation design, incentive design, single or multi-signature payments, use of smart contracts, NFT creation, contributors' work mutual evaluation and rewarding, on-chain and off-chain execution, reputation building, proof-of-humanity, social graphs to solve sybil-attacks, dispute resolution, etc.

[90] Based on https://deepdao.io/organizations.
[91] Your place to talk and hang out (no date) Discord. Available at: https://discord.com/ (Accessed: February 24, 2023).
[92] Discourse is the place to build civilised communities (no date) Discourse. Available at: https://www.discourse.org/ (Accessed: February 24, 2023).
[93] (no date) Commonwealth. Available at: https://commonwealth.im/dashboard/global (Accessed: February 24, 2023).
[94] A new era of messaging (no date) Telegram. Available at: https://telegram.org/ (Accessed: February 24, 2023).
[95] (no date) Sybil. Available at: https://sybil.org/ (Accessed: February 24, 2023).

DAOs equip themselves with tools, often in the form of decentralised applications or DApps. As Nichanan Kesonpat details in her Medium article "Organization Legos: The State of DAO Tooling"[96], these tools cover the most diverse operational and governance aspects of an organisation and a DAO in particular: identity, access, discussion and meetings, voting, content and product, frontend and analytics, contribution and reputation, compensation, treasury management and knowledge management.

When building a DAO, a choice can be made between combining separate tools in a customised setting or using an integrated platform like a.o. Aragon[97], DAOHaus[98] or Gardens[99]. The advantage of the latter consists of an out-of-the-box set of ready-to-use integrated smart contracts taking care of e.g. the onboarding, token issuance, governance and finance aspects of the DAO. Their disadvantage is the absence of flexibility and adaptability to specific DAO setups.

9.3. Notarising Your Intellectual Property

Non-fungible tokens, abbreviated NFT, can represent not only digital art, as is currently mainstream, but also any type of ownership of a unique tangible or non-tangible asset.

With public permissionless blockchains' registration functionality of ownership and their characteristic of immutable consensus, an NFT represents a permanent ownership title that anyone can verify.

Intellectual property (IP) is one of the assets an NFT can represent, and as such, any product of one's intellectual work can be registered with its digital hash – a digital identifier – on a blockchain. Some examples of IP that can be represented by an NFT include:

- **Written work:** literature, research, analysis, articles;
- **Figurative work:** digital and physical art, unique furniture pieces;
- **Engineering solutions**.

Once your IP is notarised on a blockchain, it also becomes available for your sovereign transfer of ownership to someone else. Currently Opensea[100] is one of the platforms allowing for the handling and management of your NFTs.

[96] Kesonpat, N. (2021) (Accessed: February 24, 2023).
[97] (no date) Govern better, together. Build your DAO now. Available at: https://aragon.org/ (Accessed: February 24, 2023).
[98] Daohaus (no date) DAOhaus. Available at: https://daohaus.club/ (Accessed: February 24, 2023).
[99] (no date) *Gardens*. Available at: https://gardens.1hive.org/#/home (Accessed: February 24, 2023).
[100] www.opensea.com.

9.4. Use Case In Regenerative Cryptoeconomics

The following are a few examples of possible use cases in regenerative crypto-economics:

Carbon Credit Trading: Carbon credit trading is a use case of regenerative crypto-economics that incentivises individuals and organisations to reduce their carbon footprint. Carbon credits represent the reduction or avoidance of greenhouse gas emissions, and they can be traded on blockchain-based platforms. By leveraging the power of blockchain, carbon credits can be tracked, verified, and traded in a transparent and secure way, providing an incentive for individuals and organisations to adopt sustainable practices.

Community-Based Renewable Energy: Another use case of regenerative crypto-economics is the development of community-based renewable energy systems. Blockchain technology can facilitate the creation of a decentralised energy grid that is owned and operated by local communities. This can promote the adoption of renewable energy sources, reduce carbon emissions, and support the regeneration of the environment. Additionally, the use of blockchain technology can enable secure and transparent transactions between energy producers and consumers, eliminating the need for intermediaries.

Regenerative Agriculture: Regenerative agriculture is a sustainable farming practice that aims to restore soil health, promote biodiversity, and improve ecosystem services. A use case of regenerative crypto-economics would be to develop a blockchain-based platform that supports regenerative agriculture practices. The platform can incentivise farmers to adopt sustainable practices and reward them for producing regenerative products, such as organic food or regenerative fibre. Additionally, blockchain technology can be used to track the supply chain, ensuring transparency and traceability in the production and distribution of these products. This can help to reduce waste and improve the quality of the products, while also promoting environmental and social regeneration.

Decentralised Energy Trading: A decentralised energy trading platform can enable a peer-to-peer exchange of renewable energy between households and communities. This platform can leverage blockchain technology to enable seamless, secure, and transparent energy trading while promoting the use of renewable energy sources. This use case can help in reducing carbon emissions, promoting renewable energy adoption, and promoting social equity by democratising access to energy.

Ecosystem Service Marketplace: A blockchain-based marketplace can enable the exchange of ecosystem services, such as carbon sequestration, water purification, and soil regeneration, between landowners and other stakeholders. This platform can leverage decentralised governance and smart contracts to ensure that ecosystem services are compensated fairly, leading to a more equitable economic system. This use case can help in regenerating ecosystems, promoting sustainable land use practices, and supporting local economic development.

Cultural-Driven Green Cities: The project DivAirCity, funded by the EC under the H2020 programme, is a citizen participation project that seeks to develop a decentralised application (dApp) for the inhabitants of Orvieto (Italy), Castellón (Spain), Potsdam (Germany), Bucharest (Romania) and Aarhus (Denmark), that address social inequality, health conditions and air pollution in cities. The project strives to drive the development of green cities through the definition of new services based on human diversity (with a focus on gender and multiculturalism). Citizens modify their behaviour to improve air quality. In return, they receive tokens that enable them to redeem incentives and prizes.

For further use cases on social impact projects leveraging blockchain, INATBA Social Impact and Sustainability Working Group gathered information on sixty nine different applications via their 2021 survey[101]. The results presented in their report provide an overview of the current status of blockchain applications for social and environmental impact, highlighting the priorities in terms of SDGs for the projects implemented by respondent organisations. Reported with delineation of best practice use cases of blockchain for social good, these examples represent an INATBA contribution to furthering education also in this direction.[102]

Those reported above are just some examples of the potential use cases for regenerative crypto-economics. By leveraging blockchain technology and decentralised networks, it is possible to create a more sustainable, just, and regenerative economic system that promotes responsible resource management, social equity, and environmental regeneration.

9.5. Education Use Cases

Open Education: Another use case of regenerative crypto-economics in education could be the development of a blockchain-based platform that supports open education resources (OER). OER are freely accessible and openly licensed educational materials that can be shared and modified by educators and students. By leveraging blockchain technology, OER can be verified, tracked, and securely shared between educators and students, creating a transparent and decentralised learning ecosystem.

Academic Credentialing: A blockchain-based platform might enable the secure, transparent and independent verification of academic credentials. By leveraging blockchain technology, academic credentials can be securely stored, verified, and shared between educational institutions, employers, and students..

Smart contracts could automatically verify academic credentials, ensuring that they are authentic and up-to-date. The use of blockchain technology can also help to reduce fraud and errors in the credentialing process.

[101] https://inatba.org/news/inatba-social-impact-sustainability-survey/.
[102] https://inatba.org/reports/blockchain-for-social-impact/.

Benefits include transparency and decentralisation in the academic credentialing process, enabling students to have more control over their own educational records, and facilitating the transfer of credits between educational institutions.

As an example, the Irish Institute of Banking partnering with the Bank of Ireland, Allied Irish Bank, Ulster Bank and Deloitte have developed EdQ: the first learning credential platform in Europe, providing real time access and an unalterable trusted store of educational qualifications, regulatory and other professional development designations (CPD) records.

On-Chain Education: The University of Nicosia has been offering the word's first free MOOC (massive online open course) delivered exclusively on-chain and in the metaverse[103]. Students register by minting a free NFT, which is stored in their Ethereum-compatible wallets (e.g. MetaMask). Access to the course is token-gated and course material is also minted as NFTs and airdropped to student wallets. Exams also take place on-chain, no centralised system of the university is involved in running the course and students who successfully complete the course are awarded an NFT Certificate of Completion issued by the University of Nicosia. More than 22,000 students have registered for the course, which is expected to become a regular offering at the University of Nicosia.

Hands-on Blockchain Education: The Spanish Blockchain Intelligence has created a space in the metaverse where students can practically experience Web 3.0 and the metaverse and fully understand the power of blockchain: they create avatars to understand the interaction of blockchain and VR/AR, connect their wallets to understand real-time payment through crypto and the power of valid legal business through blockchain, learn to use digital identity wallets and protect their privacy, and decorate the walls of the centre with their NFTs created by the students using AI to understand: a) the power and dynamics of creating tokens; b) the legal related elements (smart contracts, intellectual property, MiCA, etc.).

9.6. Managing Your Self-Sovereign Identity

Traditionally, our digital identity is "gatekept" by third parties like Google, Facebook, Amazon and other.

As described in one of the chapters above, self-sovereign Identity (SSI) allows you to be your own gatekeeper of your data and decide sovereignly with whom you share or from whom you retract access to your personal information.

When combining SSI with blockchain and public-private-key-pairs, one can start building different personas that are tied to different blockchain addresses.

There are already several use cases and projects looking into how to provide an effective SSI solution in various context. We mention some of them in this section, along with some practical solutions that the reader can explore today to put these concepts into practice.

[103] https://www.unic.ac.cy/openmetaverse/mooc-nfts-metaverse/.

Kiva Protocol: Although not a complete fully self-sovereign identity, Kiva Protocol was built before 2018 as an open-source platform for sharing identification and other information in the financial sector, developed with national governments and implemented as a public-private partnership. It provided "digital public infrastructure" that enabled financial institutions to securely connect and share verifiable information with their clients, government agencies, and other organisations. Kiva, with the support of the United Nations Development Programme and the National Civil Registration Authority started a mass civil registration initiative in Sierra Leone in 2017 in which over 5 million people were registered. While most users were not self-custodying their identity information due to technical challenges, the system was designed in such a way that users could opt out of Kiva gaining effectively complete control over their identity information. Although the project has come to an end, Kiva Protocol was awarded the World Bank's Mission Billion Global Prize.

AID:Tech: AID:Tech[104] provides a decentralised digital ID infrastructure to facilitate on-chain reputation via a proof of reputation protocol (PoR), a decentralised ecosystem built on a proof of stake (PoS) network designed to enable "trust-based interactions". AID:Tech in partnership with PharmAccess Foundation deployed a project in April 2018 that provided digital ID to mothers in Tanzania that links newborns' data to mothers. The company's technology was also field tested with the Irish Red Cross to deliver aid to Syrian refugees in northern Lebanon through "intelligent vouchers" containing a unique ID to verify identity. AID:Tech is currently integrating existing technology to create an actual solution for full self-sovereign identity, which will enable users to own and manage their personal data when accessing social and financial services.

Serto and Veramo: Consensys' Serto and Veramo projects (both evolved from uPort) both offer SSI solutions. Serto is "the low-code decentralised identity solution" based on W3C open standards technology. Veramo is a JavaScript framework to integrate cryptographically verifiable data into applications through modular APIs.

EBSI and ESSIF: The self-sovereign identity use case is also one of the first proposed in the EBSI project and ESSIF, the European self-sovereign identity framework (part of EBSI), whose vision is to use blockchain to create cross-border services for public administrations, businesses, citizens making services trustworthy.[105]

To start exploring this domain, we provide here a list of practical options that can be applied today:

- **Gitcoin passport** (https://passport.gitcoin.co/#/) is an online-identity aggregator that allows you to collect the proof of your access to your online accounts and your online activity to the signature of your public address on the Ethereum blockchain.

- **BrightID** (https://www.brightid.org/) is an open-source protocol that allows you to establish a unique and authentic online identity tied to one single

[104] https://www.aid.technology.
[105] https://ec.europa.eu/digital-building-blocks/wikis/display/EBSI/EBSI+Verifiable+Credentials.

account. BrightID solves the Sybil problem – i.e. multiple online identities – through the use of social graph analysis.

- **Proof-of-Humanity** (https://app.proofofhumanity.id/) is – as indicated on its dedicated Github page[106] – a "Sybil-resistant registry of Humans using social verification + @Kleros_io courts". Through its protocol, Proof-of-Humanity allows you to tie your unique human aspect to a blockchain address. This solves a recurring problem of unique participation in, for example, DAO-governance-voting.

It is of essence to note that one's online identity management through the use of SSI in combination with blockchain-based addresses should apply care and prudence. To avoid on-chain correlation analysis of your blockchain-based transactions, different personas can be tied to different public addresses. For example, one persona for the:

- Management of your NFTs on Opensea;
- Management of your Gitcoin passport;
- Management of your membership payments to sports associations;
- Payment of your online purchases paid in crypto;
- Etc.

9.7. Contributing Your Expertise to Prediction Markets and Dispute Resolution

Wisdom of crowds is "the collective opinion of a diverse group of individuals rather than that of a single expert"[107]. As mentioned by Simoiu, Sumanth, Mysore and Goel in their paper "Studying the 'Wisdom of Crowds' at scale"[108], dozens of studies document the higher accuracy from the average of groups than from individual experts in predicting the outcome of a.o. political, economic, sports or social events.

The phenomenon of crowd wisdom constitutes the basis for the functioning of prediction markets. As pointed out in the Augur white paper[109], "[i]n a prediction market, individuals can speculate on the outcomes of future events; those who forecast the outcome correctly win money, and those who forecast incorrectly lose money". As such, prediction markets constitute a platform for the manifestation of the wisdom of the crowd and its use in a wide range of use cases.

[106] Proof of humanity (no date) GitHub. Available at: https://github.com/Proof-Of-Humanity (Accessed: February 24, 2023).
[107] Wisdom of the crowd (2023) Wikipedia. Wikimedia Foundation. Available at: https://en.wikipedia.org/wiki/Wisdom_of_the_crowd (Accessed: March 25, 2023).
[108] Simoiu, C. *et al.* (Accessed: March 25, 2023).
[109] Augur. 2015. Augur Whitepaper. [online] Available at: https://media.abnnewswire.net/media/en/whitepaper/rpt/93144-Augur_Whitepaper.pdf [Accessed 25 March 2023].

For the "crowd to be wise", J. Surowiecki lists in his book "The Wisdom of Crowds"[110] five criteria: diversity of opinion, independence, decentralisation, aggregation and trust. Blockchain as an infrastructure and consensus platform enables the realisation of most of these criteria through its borderless, permissionless and decentralised aspects.

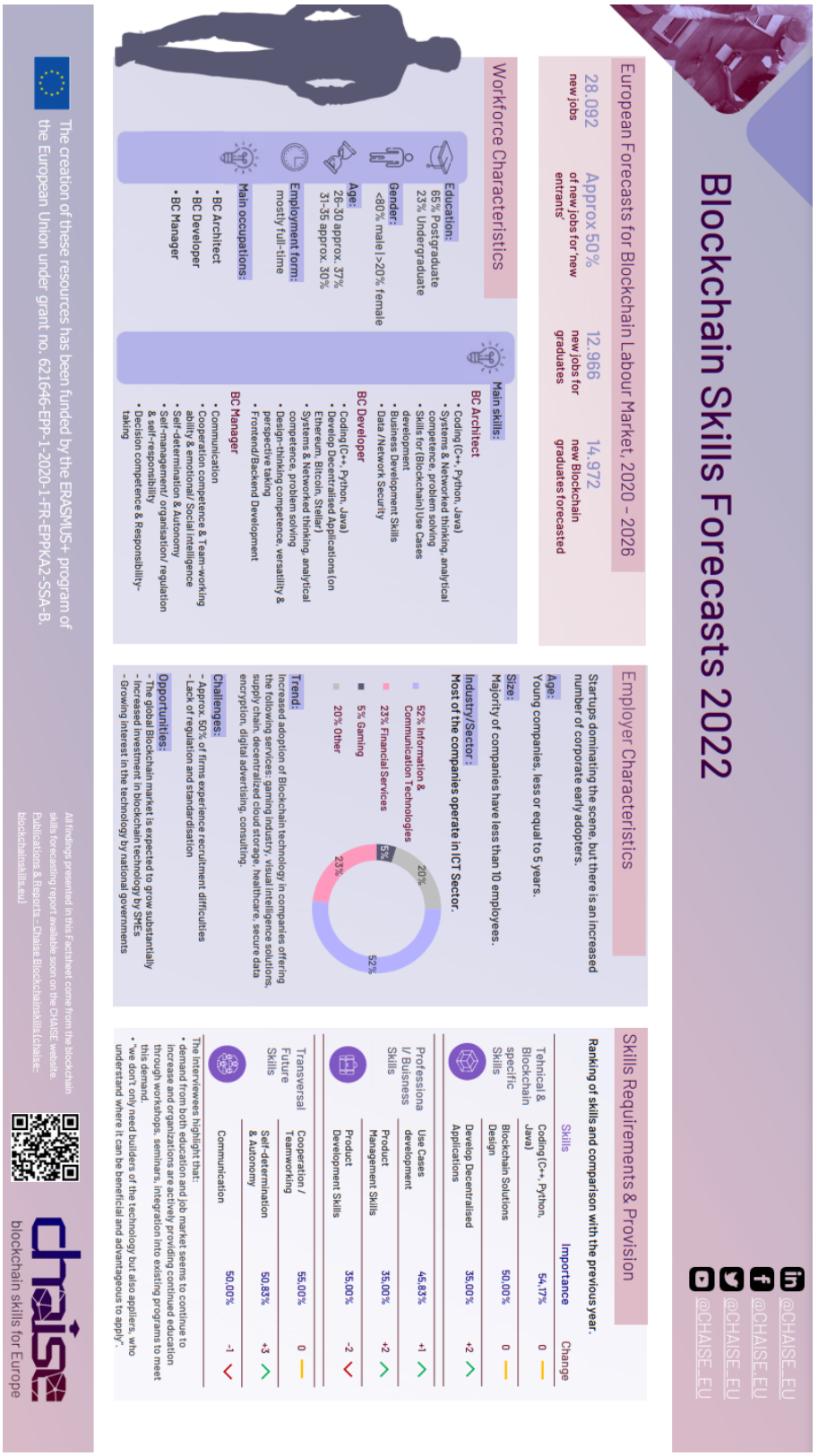
Some examples of platforms that use blockchain to implement the wisdom of the crowds where individuals can participate and contribute their views, opinions and expertise:

- https://www.augur.net/: a global platform for betting on sports, economics and world events;
- https://kleros.io/: "Kleros is a decentralised arbitration service for the disputes of the new economy."[111]

[110] Surowiecki, J. (2005) The Wisdom of Crowds. New York: Anchor Books.
[111] https://kleros.io/.

10. Appendix

10.1. CHAISE Infosheet



11. References

Antonopoulos, Andreas M. “Mastering Bitcoin: Programming the Open Blockchain” 2nd Edition, Kindle Edition https://ethereum.github.io/yellowpaper/paper.pdf.

Beck, K. et al. (2001): Manifest für Agile Softwareentwicklung. https://agilemanifesto.org/iso/de/manifesto.html. Zuletzt eingesehen am 10.08.2022.

S. Benasso et al. (eds.), Landscapes of Lifelong Learning Policies across Europe, Palgrave Studies in Adult Education and Lifelong Learning, https://doi.org/10.1007/978-3-030-96454-2_2.

Bergmann, F. (2017): Neue Arbeit – Neue Kultur. Freiburg.

Buckingham, David. (2015): Defining digital literacy: What do young people need to know about digital media?. Medienbildung in Neuen Kulturräumen Die Deutschprachige Und Britische Diskussion. 2015. 21-34. 10.18261/ISSN1891-943X-2006-04-03.

Clark, J., Metz, A., and Casher, C. 2022. ID4D Global Dataset 2021: Global ID Coverage Estimates. Washington, DC: World Bank.” Washington, DC: World Bank. License: Creative Commons Attribution CC BY 3.0 IGO.

Crummenerl, Claudia / Kemmer, Kilian (2015): Digital Leadership – Führungskräfteentwicklung im digitalen Zeitalter; Capgemini, https://www.capgemini.com/consulting-de/wp-content/uploads/sites/32/2017/08/14-10-16_digital_leadership_v11_web_17102016.pdf, zuletzt eingesehen am 21.08. 2022.

De Filippi, Primavera, Aaron Wright (2018): *Blockchain and the Law: The Rule of Code*. Harvard University Press. *JSTOR*, https://doi.org/10.2307/j.ctv2867sp. Accessed 11 Apr. 2023.

Fitzner, Mirus (2022): Konstitutive Entscheidungen und Strategisches Management, Rahmen und Fragen für eine Strategische Corporate Governance; Wiesbaden: Springer Gabler.

Giudici, Paolo (2018): Financial data science. Statistics and Probability letters, 136, pp. 160–164.

Giudici, Paolo (2018): Fintech risk management: a research challenge for artificial intelligence in finance. Frontiers in artificial intelligence, 2018,1,1.

Giudici, Paolo and Raffinetti, E. (2021): Shapley Lorenz explainable artificial intelligence. Expert systems with applications, 2021, 167, 114104.

Grech A, Sood I and Ariño L (2021): Blockchain, Self-Sovereign Identity and Digital Credentials: Promise Versus Praxis in Education. Front. Blockchain 4:616779. doi: 10.3389/fbloc.2021.616779.

Haucap, Justus (2014): Implikationen der Verhaltensökonomik für die Wettbewerbspolitik, DICE Ordnungspolitische Perspektiven, No. 65, ISBN 978-3-86304-665-1, Heinrich Heine University Düsseldorf, Düsseldorf Institute for Competition Economics (DICE), Düsseldorf.

Kesonpat, N. (2021): "Organization Legos: The State of DAO Tooling," Medium.com. Medium.com, 15 September. Available at: https://medium.com/1kxnetwork/organization-legos-the-state-of-dao-tooling-866b6879e93e (Accessed: February 24, 2023).

Kollmann, T. (2020): Digital Leadship. Grundlagen der Unternehmensführung in der Digitalen Wirtschaft. Wiesbaden.

Kondrateva, Galina, et al. (2022): The Potential Use of Blockchain Technology in Co-creation Ecosystems, Journal of Innovation Economics & Management, vol. 37, no. 1, 2022, pp. 9-27.

Kupiek, M. (2021): Digital Leadership, Agile Change and the Emotional Organization. Emotion as a Success Factor for Digital Transformation Projects. Wiesbaden.

Lemke, C. (2020): Digitalisierung im Spannungsfeld zwischen Technologie und Management. In: Rump, J./Eilers, S. (Hrsg.): Die vierte Dimension der Digitalisierung. Spannungsfelder in der Arbeitswelt von morgen. Berlin, S. 17–41.

Marchesi, L., Marchesi, M., & Tonelli, R. (2020): ABCDE–Agile block chain DApp engineering. Blockchain: Research and Applications, 1(1-2), 100002.

McCormick, M. (2012): Waterfall vs. Agile Methodology. Available at: http://www.mccormickpcs.com/images/Waterfall_vs_Agile_Methodology.pdf.

Mulgan, R. (2000): Comparing Accountability in the Public and Private Sectors. Australian Journal of Public Administration, 59: 87-97. Available at: https://doi.org/10.1111/1467-8500.00142.

Owoki, K. (2022): *Greenpilled: How Crypto Can Regenerate the World. *Gitcoin.

Resnick, M. ((1996): Beyond the Centralized Mindset. Published in Journal of the Learning Sciences, vol. 5, no. 1, p. 1-22. Available at: https://web.media.mit.edu/~mres/papers/JLS/JLS-1.0.html.

Rovida, Eduardo / Zafferi, Guilo (2022): The Importance of Soft Skills in Engineering and Engineering Education, Cham: Springer Nature.

Sapre, N. (2021): Financial Inclusion. In L. Luu, J. Lowe, P. J. Ring, & A. Sahota (Eds.), A Practical Guide to Financial Services (1 ed., pp. 172-192). Routledge. Available at: https://www.taylorfrancis.com/chapters/edit/10.4324/9781003227663-8/financial-inclusion-nikhil-sapre at pp. 176-177.

Schenker, I (2019): Blockchain in Trade Facilitation: Sectoral challenges and examples. Available at: https://unece.org/fileadmin/DAM/cefact/cf_plenary/2019_plenary/CEFACT_2019_INF03.pdf.

Schreckinger, B. (2023):Japan contemplates the distant future (and regaining its tech mantle). Available at: https://www.politico.com/newsletters/digital-future-daily/2023/02/06/japan-contemplates-the-distant-future-and-regaining-its-tech-mantle-00081447

Simoiu, C. et al. (no date) Studying the “wisdom of crowds” at scale – Stanford University. Available at: https://www.web.stanford.edu/~csimoiu/doc/wisdom-of-crowds.pdf (Accessed: March 25, 2023).

Surowiecki, J. (2005): The Wisdom of Crowds. New York: Anchor Books.

Temoshok D, Proud-Madruga D, Choong YY, Galluzzo R, Gupta S, LaSalle C, Lefkovitz N, Regenscheid A (2022): Digital Identity Guidelines. (National Institute of Standards and Technology, Gaithersburg, MD), NIST Special Publication (SP) NIST SP 800-63-4 ipd. Available at: https://doi.org/10.6028/NIST.SP.800-63-4.ipd.

Torres, Jenny, Michele Nogueira, and Guy Pujolle. "A survey on identity management for the future network." *IEEE Communications Surveys & Tutorials* 15.2 (2012): 787-802.

Tyma, B., Dhillon, R., Sivabalan, P. and Wieder, B. (2022): "Understanding accountability in blockchain systems", Accounting, Auditing & Accountability Journal, Vol. 35 No. 7, pp. 1625-1655.

W3C, Decentralized Identifiers (DIDs) v1.0, Core architecture, data model, and representations. W3C Recommendation 19 July 2022. Available at: https://www.w3.org/TR/did-core/.

W3C, Decentralized Identifiers (DIDs) v1.0 becomes a W3C Recommendation. A new tool to empower everyone on the web with privacy-respecting online identity and consent-based data sharing. Available at: https://www.w3.org/2022/07/pressrelease-did-rec.html.en.

Warden, J. (2021): "What does 'regenerative' thinking mean?," RSA. https://www.thersa.org/, 4 November. Available at: https://www.thersa.org/comment/2021/11/what-does-regenerative-thinking-mean#:~:text=A%20'regenerative'%20mindset%20is%20one,their%20connections%20with%20one%20another.

Zikas, V. (2020): Research vignette: Cryptography and game theory for blockchains, Simons Institute for the Theory of Computing. Available at: https://simons.berkeley.edu/news/research-vignette-cryptography-game-theory-blockchains (Accessed: January 23, 2023)

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