Luiss Libera Università Internazionale degli Studi Sociali Guido Carli

## **Blockchain and smart contracts in digital ecosystems**

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- A sociotechnical view on blockchain and smart contracts
- Blockchain-based digital transformation
- Case studies





#### Fashion waves in management and information systems (the Milan theory)





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#### Blockchain, smart contracts and the Big Five



#### Blockchain-based digital transformation



- The dotted arrows represent global trends (industry, society levels)

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- The solid arrows represent phases of the DT process at the organizational level



Resistance

#### Blockchain e Smart Contract - 3 March 2021

A service ecosystem is a dynamic network of *diverse actors* that cocreate value across industries and organizational boundaries (e.g. banking, healthcare, mobility, etc.)

In digital ecosystems, value is reinforced by complementary activities that are *enabled by* the integrated use of *information technology* for both communication and processing of information

Data are key resources in digital service ecosystems. Ecosystem actors need coordination in their *data control* activities to allows data access and transfer both within and beyond ecosystem boundaries





## **Case studies**

# Reflecting and learning from blockchain implementations

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## Case Study Estonia e-ID

#### "Through the country's digitised public services secured by blockchain, Estonian government estimate to be saving 2% of GDP and 1,400 working years annually"



Since 2012, blockchain has been operational in country's registries, judicial, national health and commercial code systems.



Verified digital identities in the form of digital signatures such as X-Road and E-Residency Programme allow for interaction in a cryptographically verifiable ways with authorities online which would otherwise require physical presence.



X-Road which is based on an interoperable ecosystem is a technological and organisational environment enabling secure Internet-based data exchange between information systems.



Latest entry in 2020 is a blockchain-backed notary service able to notarise marriages, birth certificates and more on-chain transactions.





## Case Study Estonia e-ID

#### No need to carry a driver licence

anymore since the drivers information can be requested via X-Road that automatically makes an inquery to the Road Aministration database about the validity of one's licence to drive.



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## **Case Study** Austria contact tracing

- Austria's Stopp Corona app, the first app initiated from the Austrian government in an effort to trace the coronavirus in the country hit wave of concern with regard to its data security and management.
- As with similar other apps, Stopp Corona app user information in the digital contact tracing lacked real authenticity of the information being shared, the type of data being recorder and how it will be used. Most of the available apps lack the capability to protect user privacy and the lack of transparency of the numbers make current apps prone to the spread of fake news due to the impossibility of a fast and efficient verification authority.
- Given the unpopularity of the first app, the Austrian government funded and commissioned a new blockchain-based app, whose prototype promises to address all previous concerns and allow for contact tracing, prevention of fake news and health tests.
- The main functions supported by the app will be attached to an Ignis blockchain utility token which required correct authorization on an ID digital wallet to be received or transferred.





## Case Study

Austria contact tracing

## Is blockchain really the only way of addressing all concerns regarding digital tracing apps?



Blockchain based contact tracing app framework

| Feature                  | Application                                                                                                                                                            |
|--------------------------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| Decentralized<br>network | The management of the data is user centric, which gives the power of data ownership to the users                                                                       |
| Data security            | The data within the blockchain is kept after applying encryption, which can only be decrypted by an authorized user                                                    |
| Data provenance          | The information being entered in the blockchain is stamped with the digital signature of the source, which proves the legitimacy of the source as well as the data     |
| Data availability        | The data are distributed among all the nodes within the network, which makes them available all the time to every user                                                 |
| Data immutability        | The information in the blockchain is immutable, which means once a detail is entered it can never be modified. This provides reliability and transparency to all users |
| Time stamping            | The data within the blockchain network is time stamped, which eliminates the chances of discrepancies being present                                                    |

Features of blockchain technology and the corresponding

application in digital contac tracing apps

Idrees et al., 2021





Examples of (potential) IS studies on blockchain implementations

- Estonia e-ID
  - What are the conditions for attaining socio-economic development through blockchain-based digital identity systems?
  - Extreme cases with diverse actors involved (i.e. ICT4D)
- Austria contact tracing
  - How a blockchain-based architectures can solve coordination problems in contact tracing applications?
  - Comparative analysis of the two Austrian cases





#### **Research areas**

- blockchain mechanisms
  - enabling vs supporting
- interorganizational coordination
  - trust vs confidence
- organizational barriers to blockchain implementations
  - polycentric governance of IT infrastructures
- organizational vs ecosystem outcomes
  - socio-economic development: access to fundamental services, capacity building
  - security and privacy: surveillance, democracy, justice





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## Grazie per l'attenzione!

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