The Alan Turing Institute

Lloyd's Register Foundation

Distributed ledgers for engineered systems:

Hype or Hope?

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Lloyd's Register Foundation and The Alan Turing Institute

What is DLT/blockchain?

A family of technologies that can provide an auditable and cryptographically secure, immutable log of ‘activities’ conducted across a network

Hype?

"It has the potential to shake the very core of western civilisation"

Hype?

872 cryptocurrencies listed on coinmarketcap.com

Total Market Cap:
$133,849,768,516

Hype?

Start-ups raised ~US$1.3bn in the first 6 months of 2017 through ICOs (initial coin offerings)

Hype?

Investment in the ‘Useless Ethereum Token’ equivalent to $88,076

Hype?

700 dapps listed on dapps.ethercasts.com
Incl. games, gambling, land management, vineyard ownership….

Hope?

But is it all hype?

Could there be genuine benefits for engineered systems, particularly in enhancing safety

Key questions

What engineering challenges can distributed ledger and blockchain technologies address?

What are the key characteristics of distributed ledger and blockchain technologies that make them an appropriate solution?

What are the inherent challenges associated with using these technologies?

The research

- Academic literature; papers and books
- Attendance at workshops, and convening a workshop at The Alan Turing Institute in January 2017
- Interviews with academic and industry professionals
- Covered a range of sectors including:

  Food, aerospace, automotive, government, building and construction, pharmaceuticals and healthcare

Safety challenges

- Increasing reliance on data in engineering
- Complex and opaque supply chains
- Qualified and experienced personnel

Opportunities

Supply chain traceability and provenance

- Engineering supplies
- Food
- Medical supplies

Secure sharing and logging of data, eg in IoT networks or smart energy supplies

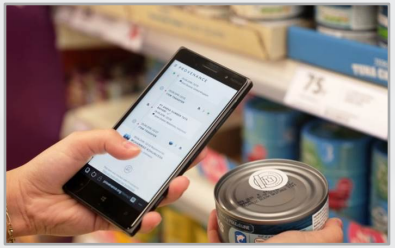
Digital identity and qualifications of people

Applicability

- Do you need a database?
- Does it require shared write access by multiple parties?
- Is there any mistrust of those writing parties?
- Would an intermediary resolve the issue of trust?
- Is there a need or desire for functionality to be controlled?
- Is there a desire for transactions to be public?

Application examples

Verification of container mass



Food supply chain provenance

Shipping container tracking

A.P. Moller - Maersk

DLT / blockchain key challenges

- Interfaces and interoperability
- Scalability
- Privacy vs transparency
- Governance
- Standardisation
- Quantum computing

Findings

DLT/blockchain does offer benefits for enhancing the safety of engineered systems.

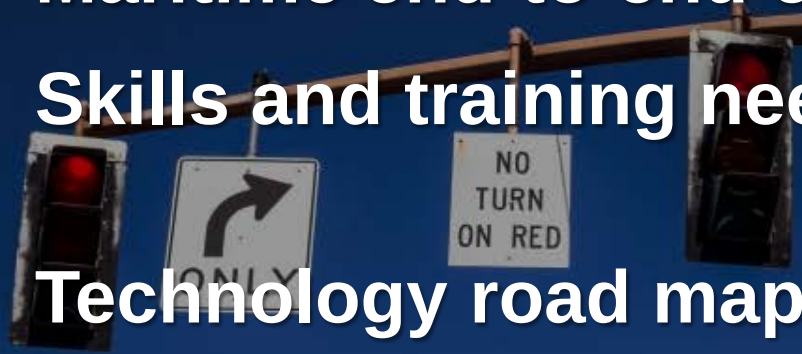
Any solution needs to consider the specific challenge being addressed.

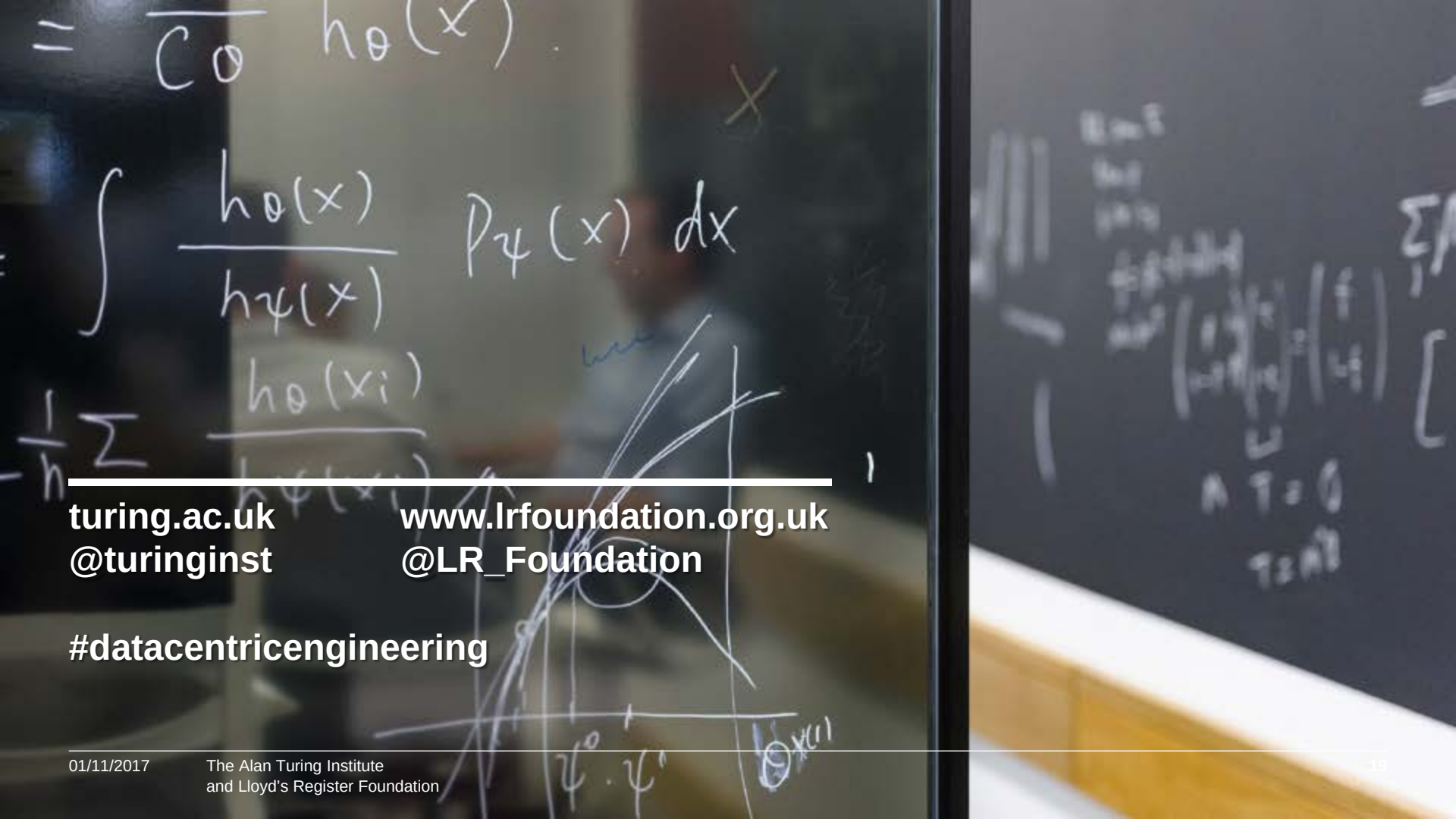
Recommendations

1. Develop leadership and support consortia within sectors - common approaches
2. Grow capability and understanding through skills and training
3. Map technology options against sectorial needs

Next steps

1. Industry-wide, real-world initiatives such as Maritime end-to-end consortia (LR Foundation)
2. Skills and training needs (The Turing / LR Foundation)
3. Technology road mapping for sectors (The Turing / LR Foundation)





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