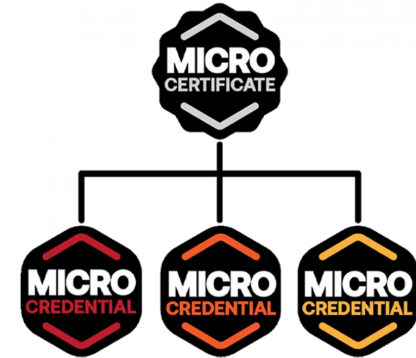




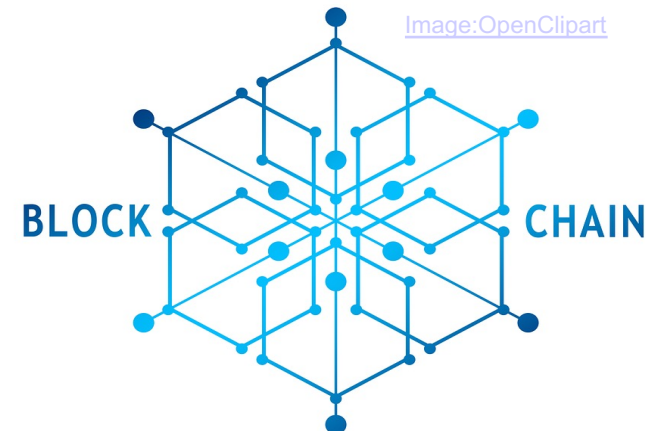
Micro-credentials, Blockchain & Artificial Intelligence: Education for All



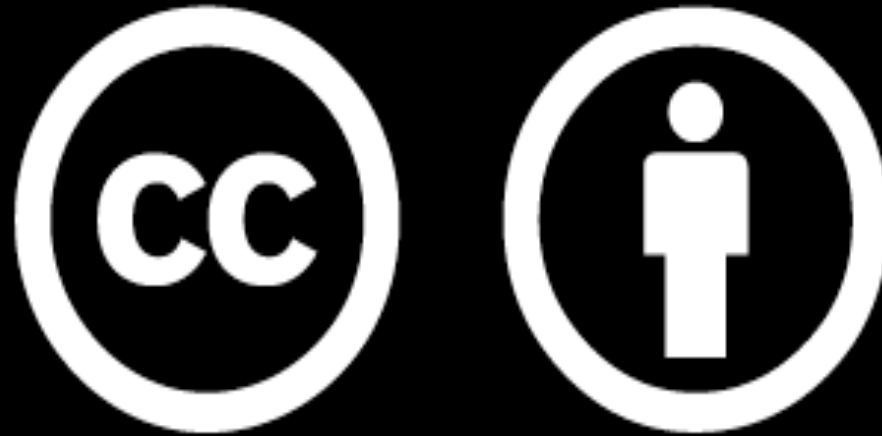
[Image: AUA](#)



[Image: OpenClipart](#)



Rory McGreal
UNESCO/ICDE Chair in OER
Athabasca University
CIDER September 2024



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Some images fair dealing or fair use

The Challenge for the 21st Century

2025 + 98 million new students

4 universities

How to educate ALL these learners?

(50k students)

& IDP Australia





Education for ALL



United Nations Educational, Scientific and Cultural Organization



UNESCO Chair in Open Educational Resources



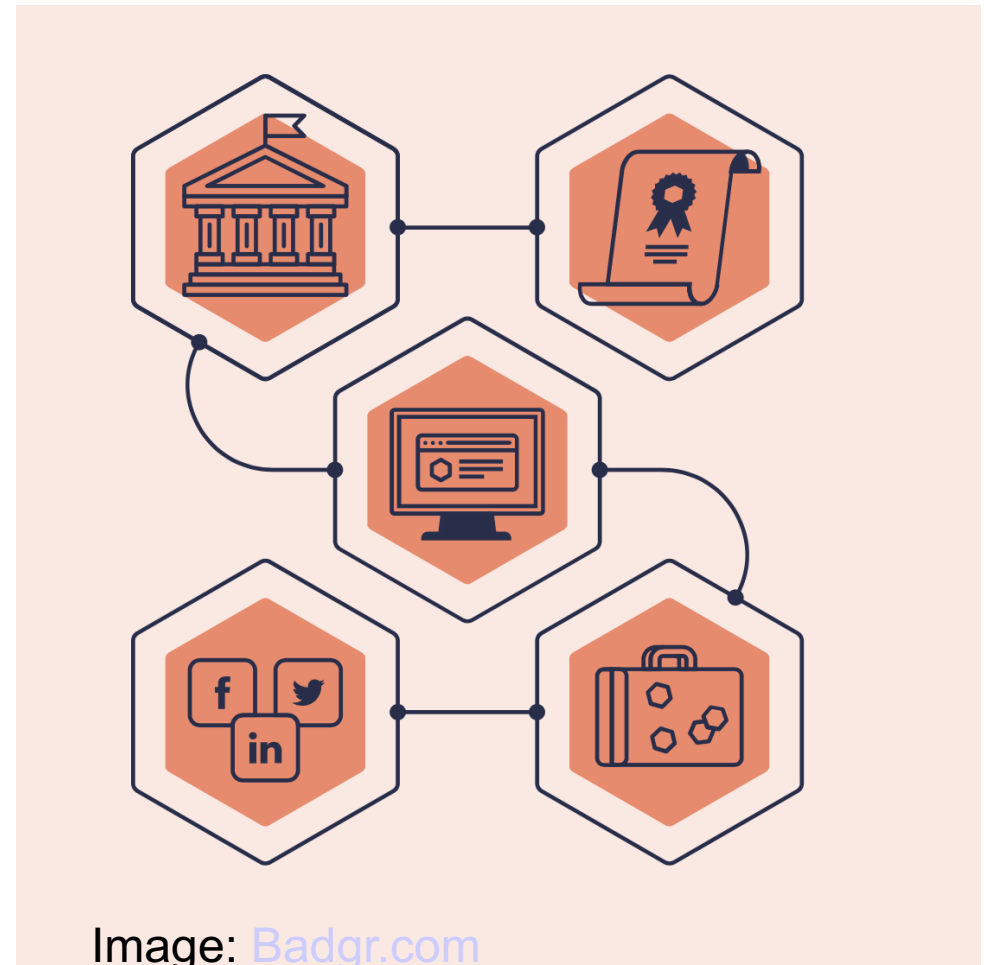
Athabasca University

The future of learning.

05/24/15

What are Micro-credentials?

- **ADCs (Alternative Digital Credentials)**
- **Badges**
- **Mini-degrees**
- **Nano-degrees**
- **Micro certificates**



Micro-credentials are for CREDIT



[Image:](#) Illinois Worknet

if not
They are not Credentials

Credentials Rethink: Why

DEMANDS:

Employers: qualified workers

Students: more jobs

Employers: promotion

Students: economic balance

“blockchain plus badges equals rocket fuel for verified, trusted credentials” - D. Belshaw

Image: Vey Willetts

Certification (Transcripts)

- Present systems are cumbersome & inefficient
- Inability to provide a certificate is serious
- Digital systems can help

“the death knell for the embossed transcript” - D. Planko

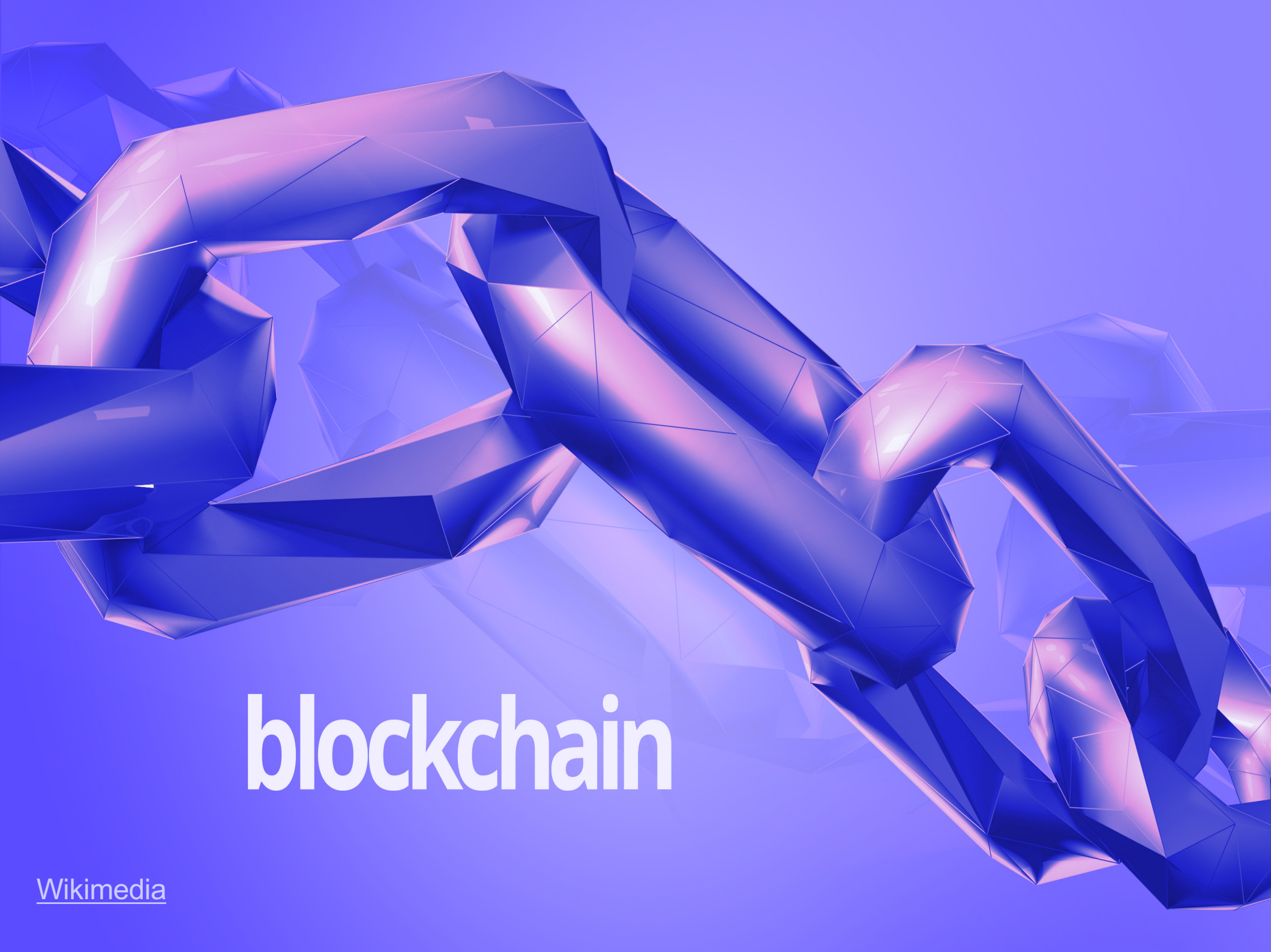


Stackable Credentials

A Model for the Future? A *Stackable Credentials Pathway*

A stackable credentials pathway allows for competencies to be translated into courses that build up into for credit or non credit programs

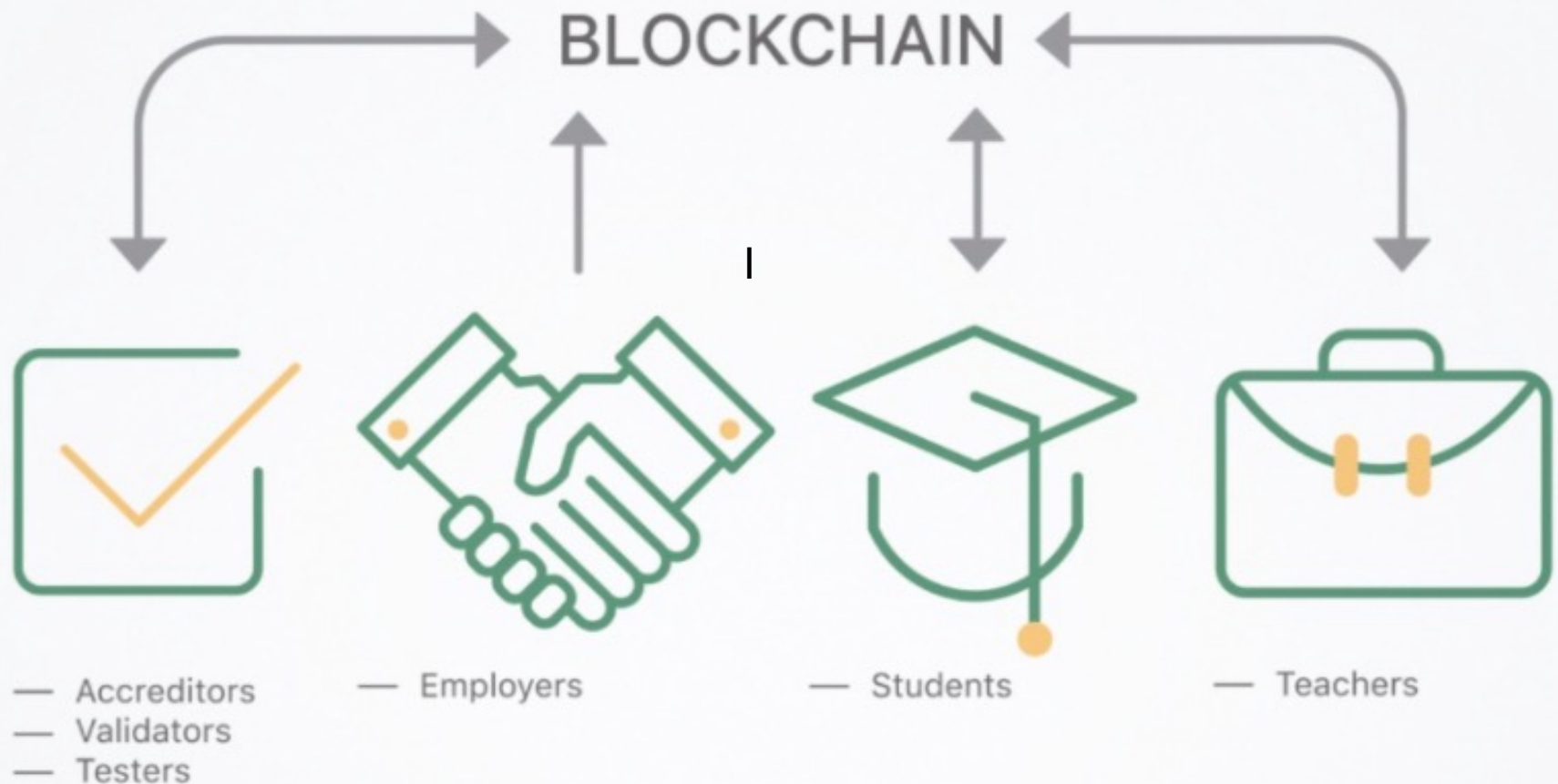




blockchain

Blockchain Explained

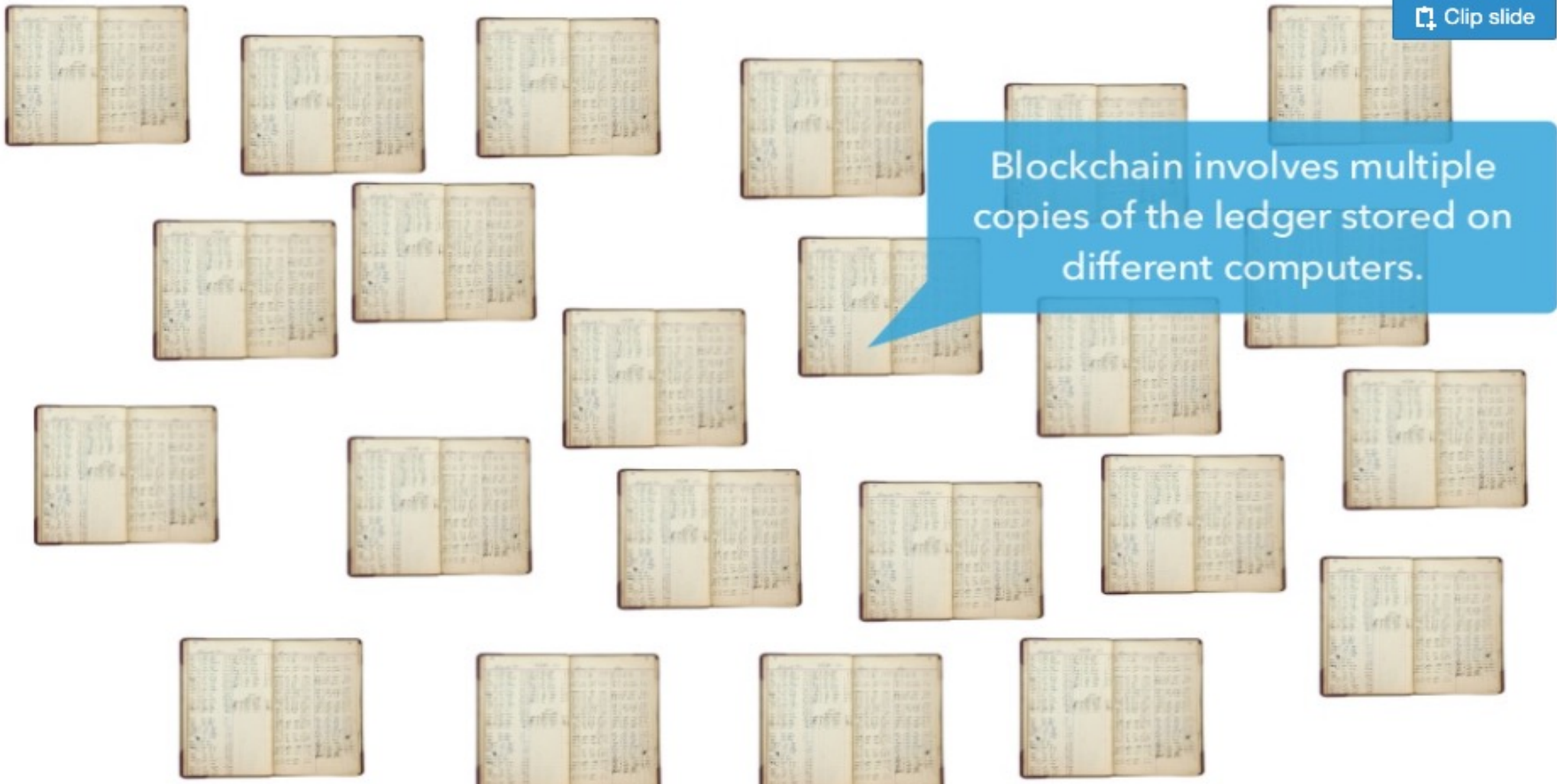
“Blockchain is a distributed ledger that provides a way for information to be recorded and shared by a community”



A Ledger

1857				1857			
Negroes bought in the Summer of 1857				Negroes sold in the fall of 1857			
May 12 th	Betsey	"	660 00	Nov 15 th	Betsey	Sold	850 00
July 28 th	Anthony	"	427 00	Nov 17 th	Anthony	"	645 00
July 29 th	Amey	"	410 00	Dec 5 th	Amey	"	550 00
July 30 th	Martha	"	550 00	Nov 5 th	Martha	"	785 00
July 30 th	William	"	500 00	Jan 20 th	William	"	770 00
Aug 2 nd	Simon	"	535 00	Jan 15 th	Simon	"	690 00
Aug 23 rd	Helly	"	587 50	Nov 24 th	Helly	"	742 50
Aug 25 th	Sally	"	650 00	Nov 15 th	Sally	"	800 00
Sept 23 rd	Maden & child	"	645 00	Oct 21 st	Maden & child	"	645 00
Sept 25 th	Miles	"	710 00	Nov 13 th	Miles	"	950 00
Oct 1 st	Charlott	"	470 00	Dec 3 rd	Charlott	"	650 00
Oct 1 st	Jones	"	700 00	Nov 13 th	Jones	"	950 00
Oct 6 th	Nathan	"	730 00	Nov 27 th	Nathan	"	950 00
Oct 8 th	Adney	"	525 00	Dec 13 th	Adney	"	750 00
Oct 8 th	Lovra	"	175 00	Dec 13 th	Lovra	"	400 00
Oct 14 th	Henry	"	675 00	Nov 26 th	Henry	"	950 00
Oct 16 th	George	"	384 00	Nov 26 th	George	"	480 00
Oct 20 th	Maderson	"	1000 00	Dec 27 th	Maderson	"	1425 00
			<u>10353 50</u>				<u>13982 50</u>

Distributed Ledger

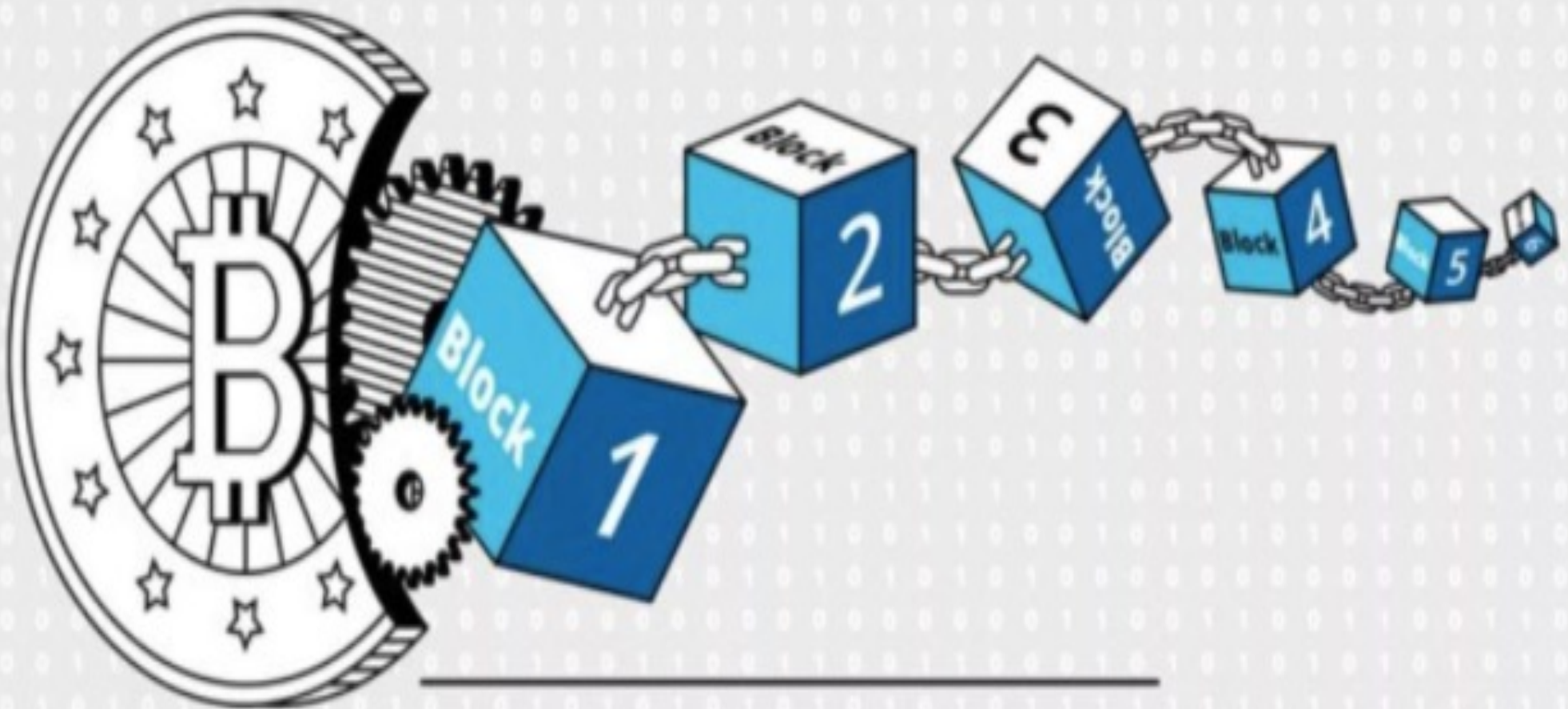


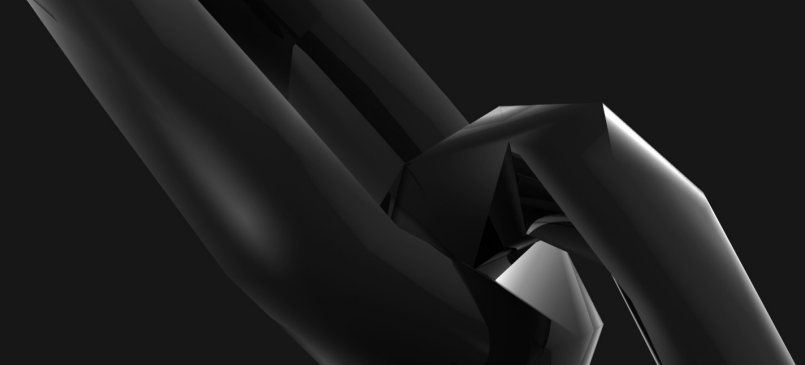
Blockchain involves multiple copies of the ledger stored on different computers.

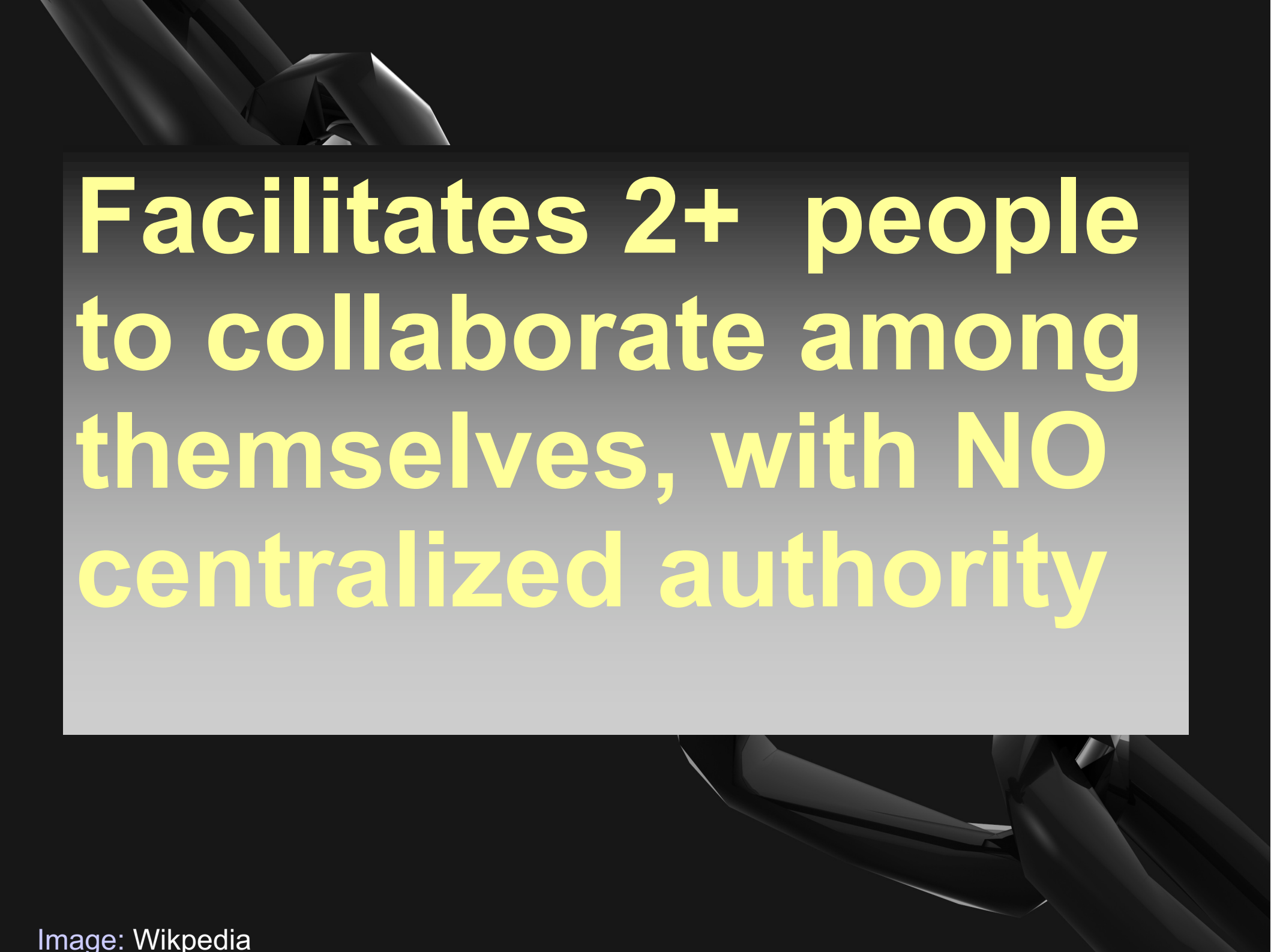
Bitcoin



Bitcoin is based on a *distributed ledger* —
or rather a specific kind of distributed ledger: *a blockchain*.



- 
- **a distributed ledger**
 - **not controlled by anyone**
 - **shared in a P2P network**
 - **Accessible from any node**




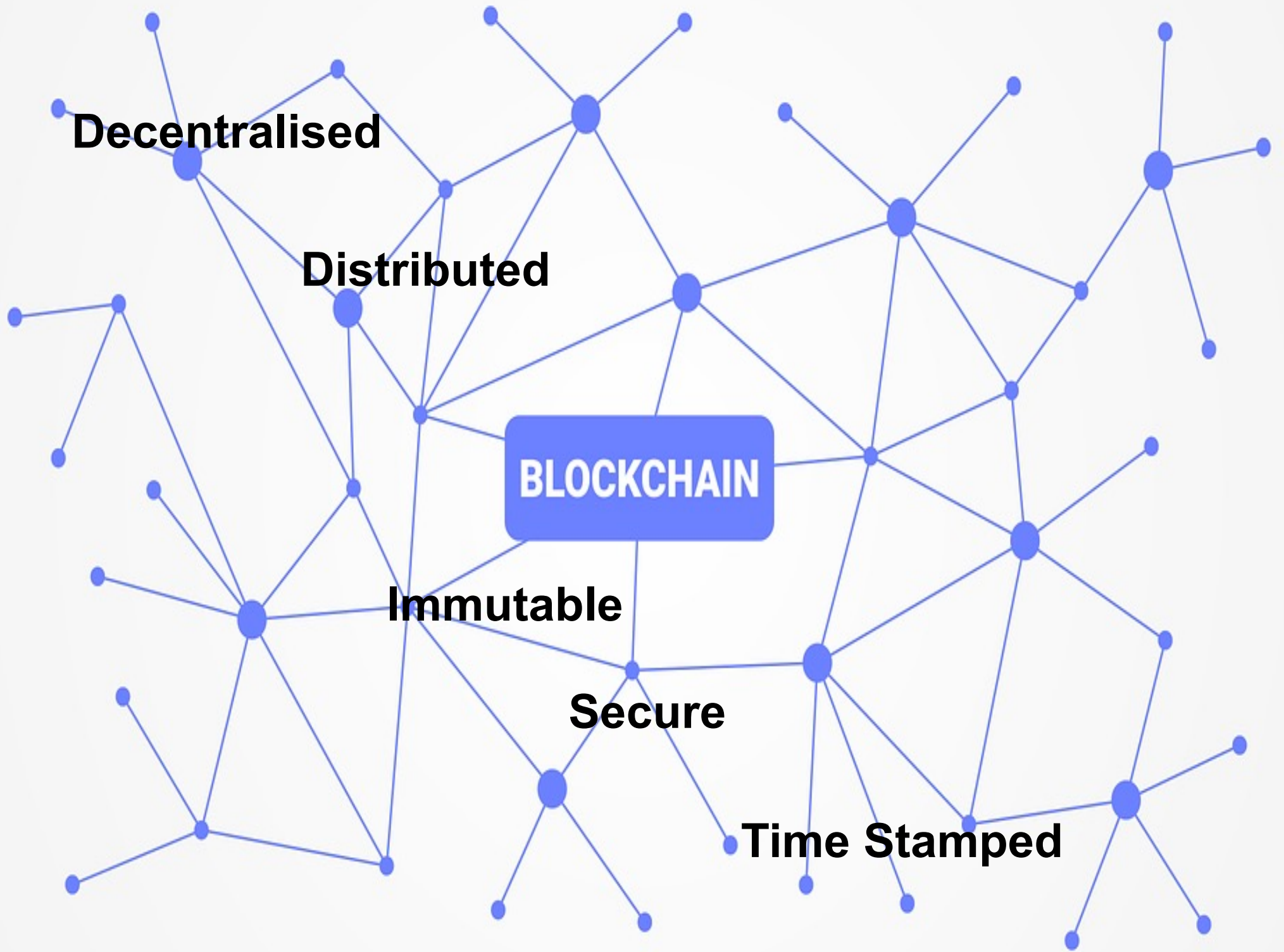
**Facilitates 2+ people
to collaborate among
themselves, with NO
centralized authority**

- **Records validated in blocks**
- **Each new block contains a hash of previous blocks creating a chain**
- **What happens on the blockchain stays on the blockchain**
- **Changing earlier blocks alters the hash & breaks the chain**

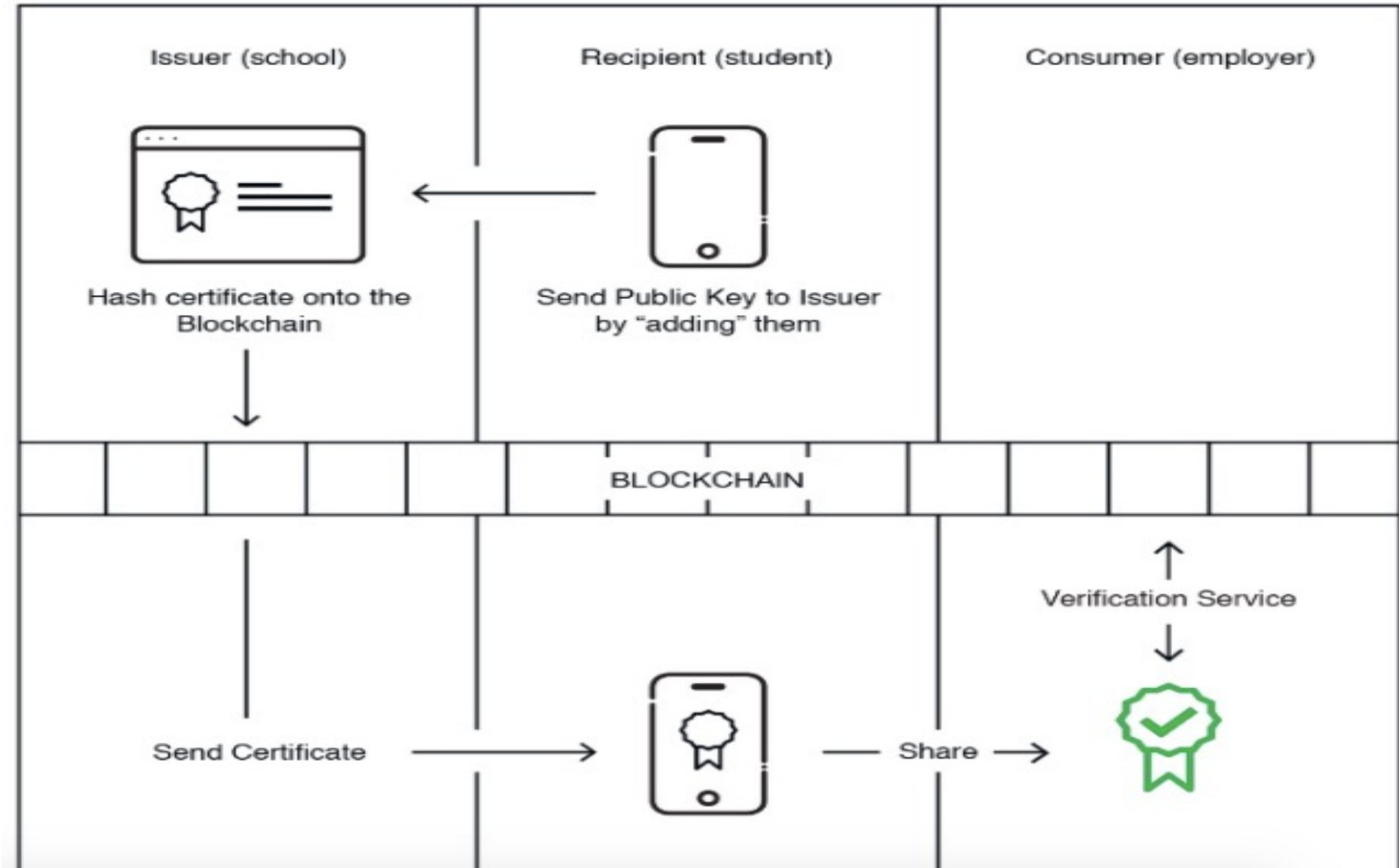
- Jon Brock

786A832913348D9BB6E35ABF60CB451934F58A9E648CA2E28724A04AACEEBB6c1

- 
- A hand holding a pen, writing on a document. The hand is positioned at the top left, and the pen is pointing towards the center. The background is dark, and the text is highlighted in yellow.
- **Can't be deleted or changed**
 - **Transactions easily traced**
 - **Organized chronologically**
 - **Time-stamped**
 - **NO need for a third party**

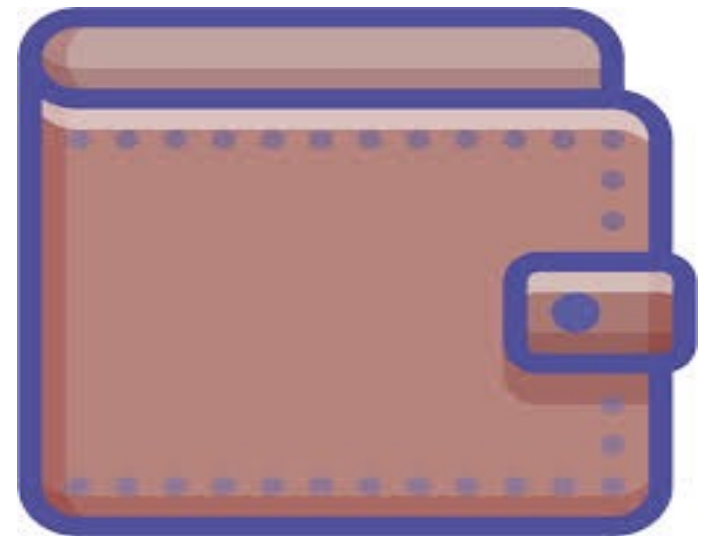


Certification by Blockchain



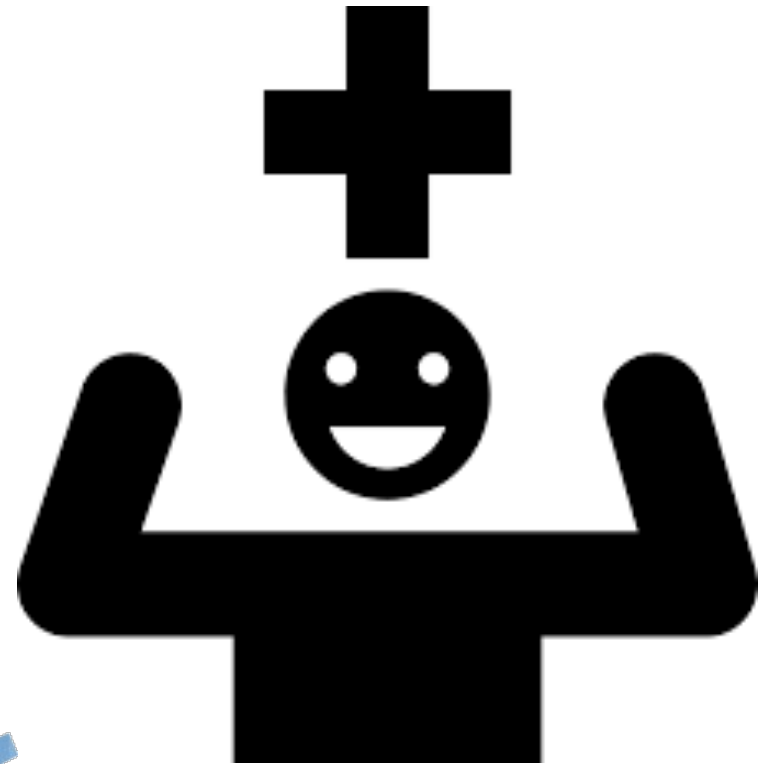
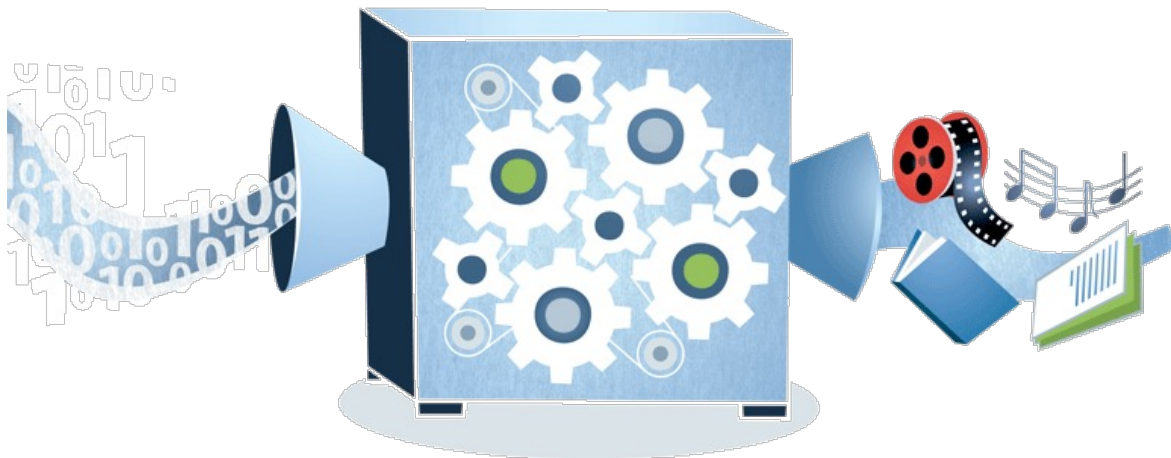
Certification: A Wallet

- For academic credentials (eg. Bitcoin)
- Pre-creating & sharing keys (& destroying them)
- Requires higher level of trust in institution
- Certificate only useful when tied to a person
- Privacy of data is essential



Ownership & Control

- **Belongs to the individual not institution**
- **Preservation**
- **Validity**
- **Reliability**



Blockchain Problems

- Big system – unexpected failures
- Why change a system that works?
- Encryption is permanent (Keys can be forgotten)



23094832	23355647	94643456	48355551	23094832	46478126	55280457	50845634
98564875	65861111	48916498	11001018	98564875	17823156	56788832	32535466
56732149	87484647	68456343	64578956	56732149	73213321	13321672	89355644
0-932476	81261782	25354668	87776886	0-932476	67223154	23154312	57577658
98345656	31115673	93556476	65478516	98345656	31221453	21453201	61111874
00874768	21332167	58647869	55844551	00874768	20113156	18831565	84647812
55647016	22315431	68866874	61494643	55647016	54345874	43577458	61743122
89355647	22145321	84610478	45648964	89355647	98645789	74986457	14532131
65864786	31500065	12617823	98684563	65864786	56877768	74457458	50006565
96880006	65434587	15673213	43253456	96880006	86065478	89567777	43458749
68748464	498			68748464		654	86421315
78126178	156			78126178		744	65434587
23156732	874			23156732		149	49886845
13321672	789			13321672		564	63432535
23154312	768			23154312		860	46689355
21453201	78516558	47851655	15673213	21453201	53546689	84563432	64765864
13156543	44551614	84455161	32110672	13156543	35564765	53546689	78696886
45874986	94643456	49464345	64564868	45874986	86111187	35564457	68748461
45789568	48916498	64896498	57875867	45789568	48464781	57765861	04781261
77768860	68456343	68456343	88944334	77768860	26178231	11187484	78231567
65478516	25354668	25354668	21010011	65478516	11567321	64781261	32133216
55844551	93556476	93556476	56456476	55844551	33216722	78231115	72213156
06149464	88647869	88647869	61249765	06149464	31543122	67321332	54345874
34564896	68866874	68866874	91093485	34564896	14532131	16727231	98645789
49860845	84610478	84610478	39201010	49860845	50006565	54312214	56877768
63432535	12617823	61782315	10048924	63432535	43458749	53213150	86654785

Blockchain Problems

Persistence



- Fake content
- Illegal content
- Unwanted content
- Leaked personal data

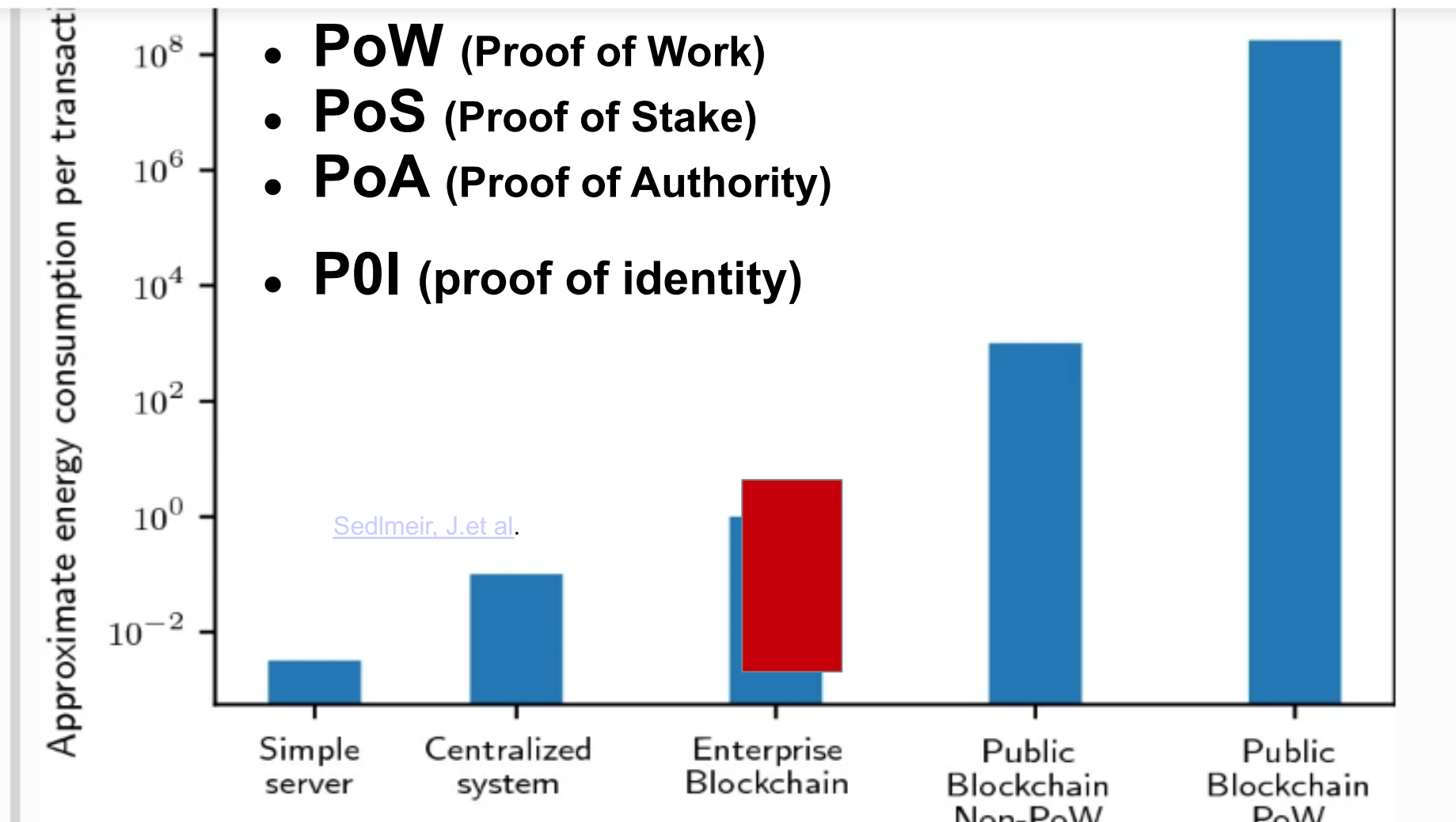
Blockchain Problems?



- **Network maintenance costs**
- **Transaction speed**
- **Storage**
- **Regulatory intervention**
- **No useful apps**
- **Hacking**

Blockchain Problem Energy Use

The Energy Consumption of Blockchain Technology: Beyond Myth



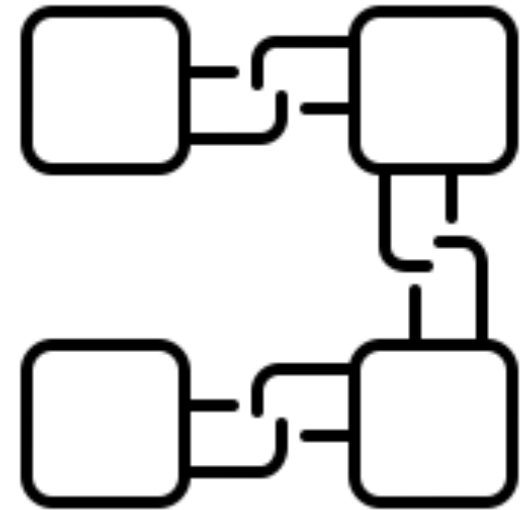
Access & Affordability

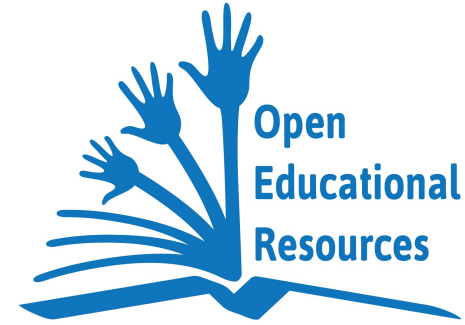
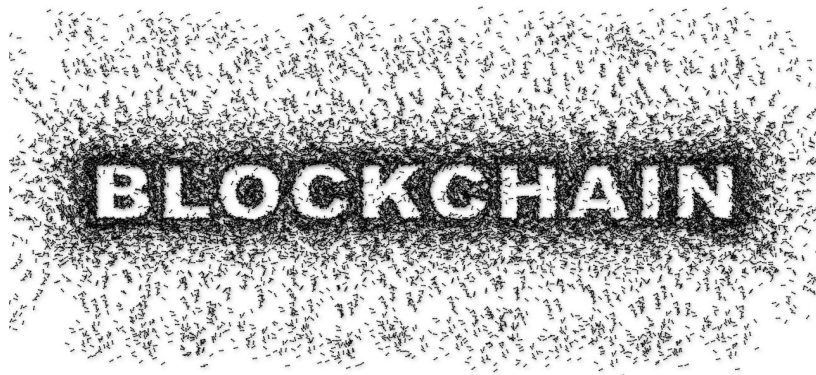
- Needs to be inexpensive when it is needed by the learner



BLOCKCHAIN

- **Solves centralization issue**
(it's distributed)
- **Network of trusted entities**
(gatekeeping nodes)
- **Access to content with public key**
- **Verification/validation based on quality**





OER Distributed Management Platform

- 1. User management**
- 2. Resource creation**
- 3. Resource management**
- 4. Copyright management**
- 5. Virtual Currency exchange**
- 6. Learning certification management**

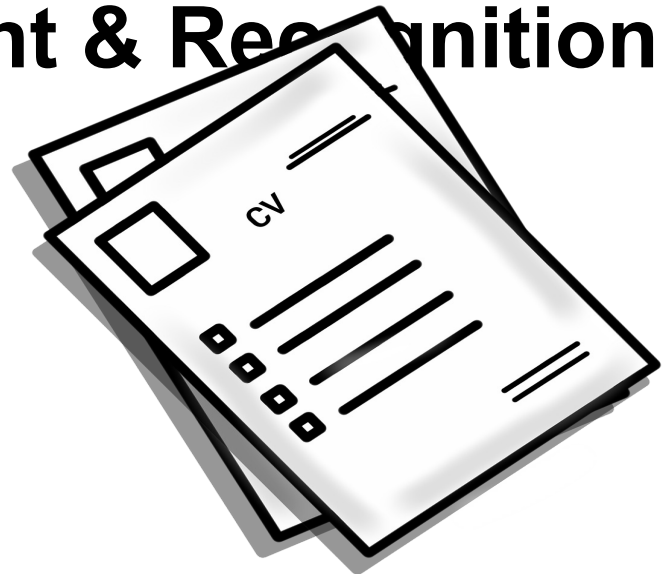


- Li & Yang

Certification

Learner Control

- **Should learners be able to choose what history they share with others?**
- **Different narratives different purposes?**
- **Highlight or hide different experiences?**
- **Prior Learning Assessment & Recognition**



BLOCKCHAIN

Problem for learners



What happens if a student wants or needs a 'fresh start'?

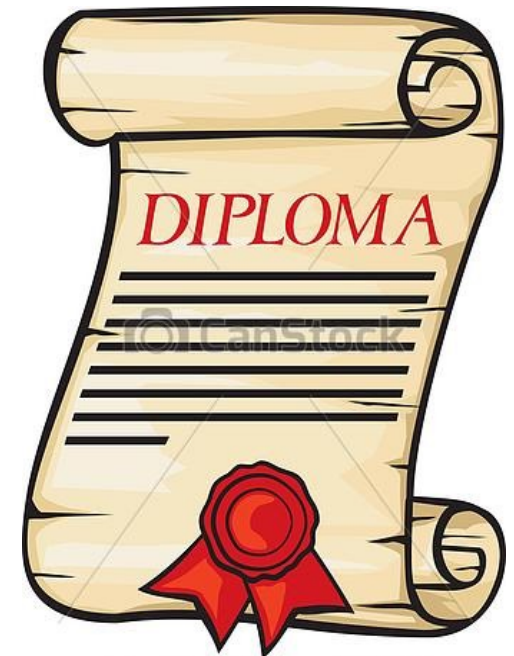
- gains afforded by the immutability of the data are undermined by problems which are left unresolvable because of that same immutability Watters (2016)



BLOCKCHAIN

Disrupting & Democratizing Education

- **Awarding qualifications**
- **Licensing & accreditation**
- **Management of student records**
- **IP management/payments**
- **Permanent distributed record of institutional output & reputation**

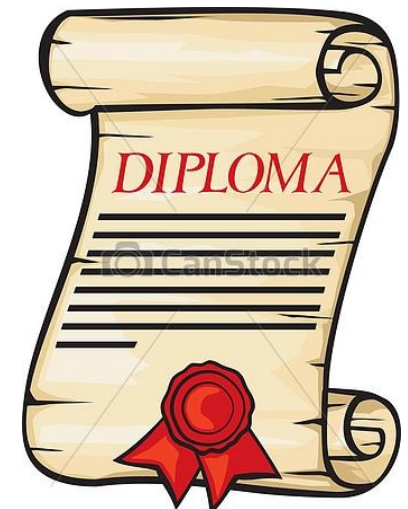


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BLOCKCHAIN

Problems for HEI

- **Can disintermediate inefficient, opaque & hierarchical centralized systems**
- **HEI need not be involved in verification**
- **Informal learning can be verified like formal education**



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BlockChain Certification: Freedom for learners

- To enroll in and complete courses at institutions of learners' choice
- To change institutions as they strive to complete a program/programs
- To transfer credits among institutions nationally and internationally.
- To have prior learning assessed & accredited



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European Union JRC

“Blockchain will end paper based certificates, automate the award, recognition and transfer of credits, increase learner ownership and control over their own data, reduce institutional data costs and risk—but only if open standards are adopted.”

“Only if open standards are adopted”

[Image](#): HongSoo Kim

JOINT RESEARCH CENTRE



- **ChatGPT 4o**
- **Gemini**



ARTIFICIAL
INTELLIGENCE

AI Benefits (Students)

- Equality
- Personalisation
- Inclusivity
- Open

AI Benefits (Administration)



- **Automate/Simplify transactions**
- **Increase efficiency**
- **Digitalisation**
- **Tracking students**
- **Consent management**
- **Security: tampering?**

AI Benefits (Instructors)

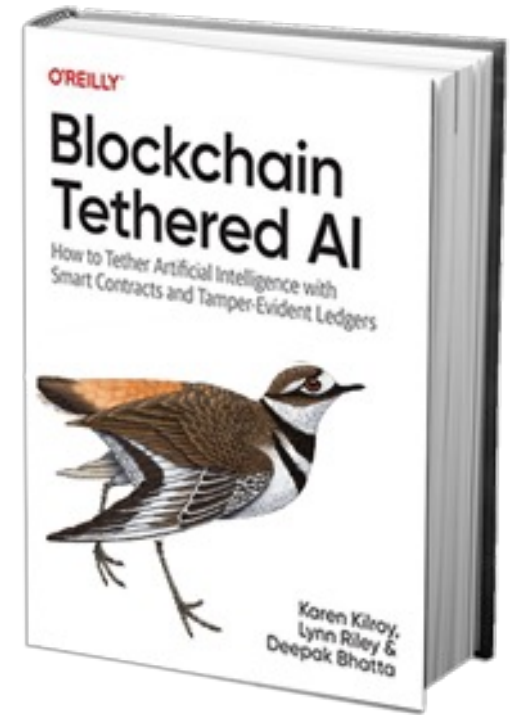
A woman in a yellow jacket is looking at a large digital display of numbers and data. The background is a glowing blue network structure with various numbers and symbols floating around it.

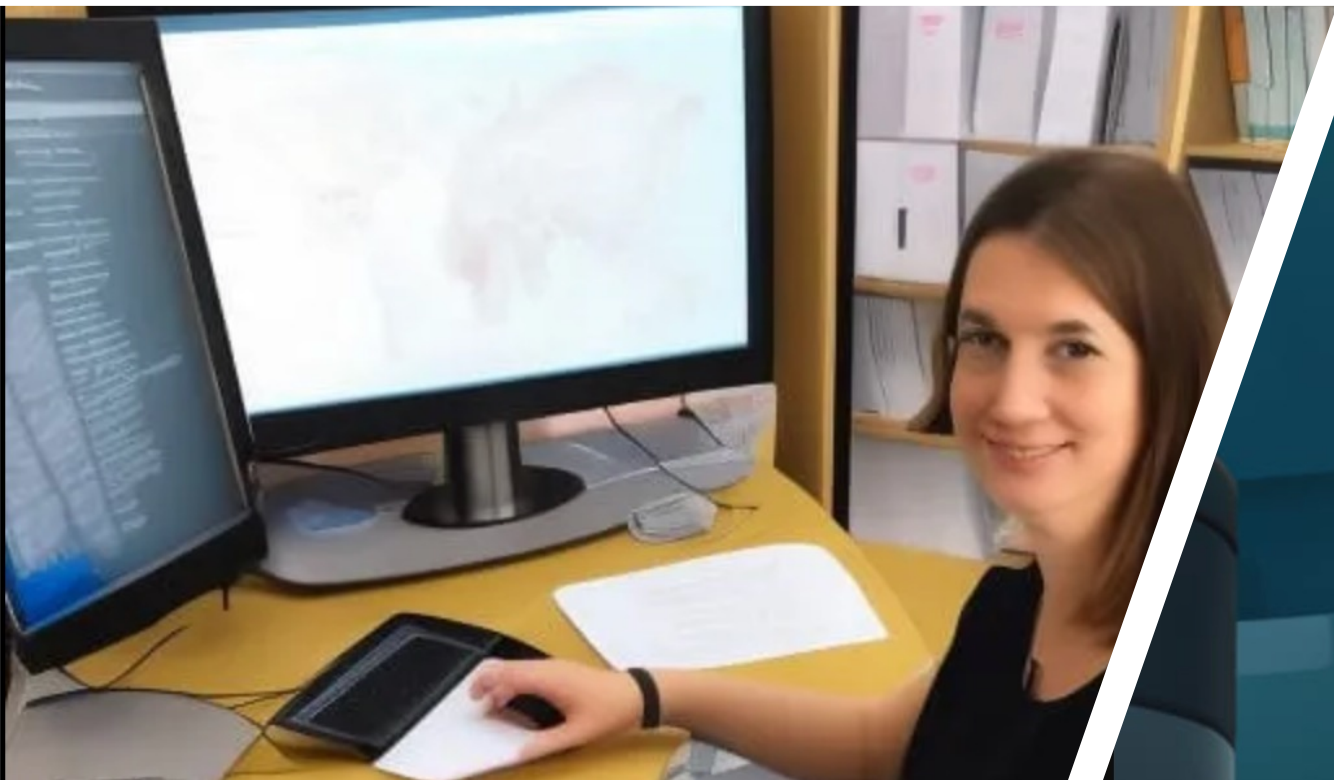
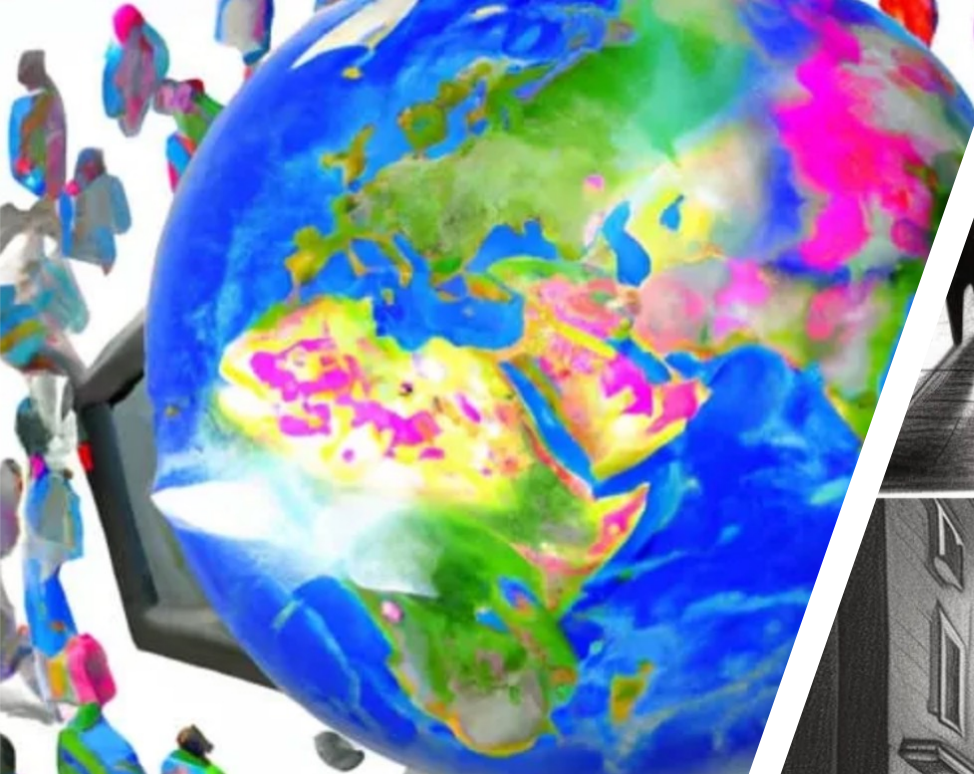
- **Verify learning outcomes**
- **Discover skill gaps**
- **Discern learning difficulties**
- **Open**

AI Limitations

- Need for large computer resources
- Ethics & broader context
- Bias
- **Human control**

BLOCKCHAIN KILL SWITCH





05/24/15

Micro-credentials, Blockchain and Artificial Intelligence

Parameters	Micro-credentials	Blockchain	Artificial Intelligence
Definition	Short-term, specialized learning credentials that validate specific skills or knowledge.	A decentralized, distributed ledger technology that securely records and verifies transactions across multiple parties.	The simulation of human intelligence by machines, enabling them to perform tasks that typically require human intelligence.
Application	Skill development and validation, professional certifications, upskilling, and reskilling.	Secure and transparent data management, identity verification, and data integrity.	Data analysis, natural language processing, machine learning, computer vision, robotics, virtual assistants, and automation.
Verification	Typically issued by educational institutions, professional organizations, or online platforms.	Consensus mechanisms, , and decentralized network consensus.	Neural networks, algorithms, and statistical models trained on large datasets.
Decentralization	Not decentralized; administered by educational institutions or online platforms.	Decentralized network architecture with distributed nodes.	Can be centralized or decentralized depending on the implementation.
Security	Low risk and less prone to hacking. Dependent on the verification of the issuing organization.	Cryptographic encryption, immutability, and consensus mechanisms ensure data integrity and security.	Vulnerable to attacks but can be enhanced through encryption and secure protocols.
Scalability	Easily scalable to large numbers of learners, due to digitization and online delivery.	Scalability challenges due to consensus mechanisms and the need for network participants.	Scalability depends on computational resources, data availability, and processing power.
Impact	Addresses the skills gap, facilitates continuous learning, and enhances employability and career enhancement	Enhances transparency, trust, and efficiency in education.	Enables automation, optimization, and innovation.
Ethical Considerations	Ensuring quality and standardization, avoiding bias, and protecting personal data.	Privacy concerns, data ownership, governance, and environmental impact.	Bias in algorithms, privacy concerns, job displacement, and ethical use of AI in areas such as surveillance and decision-making.

- Table 1: Comparison of Micro-credentials, Blockchain and Artificial Intelligence (adapted from ChatGPT)

A woman in a yellow jacket is walking through a digital space filled with numbers and glowing blue lines. The background is a complex network of blue lines and numbers, creating a sense of a digital or data environment. The text "Future is NOW" is overlaid in the center in a bold, yellow font.

Future is NOW

Open Credential Services

- **must have credible local accreditation**



Microcredentials: Affordable Learning for ALL

+ Blockchain

**+ Artificial
Intelligence**

+ Openness

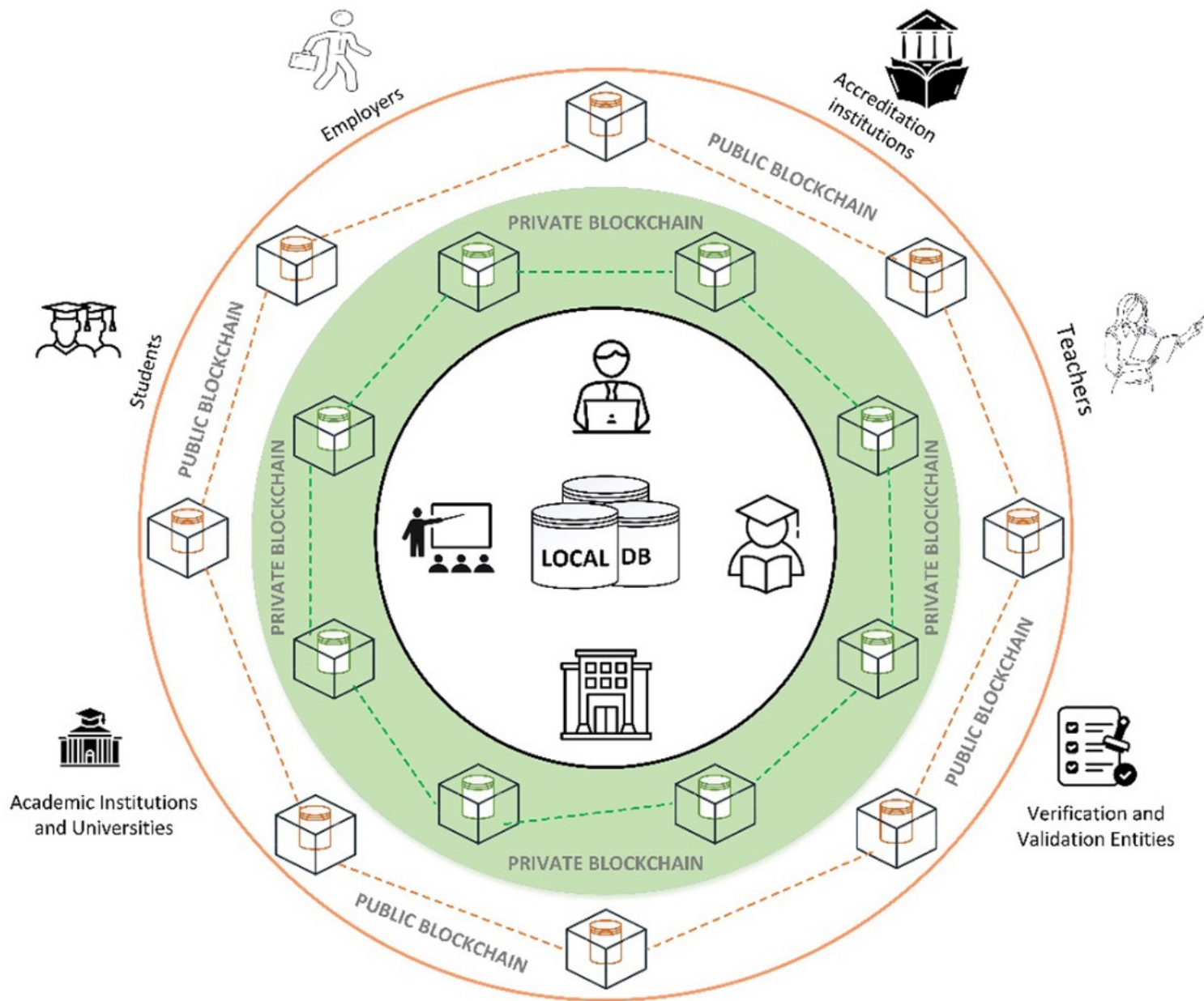


Thank

you



rory@athabascau.ca



Kabashi, F., Snopçe, H., Luma, A., & Neziri, V. (2024). Trustworthy Verification of Academic Credentials through Blockchain Technology. *International Journal of Online and Biomedical Engineering (iJOE)*, 20(09), 51 - 64.

<https://doi.org/10.3991/ijoe.v20i09.48999>