

# Case Studies in Design Informatics 1 - INFR11094

Week 3 – 30<sup>th</sup> October 2023

# Blockchains & looking at CW1.1

## John Vines

Professor of Design Informatics

[john.vines@ed.ac.uk](mailto:john.vines@ed.ac.uk)



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# What we will do today

- Look at how you did in CW1.1
- Questions from your prep work
- Designing with blockchain
- Ethics of blockchain
- Prep work for next week



# Looking at CW1.1

# Let's jump straight into Miro!

[https://miro.com/app/board/uXjVNUIU5bl=/?share\\_link\\_id=121890719720](https://miro.com/app/board/uXjVNUIU5bl=/?share_link_id=121890719720)



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# Activity 1!: 20 minutes

*In the Miro ...*

- 1. Read the example your group has been assigned*
- 2. After reading it, add feedback via post-its (green for “this is good”, orange for “this could be better”). Things to consider:*
  - Is the writing clear?*
  - Does the example make it obvious what the papers are about that are being reviewed?*
  - Are the approaches to design in the papers described clearly?*
  - Does the example compare and contrast the approaches taken in the paper?*
  - Are the references in the correct format?*



# Some broad feedback from me...

- Make sure to introduce what you are writing about, even for short assignments!
- Be careful about making sweeping statement and un-referenced claims, e.g.:

*“In terms of reliability, both papers show a high relevance to the topic but the publication time is not modern enough. Paper 1 was published before the 2000s' which lowers its reliability.”*

- Use the reference format if you are given one, e.g.:

Human-Centered Multimedia: Representations and Challenges, Ahmed Elgammal, 2006

<https://dl.acm.org/doi/pdf/10.1145/1178745.1178751>

Design thinking, Peter J. Denning, 2013 <https://dl.acm.org/doi/pdf/10.1145/2535915>

- Use the template if you're given one!!!!



# Questions for this week

68% submission (quite down but ...)

Approx. 7200 words (... so much!)

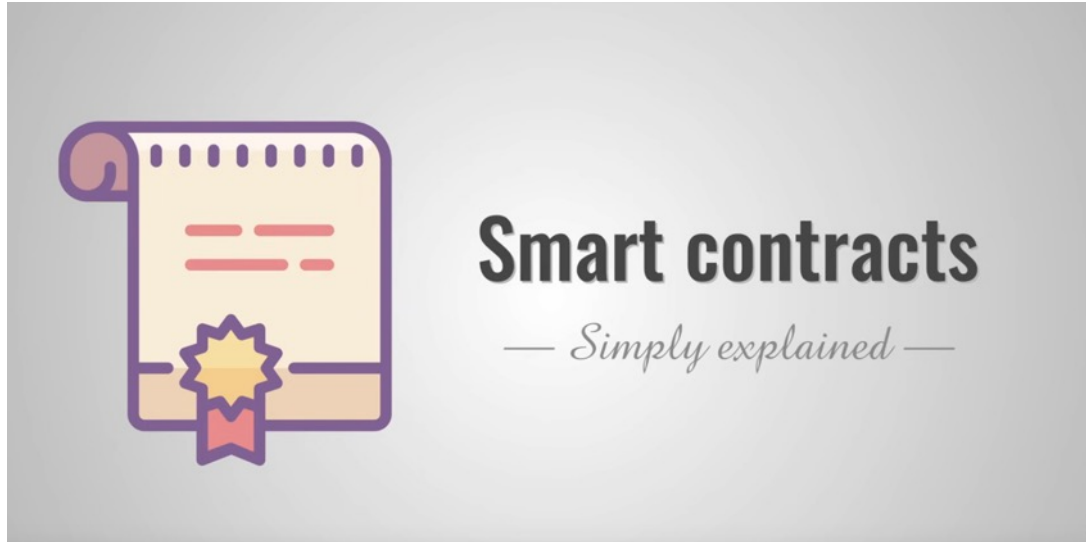
## Student question!

*OMG blockchain blows my mind I  
still can't understand how it works  
or what it is!*





# Some easy intros



<https://youtu.be/ZE2HxTmxfrl>



<https://youtu.be/FkUn86bH34M?t=26>



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## Student question!

*How can design and human-computer interaction researchers contribute to blockchain developments?*



# HCI and Blockchain

## Making Sense of Blockchain Applications: A Typology for HCI

Chris Elsdon<sup>1</sup>, Arthi Manohar<sup>1</sup>, Jo Briggs<sup>1</sup>, Mike Harding<sup>2</sup>, Chris Speed<sup>3</sup>, John Vines<sup>1</sup>  
Northumbria University<sup>1</sup>  
Newcastle upon Tyne, UK  
{chris.elsden; arthi.manohar; jo.briggs;  
john.vines@northumbria.ac.uk}

Data Science Institute<sup>2</sup>  
Lancaster University  
Lancaster, UK  
m.harding@lancaster.ac.uk

Design Informatics<sup>3</sup>  
University of Edinburgh  
Edinburgh, UK  
c.speed@ed.ac.uk

### ABSTRACT

Blockchain is an emerging infrastructural technology that is proposed to fundamentally transform the ways in which people transact, trust, collaborate, organize and identify themselves. In this paper, we construct a typology of emerging blockchain applications, consider the domains in which they are applied, and identify distinguishing features of this new technology. We argue that there is a unique role for the HCI community in linking the design and application of blockchain technology towards lived experience and the articulation of human values. In particular, we note how the accounting of transactions, trust in immutable code and algorithms, and the leveraging of distributed crowds and publics around vast interoperable databases all relate to longstanding issues of importance for the field. We conclude by highlighting core conceptual and methodological challenges for HCI researchers beginning to work with blockchain and distributed ledger technologies.

### Author Keywords

Blockchain; Distributed ledger technology; Bitcoin; Trust; Identity; Typology;

### ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI); Miscellaneous.

### INTRODUCTION

As HCI has grown and matured as a field, its scope has extended far beyond the user interface. We now ask more fundamental questions about what the design and socio-technical assemblage of new technologies means for 'being human' [22,62], and the ways in which technical infrastructures shape, and in turn are shaped by, social and cultural phenomena. These are questions of experience, politics and human values [11,19,79]. In this vein, this

paper discusses the role HCI researchers, and designers, can – and should – play in the study and development of blockchain technologies and related distributed ledgers.

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CHI 2018, April 21–26, 2018, Montreal, QC, Canada  
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ACM ISBN 978-1-4503-5620-6/18/04.  
<https://doi.org/10.1145/3173574.3174032>

A blockchain, of which Nakamoto's Bitcoin Protocol [49] was the first and most popularized example, can be described as a combination of three powerful technologies: a *distributed ledger*, a database shared between multiple actors who are all allocated read and write permissions; *immutable storage*, where changes to the ledger, or transactions, are stored in 'blocks' and where each copy of the database retains every block in the 'chain' as an immutable history; and *consensus algorithms*, which are protocols for trustless actors in the network to verify the transactions made on the blockchain, and which achieve a secure, shared consensus about the state of the database. Most famously, these three core features have supported cryptocurrencies, primarily Bitcoin. However, of late, there has been a proliferation of blockchain-based applications. Proponents of blockchain view the technology as utterly transformative, comparable to the Internet in its potential scope and impact [1,32,75,78]. Proposed applications include crowdfunding, payment services, voting, copyright management, supply-chain tracking, authentication services and distributed, autonomous organizations. All of these applications concern elementary issues of establishing online identity, managing online data and privacy, and peer-to-peer online collaboration, underpinned by decentralized, algorithmic governance. As such, blockchain technologies and their emergent application areas all speak to a broad set of longstanding topics of interest for the HCI community.

While many of the challenges related to blockchain technologies may be perceived as technical, or deeply infrastructural, these technologies have the potential to profoundly impact human experience. HCI researchers are increasingly pursuing research funding for blockchain-related projects and, in our own experience, starting to grapple with the hyperbole, implications and place of human interaction and agency in relation to this technology. In this spirit, we set out to produce the first detailed mapping and examination of applications of blockchain technologies to chart the space for HCI and raise implications, issues and challenges for future research. To do so, we have undertaken a qualitative survey of more than 200 emerging blockchain startups, projects and

## Studying the ethical implications of blockchain apps:

- Biases in datasets
- Excluded user groups
- Tools for regulators

## Methods for co-design:

- Develop applications with more diverse users
- Techniques to help non-experts understand the technology

## Designing blockchain interfaces:

- More usable e-wallets
- Creating smart contracts
- Tracing the histories of digital property

## Expanding imagination of applications:

- Creating more provocative systems
- Identifying use cases with more diverse users



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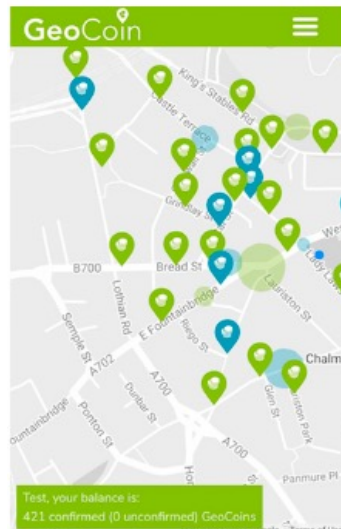
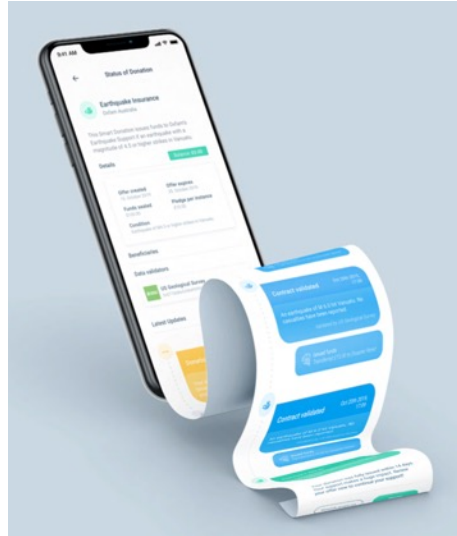
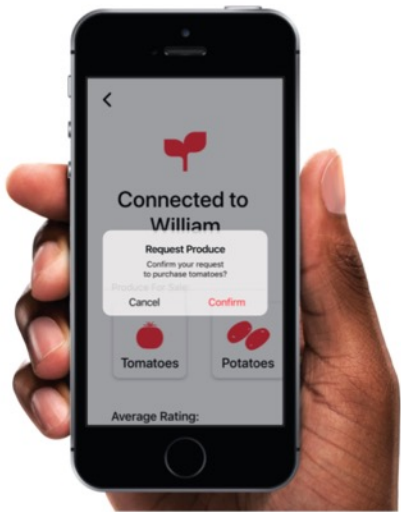
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**Take a break!**  
**Back at 16:10**



# Designing with Blockchain

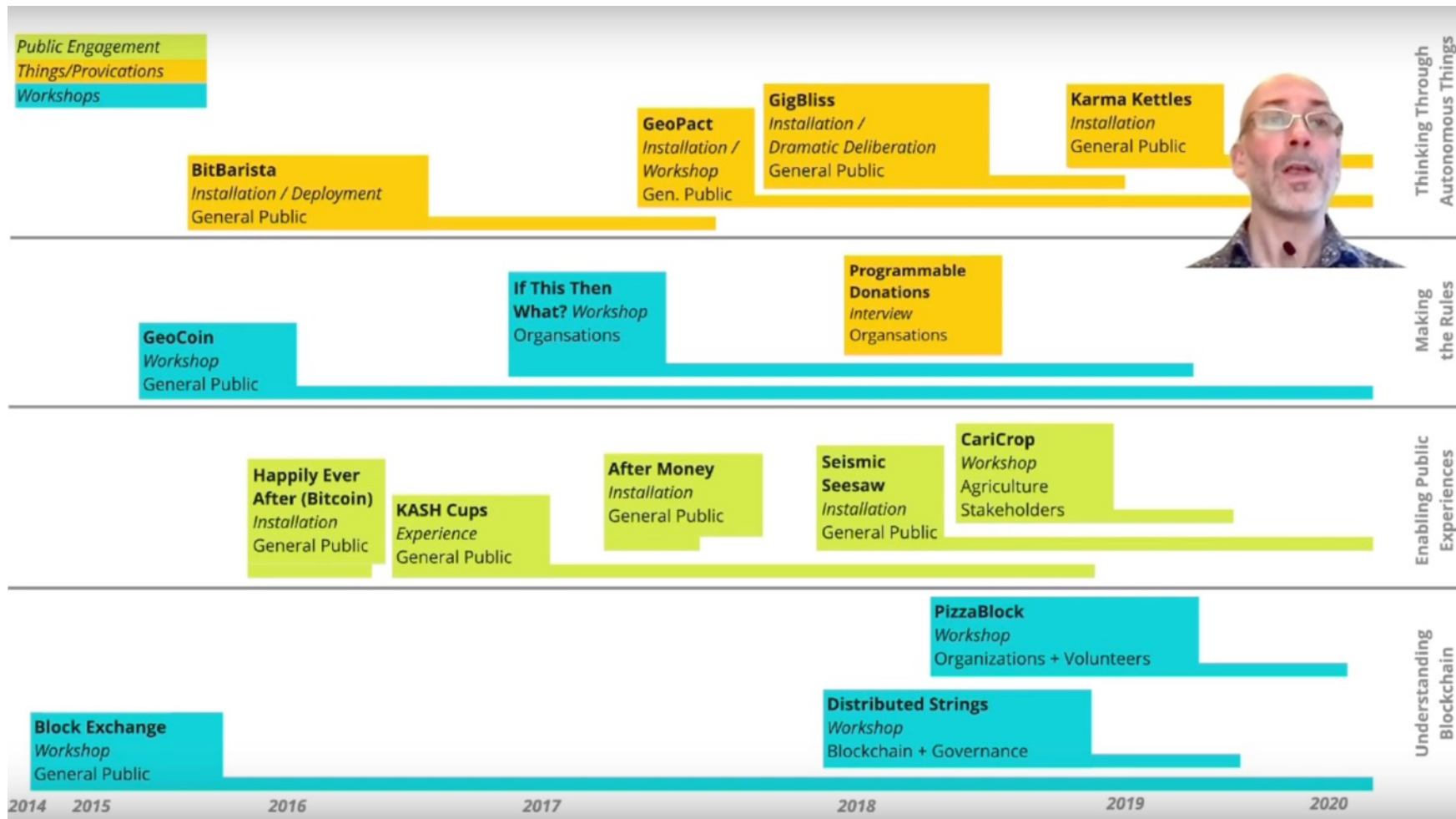
# An introduction to blockchain and smart contracts



## 6 case studies of designing from, with, through blockchain



# Design and blockchains



Dave Murray-Rust, Chris Elsdén, Bettina Nissen, Ella Tallyn, Larissa Pschetz, and Chris Speed. 2023. Blockchain and Beyond: Understanding Blockchains Through Prototypes and Public Engagement. ACM Trans. Comput.-Hum. Interact. 29, 5, Article 41 (October 2022), 73 pages. <https://doi.org/10.1145/3503462>



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# A quick poll: Head to Teams....





# Let's go back to Miro...

[https://miro.com/app/board/uXjVNUIU5bl=/?share\\_link\\_id=121890719720](https://miro.com/app/board/uXjVNUIU5bl=/?share_link_id=121890719720)



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# Activity 2!: 20 minutes

**Step 1** - Go to the box for the paper you read

**Step 2** - Complete 5 post-its that capture 5 different "insights" from the paper you read. Focus on insights about blockchain, smart contracts, or data-driven systems

**Step 3** - Make sure your post its are the correct colour!

**Step 4** - Drag all of your post its into this central canvas

**Step 5** - Start to read the post its of others

**Step 6** - After reading post its for a while, start to cluster them together

**Step 7** - Are you starting to see "themes" or categories of clusters appear? If so... start to add comments on them to capture these.



## Student question!

*What are the ethical issues of blockchains?*



## Reminder: our simple ethical framework...

<b>Choices &amp; decisions</b>	<b>Implications</b>		
	<b>Social</b>	<b>Environmental</b>	<b>Legal</b>
Design process			
Interface design			
Data gathering & use			
Model development & use			
Openness & transparency			

# Issue #1: Tokenising and smart contracting life

## Making the Blockchain Civic

### Insights

- Blockchains promise to decentralize administrative systems and invite us to consider distributed civics and the roles of algorithmic governance.
- Interaction designers should explore the embodied and social experiences of interacting with abstract data transactions, smart contracts, and automation.
- Making the blockchain civic requires thinking across philosophical, political, interactional, and social layers.

To what extent can the application of blockchain technologies be employed toward civic empowerment, organizing local civic and circular economies, reinstating trust in civic institutions, or, perhaps, creating entirely new types of institutions?

In May 2018, researchers from the Amsterdam University of Applied Science's Faculty of Digital Media and Creative Industries, Northumbria University's interdisciplinary North Lab, and local—Amsterdam-based—professional partners gathered for a speculative design charrette to explore the opportunities and challenges of designing for futures of civic good with blockchain technologies.

This design charrette was intended to broaden these discussions and introduce a value-driven perspective to debates around blockchain. We see

an important role for the design community in linking the design and application of blockchain technology toward matters of public and social concern. While blockchains raise suspicions as instruments of market-driven “financialization” (e.g., [1,2]), they may also be configured to radically regulate and distribute common resources. Specifically, we set out to ask what these emerging technologies could mean for the organization of civil society and civic practices. What future imaginaries and design trajectories can we envision that could shape these new technologies from a civic perspective? Our charrette asked participants to reverse engineer a future scenario they developed, in which civic technologies in Amsterdam were underpinned by blockchain technologies. What would

“... the rise of blockchain and smart contracts facilitates the functions of a city to be expressed as a number of licences to provide services which can be auctioned off to citizens, companies or organizations, (e.g. parking, housing, energy etc). In practice, the city depends upon a set of distributed autonomous organizations (or DAOs) that run these licensing programmes themselves, administering these temporarily granted rights and cryptocurrency payments on a blockchain.”

Chris Elsdon, Inte Gloerich, Anne Spaa, John Vines, and Martijn de Waal. 2019. Making the blockchain civic. *interactions* 26, 2 (March - April 2019), 60–65. <https://doi.org/10.1145/3305364>



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# Issue #3: Energy consumption

Bus Inf Syst Eng 62(6):599–608 (2020)  
<https://doi.org/10.1007/s12599-020-00656-x>



CATCHWORD

## The Energy Consumption of Blockchain Technology: Beyond Myth

Johannes Sedlmeir · Hans Ulrich Buhl · Gilbert Fridgen · Robert Keller

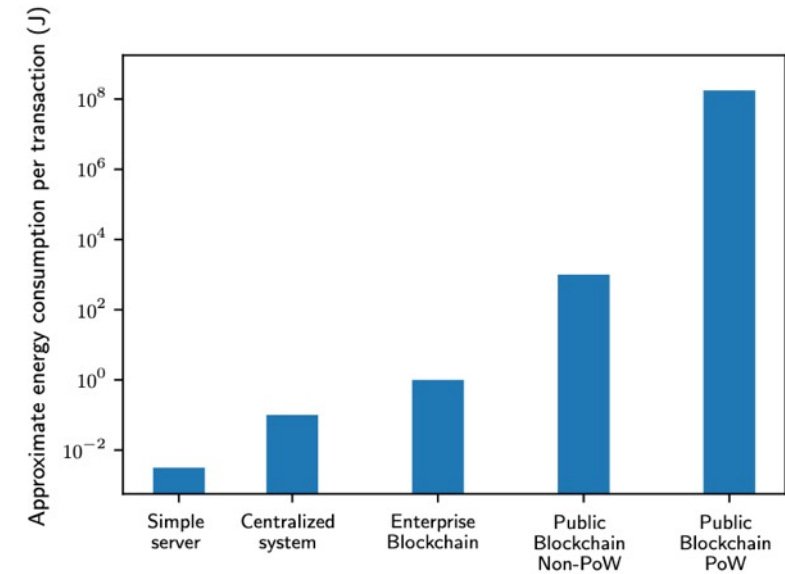
Received: 10 February 2020 / Accepted: 9 May 2020 / Published online: 19 June 2020  
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**Abstract** When talking about blockchain technology in academia, business, and society, frequently generalizations are still heard about its – supposedly inherent – enormous energy consumption. This perception inevitably raises concerns about the further adoption of blockchain technology, a fact that inhibits rapid uptake of what is widely considered to be a groundbreaking and disruptive innovation. However, blockchain technology is far from homogeneous, meaning that blanket statements about its energy consumption should be reviewed with care. The article is meant to bring clarity to the topic in a holistic fashion, looking beyond claims regarding the energy consumption of Bitcoin, which have, so far, dominated the discussion.

**Keywords** Blockchain · Cryptocurrency · Energy consumption · Distributed ledger technology · Sustainability

### 1 Introduction

Blockchain technology entered public awareness with its first application, the cryptocurrency Bitcoin (Nakamoto 2008), which was established in 2009 and currently exhibits a market capitalization of more than 100 billion USD. In the last decade, blockchain technology has developed significantly and is now implemented in a wide range of scenarios, including Ethereum or Hyperledger Fabric, which allow distributed platforms to function with



**Fig. 2** A rough comparison of the order of magnitude of energy consumption per transaction for different architectures. A simple server can operate transactions with very low energy consumption. A typical non-blockchain, centralized system in applications will use a more complex database and backups, thus mildly increasing the energy consumption. A small-scale permissioned blockchain as used in cross-enterprise use-cases has a similar degree of redundancy, but some additional yet limited overhead due to, e.g., PoA consensus and more complex cryptographic operations. A non-PoW permissionless blockchain with a large number of nodes can already exhibit a significantly increased energy consumption due to the high degree of redundancy. However, compared to a major Proof-of-Work blockchain, energy consumption is still negligible

Sedlmeir, J., Buhl, H.U., Fridgen, G. et al. The Energy Consumption of Blockchain Technology: Beyond Myth. Bus Inf Syst Eng 62, 599–608 (2020).  
<https://doi.org/10.1007/s12599-020-00656-x>



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# Issue #2: The right to be forgotten



## What is the right to be forgotten?

The right to be forgotten appears in Recitals 65 and 66 and in [Article 17 of the GDPR](#). It states, “The data subject shall have the right to obtain from the controller the erasure of personal data concerning him or her without undue delay and the controller shall have the obligation to erase personal data without undue delay” if one of a number of conditions applies. “Undue delay” is considered to be about a month. You must also take reasonable steps to verify the person requesting erasure is actually the data subject.

The right to be forgotten dovetails with people’s right to access their personal information in [Article 15](#). The right to control one’s data is meaningless if people cannot take action when they no longer consent to processing, when there are significant errors within the data, or if they believe information is being stored unnecessarily. In these cases, an individual can request that the data be erased. But this is not an absolute right. If it were, the critics who argue that the right to be forgotten amounts to nothing more than a rewriting of history would be correct. Thus, the GDPR walks a fine line on data erasure.

# Issue #4: Lack of Regulation

## Bitcoin paradise? Briton creates 'crypto utopia' in South Pacific

Anthony Welch and partner try to woo cryptocurrency investors to regulation-free island on Vanuatu archipelago



📷 Vanuatu is a South Pacific Ocean nation made up of approximately 80 islands. Photograph: Westend61/Getty Images



<https://www.theguardian.com/technology/2022/feb/12/bitcoin-paradise-briton-creates-crypto-utopia-in-south-pacific>

<https://www.bankofengland.co.uk/-/media/boe/files/paper/2023/the-digital-pound-consultation-working-paper.pdf>



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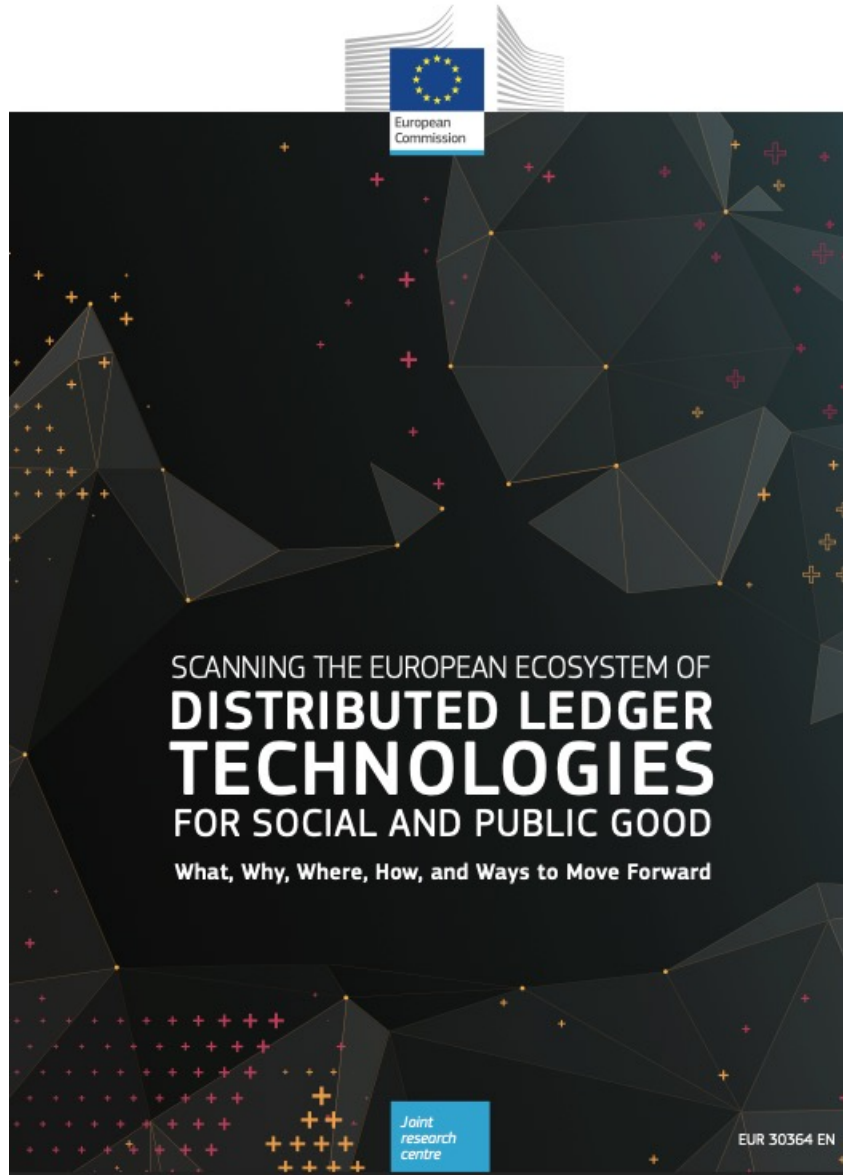


## Student question!

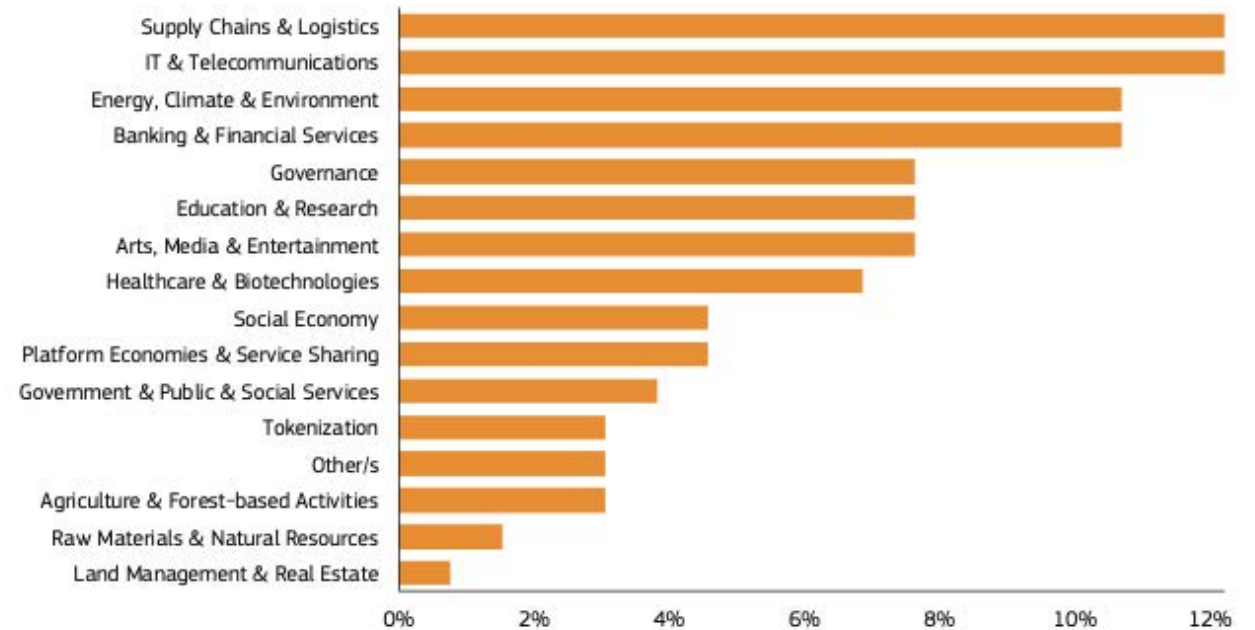
*What other applications of blockchain are there that are not just cryptocurrencies or NFTs?*



# Blockchains for social and public good



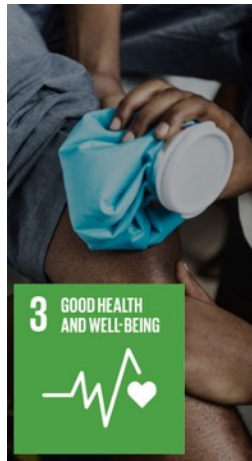
<https://op.europa.eu/en/publication-detail/-/publication/8be60290-0d00-11eb-bc07-01aa75ed71a1/language-en>



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# Blockchain and Sustainable Development .....??



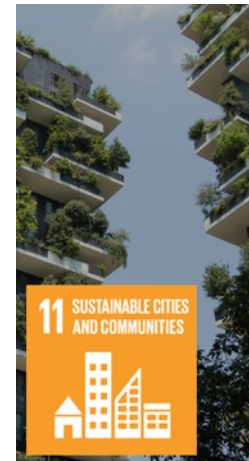
**Pharmaceutical and Research Companies**  
You no longer need to approach hospitals or clinics for information. Through Medicalchain you can access a database of patients who have opted in to being contacted by researchers. The information you receive is up to date, accurate and streamlined to your specific enquiries. Following up patients is simplified with a dynamic health record that stays with the patient.

**Patients at the center**  
Patients have the ability to grant access to their electronic health records (EHR) to other users and revoke access by setting up a time limited gateway, thereby improving their experience and guaranteeing data security.

**Medical insurance**  
Cut out the middle-man and receive prompt, validated health information directly from patients allowing you to access their accurate and up to date record in more cost and time effective manner.

**Developers and Monetising Health Records**  
Get in touch with us to find out more about the monetary value that health data holds. We're at the cutting edge of health technology and we're excited to work with other trailblazers and early adopters who will help us to shape the future of digital healthcare.

<https://medicalchain.com/en/>



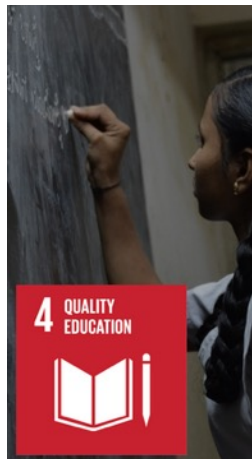
**Fairbike**

The rise of dockless bike rentals poses a problem for public spaces, consumer privacy, and puts pressure on the local economy. We designed a concept for a decentralized, autonomous sharing model that could be a responsible alternative to the new wave of bike rentals.

**Fairbike**

A bike sharing ecosystem driven by local economy.

<http://the-incredible-machine.com/fairbike.html>



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# Tasks for the next 7 days:

## 1. Your prep work for next week's lecture

- i. Watch this!: <https://youtu.be/XuwP5iOB-gs?si=cycwUVL7-JFqaorm>
- ii. And this!: [https://youtu.be/ppPLDEi82lg?si=Mg6uiRdBTV\\_FNaC4](https://youtu.be/ppPLDEi82lg?si=Mg6uiRdBTV_FNaC4)
- iii. And this... (not on robots, but a critical take on technology for "elder" care!):  
<https://youtu.be/Ear8W-C96bk?si=gmpJaCCD2YU1WMAf>
- iv. Read this!: <https://www.technologyreview.com/2023/01/09/1065135/japan-automating-eldercare-robots/>

## 2. Complete your Class Notebook submission in MS Teams:

- i. Write 3 reflections from last week's prep work and today's lecture – what did you learn (go beyond what you wrote last week)?
- ii. Write 2 questions you have based on the prep work for us (John and Susan) to consider for our lecture next week.
- iii. Write 1 comment – something you have learned, are intrigued by, something related to your background and interests – prompted by the prep work.



# Reminder ....

## 1. Tutorials!

- i. This week – another opportunity to explore a different case study in more detail looking at the social, environmental and legal implications of new technologies.

## 2. Mentoring meetings with Adv MSc DI students!

- i. Opportunity to talk with experienced students to get feedback on your ideas for CW1.2



# Any questions?

If you have any questions about this week's lecture, contact me at :  
[john.vines@ed.ac.uk](mailto:john.vines@ed.ac.uk)

