AN EXCELLENCE STANDARDS FRAMEWORK

FOR

UK'S NATIONAL BLOCKCHAIN ROADMAP (NBR)

(VISION 2030)



The British Blockchain Association

Advocating Evidence Based Blockchain

RECOMMENDATIONS BY

THE CENTRE FOR EVIDENCE-BASED BLOCKCHAIN

CEBB | Centre for Evidence-Based Blockchain

JULY 2021

www.britishblockchainassociation.org



FOREWARD

This framework sets out a blueprint to devise the UK's National Blockchain Roadmap. It is a concise summary of the key recommendations that aim to inspire and reform Britain's DLT landscape. It builds on the excellent foundational principles set by blockchain academics, industry leaders, policymakers and communities over the past decade.

At this critical juncture, the timely recommendations provide clarity, inspiration and guidance to build a world-class blockchain ecosystem. It is an informative tool that can be used to construct the key components of the UK's Blockchain economy. There is real momentum and enthusiasm among the DLT stakeholders and the UK is ready to capitalise on opportunities offered by emerging technologies.

There is a pressing need to devise policies that are evidence-based. In the midst of the challenge lies some of the greatest opportunities. The principles and recommendations put forward in this excellent framework will position the UK at the forefront of DLT leadership, advance best standards, and provide signposts for future development.

Martin Docherty-Hughes MP
Chair, UK All-Party Parliamentary Group on Blockchain



FOREWARD

This is a landmark report – an evidence-based summary of excellence standards that lays the foundations of a holistic and interdisciplinary approach towards the UK's National Blockchain Roadmap. The UK has emerged as a world leader in the field of Blockchain. However, there is further work to be done. In times of uncertainty, there was an emergent need to establish a scientific blueprint that provides objectivity and precision to deliver the next 10-15 year DLT roadmap for the UK. Blockchains have been in existence for more than a decade and it is about time we measure the societal impact of their applications. We have the tools and frameworks of evidence-based blockchain to evaluate projects against rigorous standards and deploy those that show demonstrable evidence of effectiveness.

These recommendations will provide the foundation of targeted action steps, policies and benchmarks to advance best practices. The credit goes to the Centre for Evidence-Based Blockchain for their insightful contributions and to the British Blockchain Association for their convening and production of this report, expert navigation and synthesis of the many complex issues that it covers. Peer review is a critical part of the process of becoming a trusted source of information. It is traditionally considered as a benchmark in most sciences to examine the accuracy, integrity, validity and reliability of the information. This quality control filter builds authority and leads to increased collaboration and creativity. I truly believe that this report will become a milestone in setting the agenda and scientific policy framework for the UK's National Blockchain Roadmap. Our collective aspiration is to build a progressive and resilient DLT ecosystem in which UK's DLT sector and communities can then thrive.

I hope that these recommendations will stand as the blueprint for the UK's DLT roadmap and that it will provide a firm basis for a DLT -based digital UK. I welcome the arrival of this report and look forward to building a more trusted UK DLT economy with the BBA and other stakeholders in the quadruple helix innovation ecosystem.

Lord Holmes of Richmond MBE
Vice-Chair, UK All-Party Parliamentary Group on Blockchain



PREFACE

It is an understatement to say that blockchain is transforming the societal fabric of our lives. Policymakers and regulators face increasing pressure to support blockchain innovation while ensuring that policies are safe, cost-effective, consumer-centred, business-friendly, and based on trustworthy, reliable, and reproducible evidence.

Blockchain exists at the junction of technical, social, legal, and political paradigms; thus, there is a strong need for interdisciplinary harmony within the branches of distributed ledger technology (DLT). Blockchain ecosystems must provide freedom for innovation while at the same time, the stakeholders should be held accountable for the communities they intend to serve.

This framework outlines the essential components of the UK's National Blockchain Roadmap (NBR). Though primarily applicable to the UK DLT landscape, the framework may be equally relevant for other nations with similar economies that are experimenting with blockchain deployment. The benchmarks built upon these frameworks are intended to create a world-class, dynamic, and responsive DLT ecosystem.

The recommendations contained in this report are constructed on academic and industry research outputs built on peer-reviewed scientific data. This document is intended to provide a blueprint for the UK's National Blockchain Roadmap and to inform other evidence-based implementations of DLT in the United Kingdom and beyond.

Dr Naseem Naqvi FBBA
Chair, Centre for Evidence-Based Blockchain
President, The British Blockchain Association

RECOMMENDATIONS

01

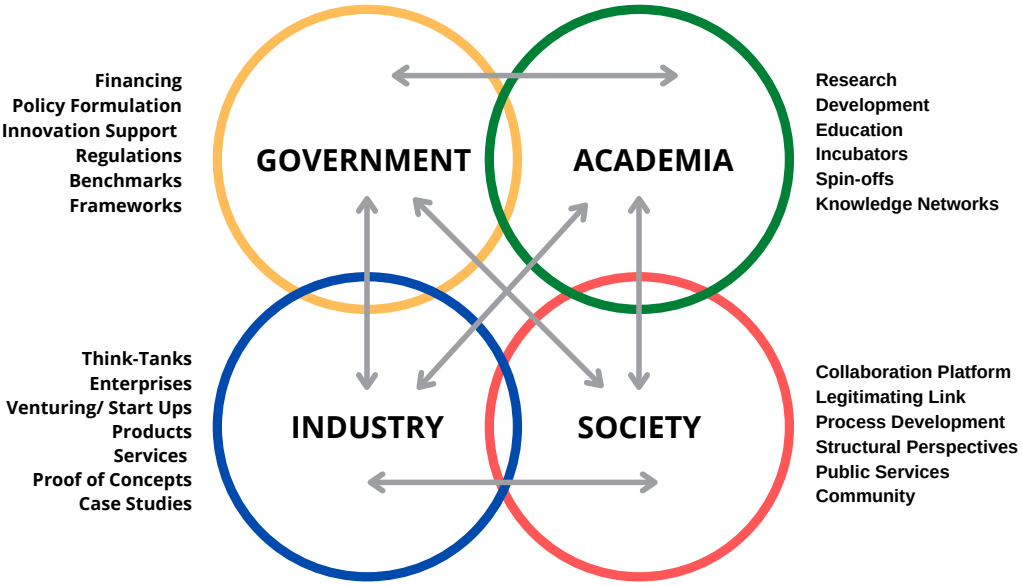
FOSTER "QUADRUPLE HELIX" BLOCKCHAIN INNOVATION ECOSYSTEMS

Evidence ecosystems are greater than the sum of their parts. Interventions, including those related to distributed ledger ecosystems, are most effective when deployed as a collective effort to benefit society and drive structural changes beyond the scope of any one organisation. The government must support blockchain clusters of quadruple-helix innovation systems by collaborating with policymakers, academia, industry, and public services. Best-practice standards should be established to nurture and advocate 'extended knowledge networks' (such as the Centre for Evidence-Based Blockchain) that will advance holistic, multi-disciplinary benchmarks in blockchain.

References:

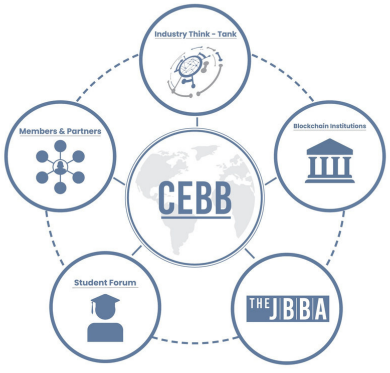
The quadruple helix model of innovation for Industry 4.0:
http://www.scielo.org.za/scielo.php?script=sci_arttext&pid=S1684-19992019000100025

Micro- and Macro-Dynamics of Open Innovation with a Quadruple-Helix Model:
https://www.researchgate.net/figure/The-roles-of-the-quadruple-helix-model-for-open-innovation-micro-and-macro-dynamics_fig4_333795559

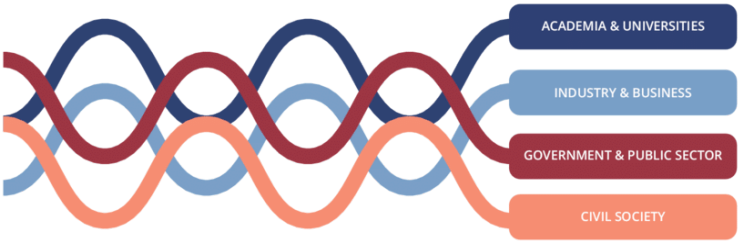


Modified from: Developed notion of a Quadruple Helix innovation system
DOI:10.1007/s13132-012-0098-3

Bridging the Blockchain Research and Practice Gap



CEBB | Centre for Evidence-Based Blockchain



Knowledge Society Policy Handbook (2016)

02

BUILD A PUBLIC REPOSITORY OF SUCCESSFULLY IMPLEMENTED BLOCKCHAIN USE CASES

In a 2016 blockchain report, Sir Mark Walport recommends:

“Government should establish trials of distributed ledgers in order to assess the technology’s usability within the public sector. We suggest that the trials should be coordinated in a similar fashion to the way that clinical trials are implemented, reported and assessed, in order to ensure uniformity and maximize the rigour of the process.”

We propose that the UK should not only establish the trials proposed by Walport but also build a public repository of successfully implemented use cases based on high-quality, peer-reviewed evidence from the UK and elsewhere. This repository would take the form of public permissioned data and would be managed by a federated consensus network of key stakeholders of the NBR's Sub-Speciality Steering Groups (SSGs, page 15), all of whom would have “write” access.

References:

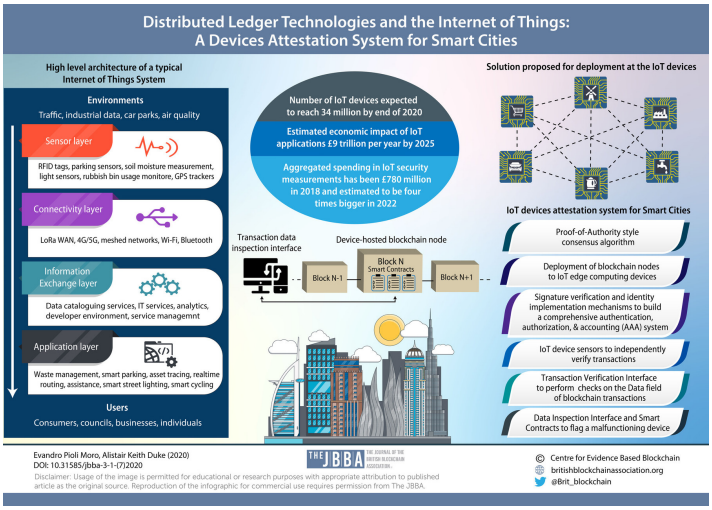
E-Voting on the Blockchain:
https://jbba.scholasticahq.com/article/4451-e-voting-on-the-blockchain

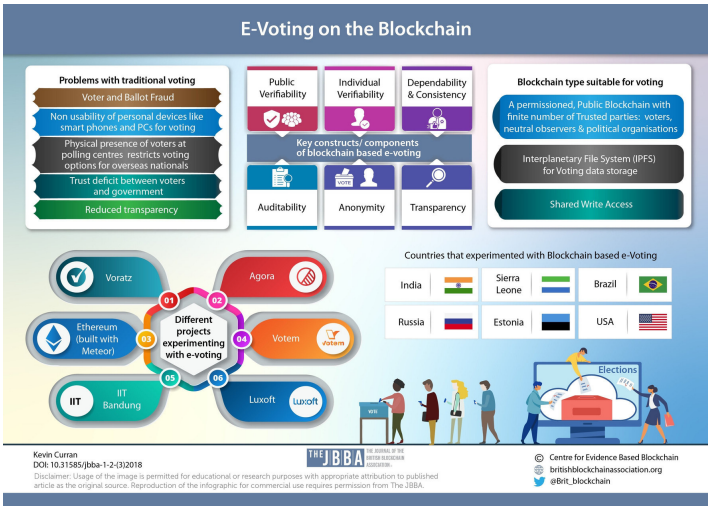
Distributed Ledger Technologies and the Internet of Things: A Devices Attestation System for Smart Cities:
https://jbba.scholasticahq.com/article/12500-distributed-ledger-technologies-and-the-internet-of-things-a-devices-attestation-system-for-smart-cities

Parameters for Building Sustainable Blockchain Application Initiatives:
https://jbba.scholasticahq.com/article/7758

Academic Certification using Blockchain: Permissioned versus Permissionless Solutions
https://jbba.scholasticahq.com/article/13618-academic-certification-using-blockchain-permissioned-versus-permissionless-solutions

Blockchain for real-time attribution, provenance and recognition of scientific research:
https://core.artifacts.ai/journal/jbba





03

ESTABLISH MEASURES TO AUDIT THE SOCIETAL IMPACT OF BLOCKCHAIN APPLICATIONS

We propose UK government work in collaboration with DLT Think-Tanks such as the British Blockchain Association to undertake regular audits of DLT projects using EBB's PCIO framework for evaluation of blockchain applications.

How do we know that the interventions worked? How do we know that a blockchain-based system works more efficiently than a legacy system? Blockchain think-Tanks should take an action-oriented approach to guide the use of blockchain. The pragmatic impact of all DLT based interventions should be reviewed and reflected over time to ensure they remain credible and relevant for the communities they intended to serve.

The 7 major domains of societal impact are:
Enterprise Economy / Industry and Private Sector
Society, Behavior and Culture
Public Policy and Legal
Environmental
Health, Life Sciences and Quality of Life (QOL)
Political and Governance
International / Trans-National

References:
Evidence Based Blockchain:
https://jbba.scholasticahq.com/article/16795-evidence-based-blockchain-findings-from-a-global-study-of-blockchain-projects-and-start-up-companies

EVIDENCE-BASED BLOCKCHAIN:

BLOCKCHAIN EXCELLENCE FRAMEWORK
(HIGH-IMPACT CASE STUDY)

ACADEMIC IMPACT

(PUBLICATIONS, CITATIONS, RESEARCH ENVIRONMENT)

↓

SOCIETAL IMPACT (THE "**BIG 7**")

> ENTERPRISE ECONOMY/ INDUSTRY
> SOCIETY AND CULTURE
> PUBLIC POLICY
> ENVIRONMENTAL
> HEALTH AND QUALITY OF LIFE (QOL)
> POLITICAL AND GOVERNMENT
> INTERNATIONAL / TRANS-NATIONAL

KEY INDICATORS	RANKING METRICS
IDEA/ CONCEPT	**EXCEPTIONALLY NOVEL** in developing Solutions, Concepts or Paradigms
PROJECT DESIGN	**EXCEPTIONALLY RIGOROUS** FOR METHODOLOGY (**EBB PCIO FRAMEWORK)**
OUTPUTS	Generate **EXCEPTIONALLY SIGNIFICANT** Data Set, Outcomes or proposals
IMPACT	A **FORMATIVE** influence on Intellectual Agenda, Policies, National Guidelines, Benchmarks and Standards
POINT OF REFERENCE (POR)	A **PRIMARY** or **ESSENTIAL** Point of Reference (POR)

Source: Modified from UK REF and EBB PCIO Framework


GOVERNMENT & POLITICAL
ACADEMIC
PUBLIC POLICY
ENTERPRISE/ INDUSTRY
ENVIRONMENTAL
INTERNATIONAL/ TRANS-NATIONAL
HEALTH & QOL
SOCIETY & CULTURE
Blockchain: Societal Impact

04

AVOID DUPLICATION OF EXISTING WORK

The UK government has produced important reports related to blockchain since 2015, including the Walport Report (2015–16), Lord Holmes Report (2017), and 'Unlocking Blockchain' by Rt Hon Eddie Hughes MP., et al (2018).

In drafting a national blockchain roadmap for the UK, it is important to avoid duplication of existing work by revisiting and extracting key recommendations and proposals made in other reports.

Well-constructed plans must be established for the dissemination of consistent and reliable information and to ensure consistency among stakeholders regarding the language and taxonomy of DLT applications. When possible, DLT solutions should be integrated into existing systems instead of building de novo solutions from scratch. In a 2018 report, Eddie Hughes et al. proposed the establishment of a UK "Chief Blockchain Officer" and a long-term blockchain department target of 1% efficiency savings by embracing blockchain and other associated innovative technologies.

References:

Distributed ledger technology: beyond blockchain:
https://www.gov.uk/government/news/distributed-ledger-technology-beyond-block-chain

Distributed Ledger Technologies for Public Good:
https://chrisholmes.co.uk/wp-content/uploads/2020/12/Distributed-Ledger-Technologies-for-Public-Good_leadership-collaboration-and-innovation.pdf

Unlocking Blockchain: Embracing New Technologies to drive Efficiency and Empower the Citizen:
https://jbba.scholasticahq.com/article/3741-unlocking-blockchain-embracing-new-technologies-to-drive-efficiency-and-empower-the-citizen


THE JBBA

ANALYSIS

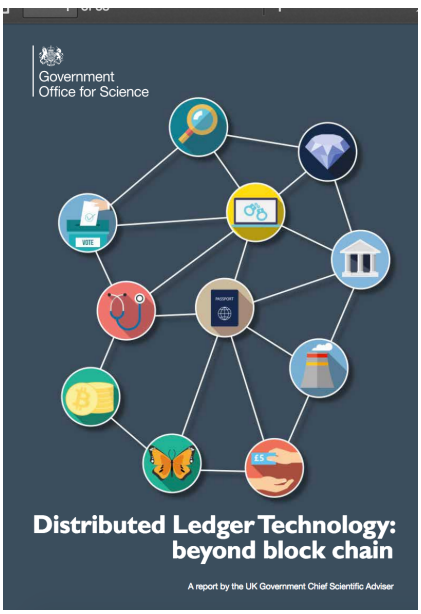
OPEN ACCESS
ISSN Print: 2516-3949
https://doi.org/10.31585/jbba-1-2-(6)2018

Unlocking Blockchain:
Embracing New Technologies
to drive Efficiency and Empower the Citizen

Eddie Hughes[1], Luke Graham[2], Lee Rowley[3], Rebecca Lowe[4]
[1, 2, 3] Member of Parliament, UK
[4] Director, FREER, UK
Correspondence: rebecca@freeruk.com
Received: 25 June 2018 **Accepted:** 4 July 2018 **Published:** 5 July 2018

Abstract
With their innovative and fundamentally liberalising approach to data storage, distributive ledger technologies


Distributed Ledger Technologies for Public Good: leadership, collaboration and innovation



05

AGREE UPON THE TERMS AND TAXONOMY USED TO DESCRIBE EVIDENCE AND STANDARDS

The UK must be consistent and coherent in its use of the term 'evidence' in the context of blockchain policymaking. A transparent framework should be established to develop and present summaries of evidence. This framework will support a systematic approach to making practice recommendations for NBR.

We recommend the establishment of **levels** of evidence and **grades** of recommendations, as in other established scientific disciplines, to facilitate the assessment, development, and evaluation of distributed ledger technology projects (Hussain, 2021).

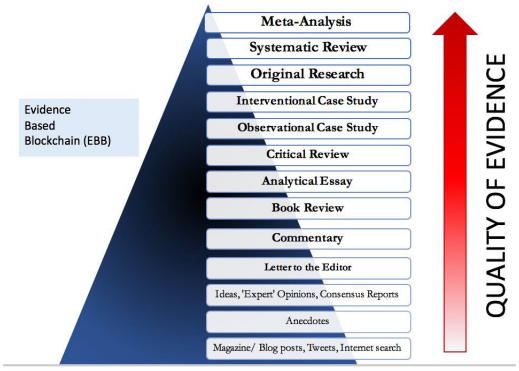
References:

Evidence-Based Blockchain: Findings from a Global Study of Blockchain Projects and Start-up Companies: https://jbba.scholasticahq.com/article/16795

A Future History of International Blockchain Standards: https://jbba.scholasticahq.com/article/3724-a-future-history-of-international-blockchain-standards

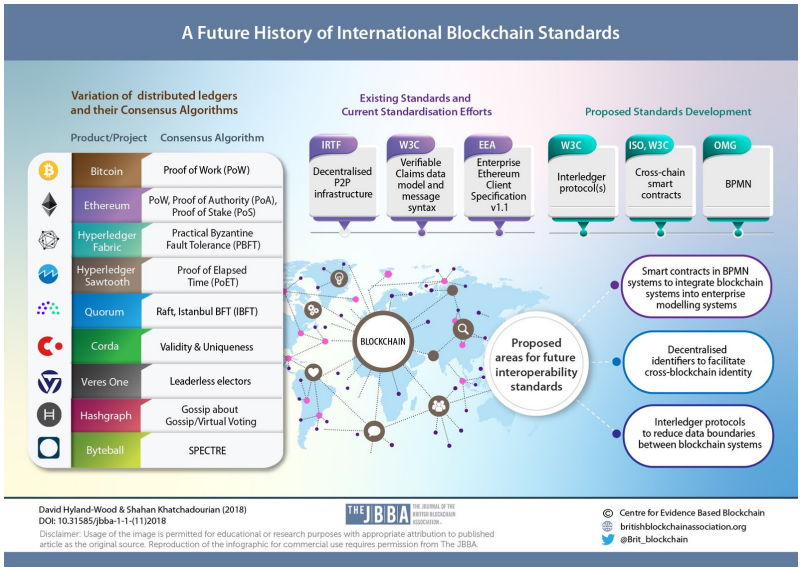
Level of Evidence and Grade of Recommendation:
M. Hussain, The JBBA, https://jbba.scholasticahq.com/post/1041-level-of-evidence-and-grade-of-recommendation





Blockchain Hierarchy of Evidence

(Copyright © N Naqvi, 2018, The Journal of the British Blockchain Association)



Level of Evidence	Grade of Recommendation
Level 1 Multiple peer-reviewed research studies from at least two independent institutions Evidence synthesis of critically appraised papers Meta-Analysis and Systematic Reviews High-quality Randomised comparative studies National evidence guidelines	**Grade A** Established proof of effectiveness or efficiency Clear evidence of benefits Strong evidence to recommend the action
Level 2 Single peer-reviewed research article Single peer-reviewed interventional case study Single high power comparative industry research Critical review Analytical essay	**Grade B** Scientific presumption * Benefits > risks Fair/ moderate evidence to recommend the action
Level 3 Non peer-reviewed case study Low power comparative industry research Book review White paper Consensus reports, Letter to the editor Commentary, Committee reports	**Grade C** Benefits = Risks Low or conflicting level of evidence Risk of bias Insufficient evidence to make a recommendation
Level 4 No scientific publication or case study Untested hypothesis Expert opinion without explicit critical appraisal Anecdotes / historical data Blog posts Narrative	**Grade D** Consider alternatives Risk of harm > proposed benefit Risk of serious bias Fair evidence to recommend against the action

Evidence Based Blockchain: Levels of Evidence & Grades of Recommendation

Source: M. Hussain, The JBBA, https://jbba.scholasticahq.com/post/1041-level-of-evidence-and-grade-of-recommendation

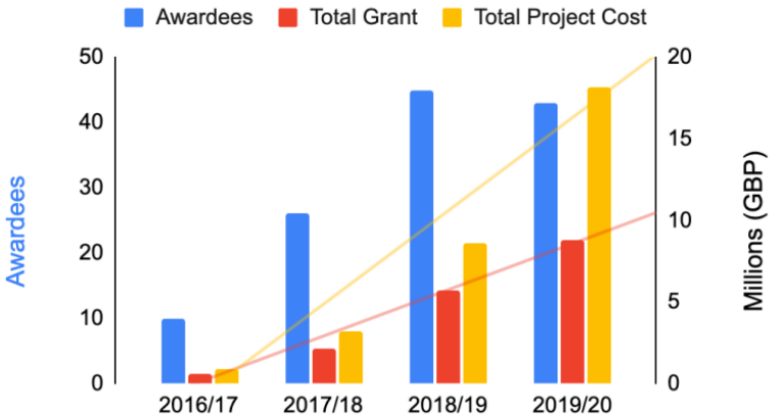
Factors that can reduce the quality of evidence:
Limitations in study design or execution (risk of bias)
Inconsistency of results
Indirectness of evidence
Imprecision
Selection bias
Insufficient data
Lack of peer-review / critical appraisal

06

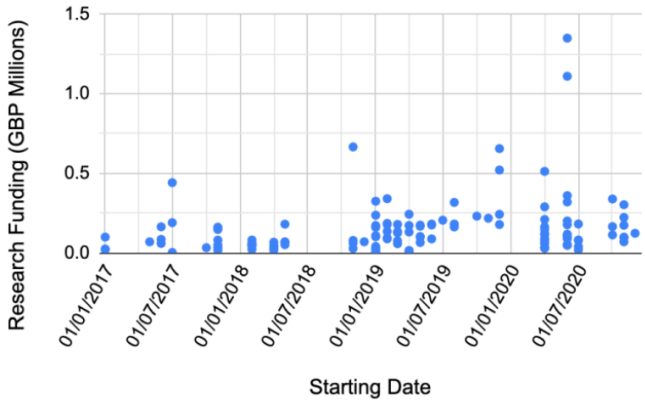
EMBED QUALITATIVE AND QUANTITATIVE EVIDENCE INTO NATIONAL BUDGETING PROCESSES AND DECISIONS

It is a challenging task to make evidence-based policy decisions in rapidly evolving innovative technology systems. Some blockchain systems are not linear (i.e., problem – intervention – impact) but follow complex system logic that is non-linear, emergent, and adaptive. A flexible and dynamic approach is needed to adapt policies to a rapidly progressive ecosystem. Barriers to translating evidence from research to practice must be identified. When possible, evidence drawn from high-quality research (i.e critically appraised peer-reviewed studies) must be embedded into national budgeting processes and policies (Ellul., 2021).

References:
Blockchain is dead! Long live Blockchain!:
https://jbba.scholasticahq.com/article/21948-blockchain-is-dead-long-live-blockchain



Innovate UK total blockchain-related project funding, costs and awardees



Innovate UK-funded blockchain-related research and development projects

Global research examining metrics including budgets and investment; company registries and data; community engagement, projects and source code repositories; academic research and programmes; social media posts; and public interest in Blockchain and Distributed Ledger Technologies
Ellul., 2021: https://doi.org/10.31585/jbba-4-1-(8)2021

(Innovate UK's public transparency dataset on their funded projects was used and projects were filtered out so that only the ones whose description or title contained the following terms were included: *Blockchain*, *Cryptocurrency*, *Cryptocurrencies*, *DLT*, *DLTs*, *Distributed Ledger Technology*, *Distributed Ledger Technologies*, *Bitcoin*, *Ethereum*, *Hyperledger*, *Smart contract*, *Smart contracts*, *Cryptocurrency exchange*, *Crypto exchange*. The dataset also contains projects that were withdrawn, which were excluded from this analysis. The version uploaded on 8 January 2021 was used).

07

ESTABLISH BLOCKCHAIN SUB-SPECIALITY STEERING GROUPS (SSG)

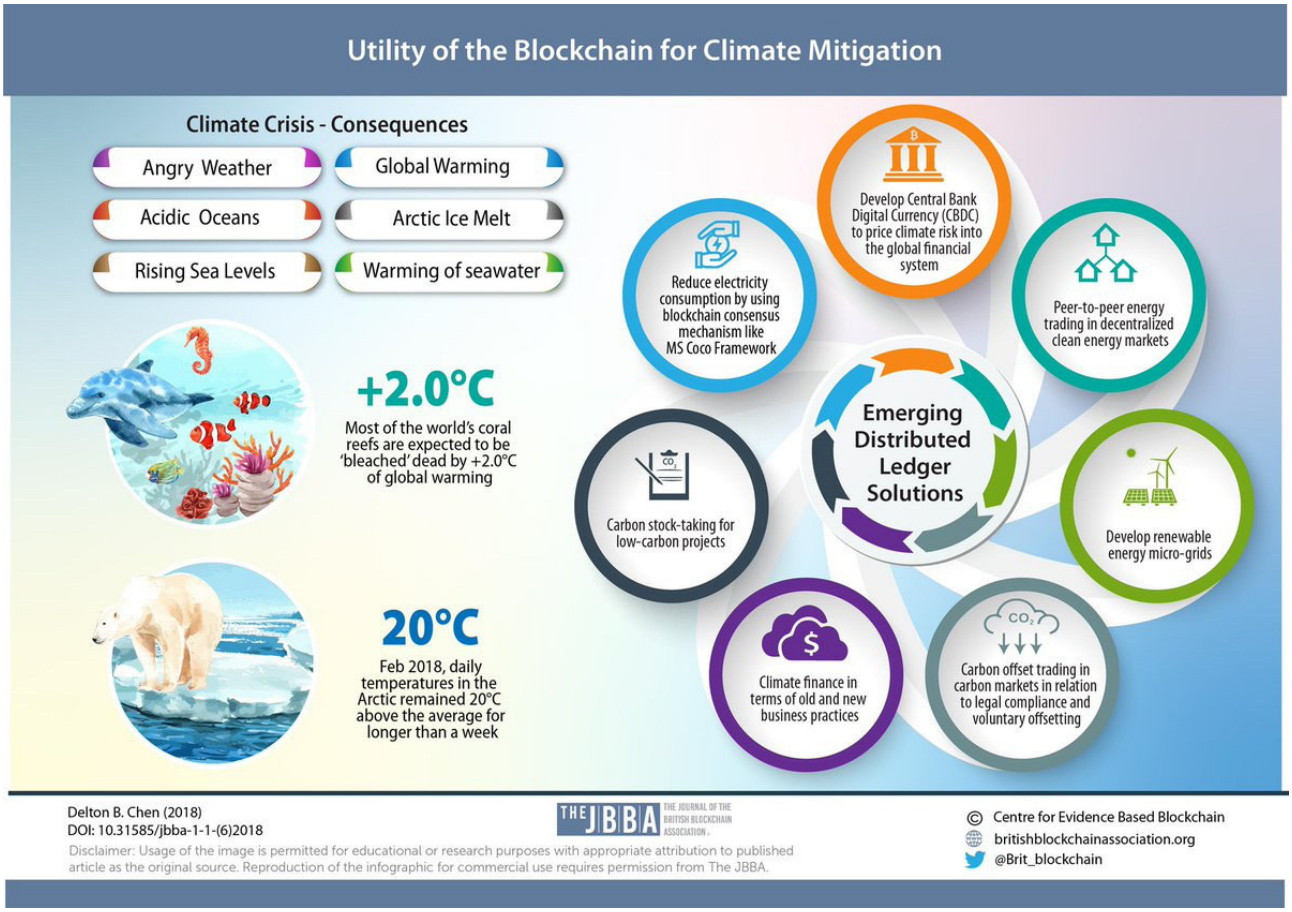
We propose the formation of sub-speciality steering groups (SSGs) to review the progress of the NBR and oversee its strategic implementation.

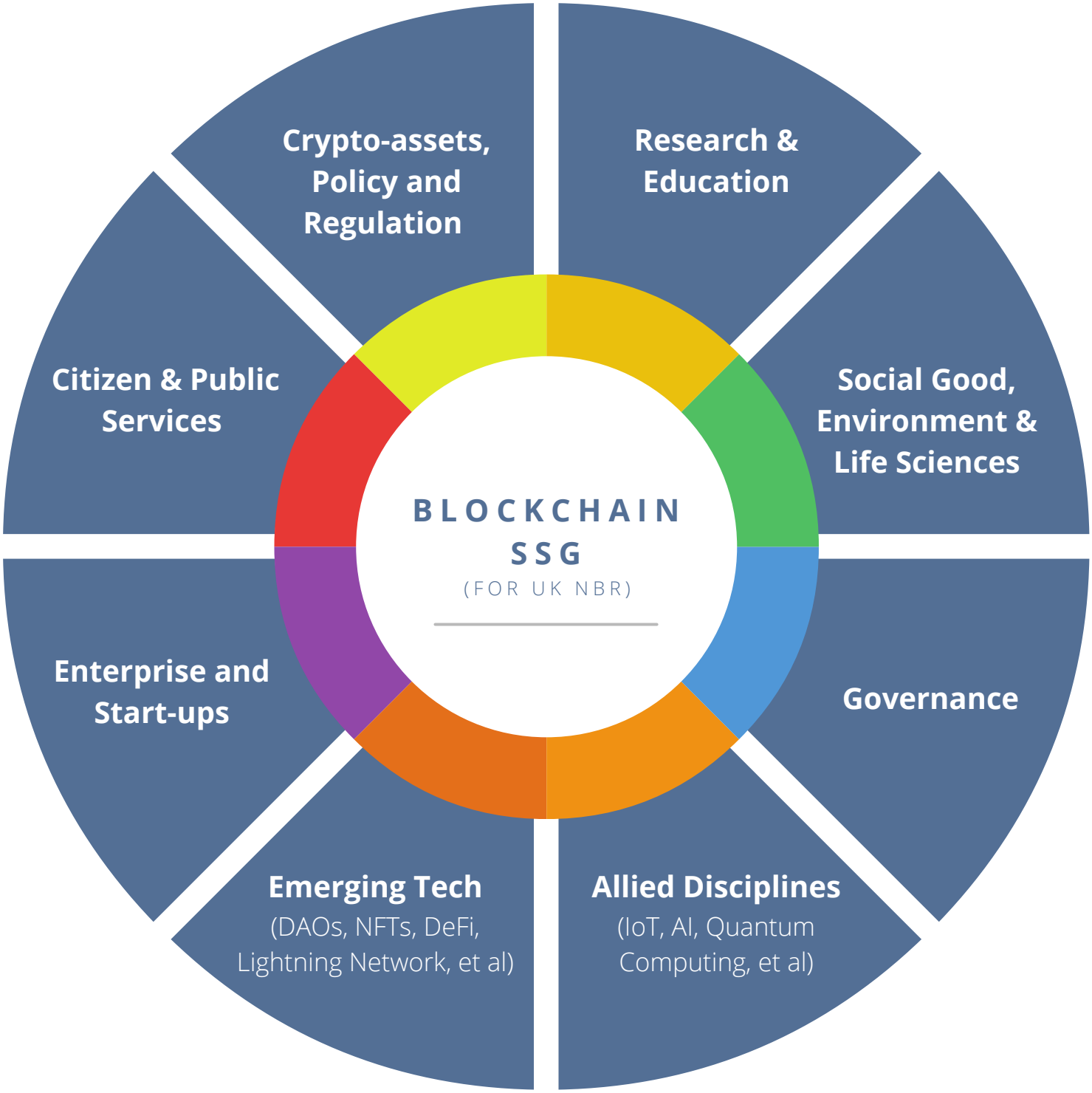
New and emerging markets (e.g., decentralised finance, nonfungible tokens, self-sovereign identity, crypto assets, supply chain, and central bank digital currency) are highly specialised areas that must be supervised by subject matter experts. These experts should be drawn from a broad range of organisations and should be tasked with overseeing the strategic direction of SSGs aligned with the broad vision of the NBR.

SSGs must leverage the capabilities and intellectual resources of neutral think tanks, such as the British Blockchain Association. Mechanisms must be established to translate innovative ideas into practice to create value for end-users. SSGs must also build dynamic capabilities to discuss, debate, and propose best practices in blockchain technology. All SSG output should feed into the dynamic NBR frameworks, and SSGs should collaborate with multidisciplinary industry consortia to share intellectual resources and information about best practices. We propose eight SSGs during the phase1 of the NBR (page 14).

References:

Utility of the Blockchain for Climate Mitigation:
https://jbba.scholasticahq.com/article/3577





SUB-SPECIALITY STEERING GROUPS (SSG)

08

FOSTER EVIDENCE-INFORMED POLICY MAKING

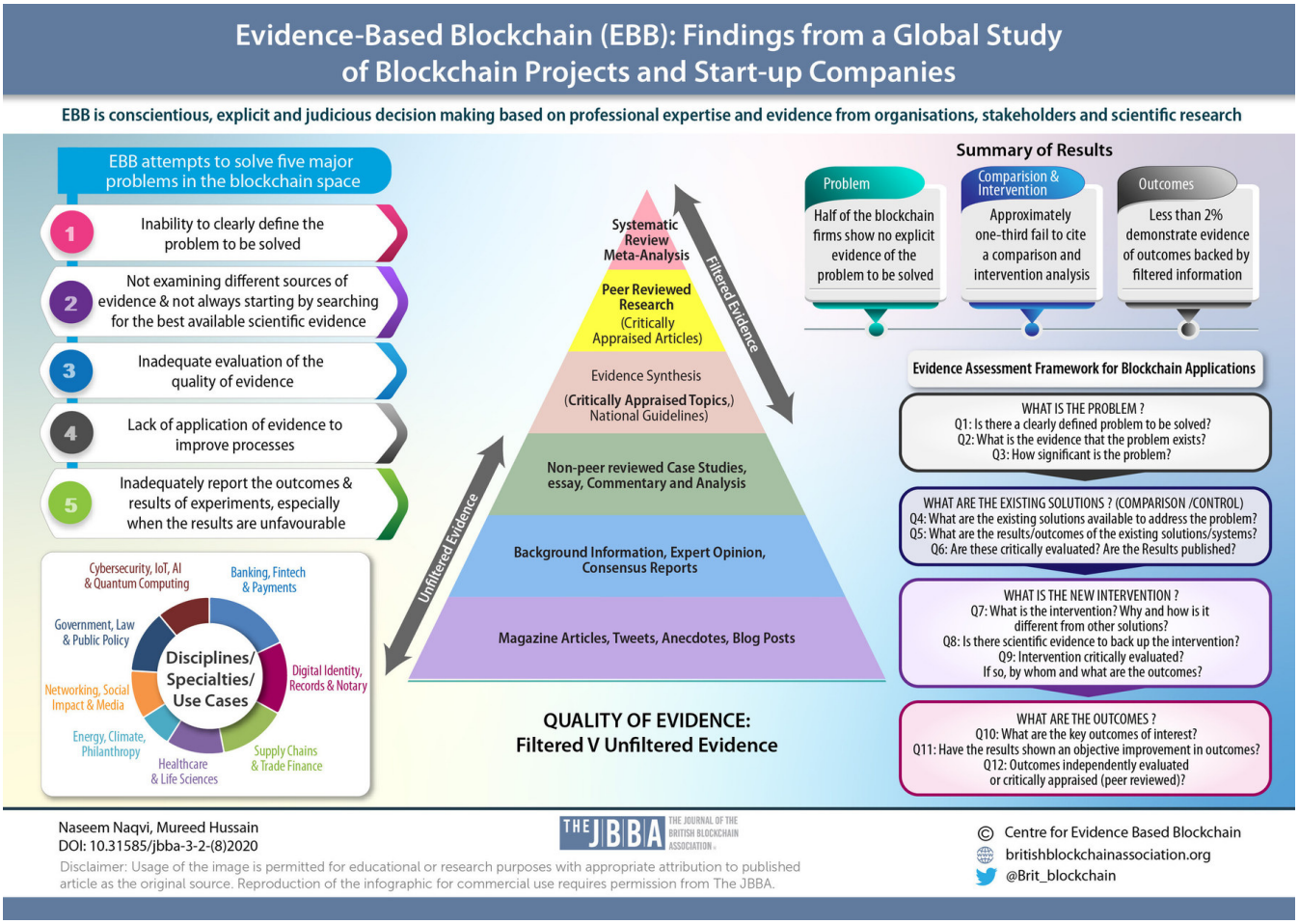
European Commission report (2020) states that 'it is now relevant for decision-makers to have an evidence-based perspective on which benefits DLT can generate through projects targeting social and public good'. There is an urgent need for evidence-based practice in the field of blockchain. Fewer than 2% of blockchain projects demonstrate evidence of impactful outcomes supported by critically appraised peer-reviewed data, according to research conducted by the Centre for Evidence Based Blockchain (Naqvi et al., 2020) The NBR must compile all evidence-based resources in distributed ledger technologies to strengthen policy-making efforts.

The think tank should focus on the impact narrative and metrics to establish robust underlying frameworks. The potential impact of blockchain on future policies, society, economy, law, culture, and environment must be taken into consideration. All DLT enterprises should consider appointing a 'Chief Evidence Officer' to provide scientific rigour to workflows and business processes.

References:

Evidence-Based Blockchain: Findings from a Global Study of Blockchain Projects and Start-up Companies https://jbba.scholasticahq.com/article/16795-evidence-based-blockchain-findings-from-a-global-study-of-blockchain-projects-and-start-up-companies

Unlocking Blockchain: Embracing New Technologies to drive Efficiency and Empower the Citizen: https://jbba.scholasticahq.com/article/3741



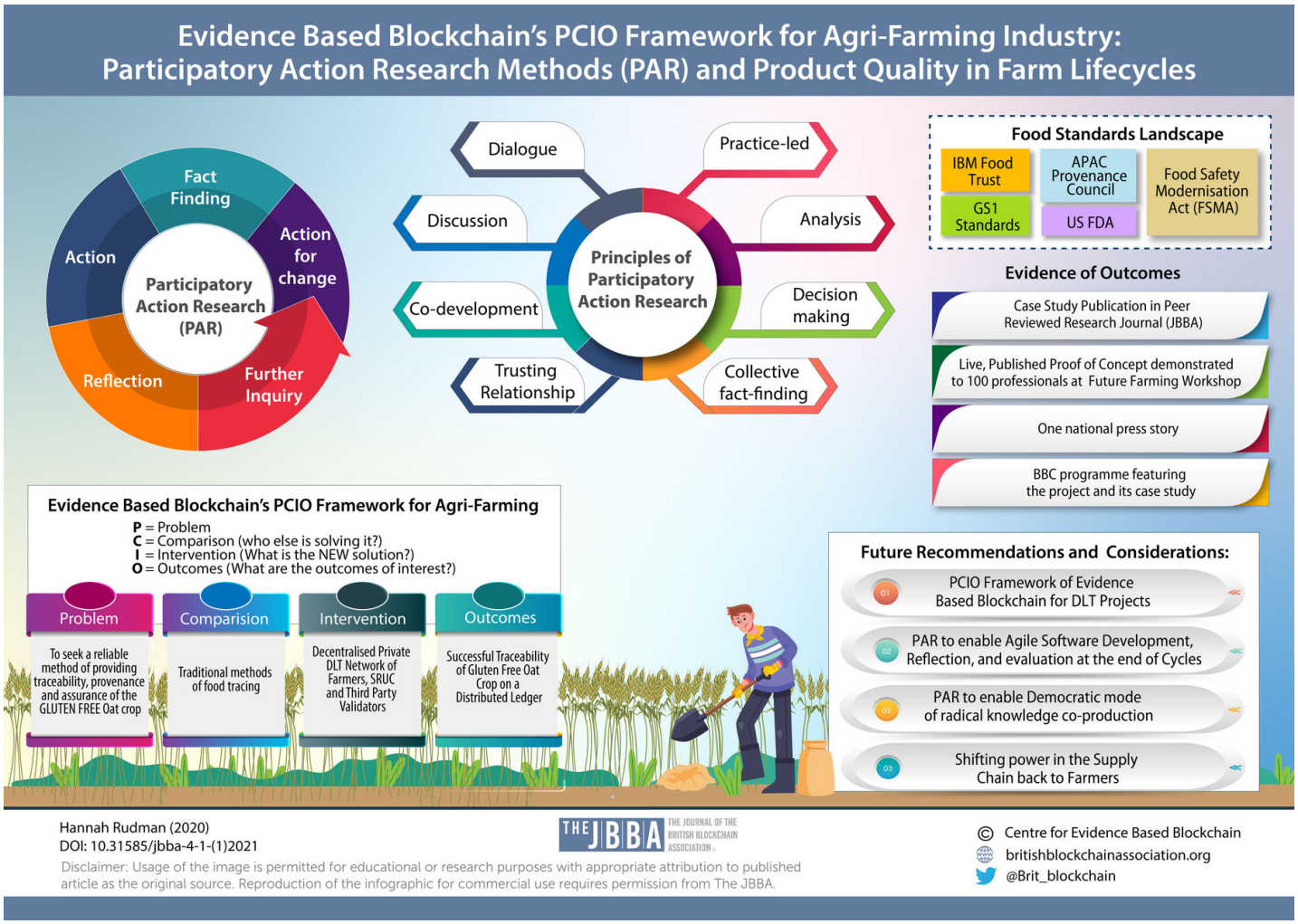
09

COMMIT RESOURCES AND CAPACITY TO GENERATE AND DEPLOY HIGH-QUALITY EVIDENCE

There is a need for strategic intent and senior-level buy-in for NBR to identify sources of evidence, develop and test blockchain pilots, and deploy interventions based on high-quality evidence. The use of resources must be constantly and dynamically optimised and aligned with emerging data (Rudman, 2021).

This approach should apply to all stages of quality management in blockchain interventions, namely:
Quality Assurance
Quality Control
Quality Management

References:
Evidence based Blockchain or Agri-Farming:
https://jbba.scholasticahq.com/article/17845-piece-of-cake-assuring-specific-qualities-of-product-in-farm-lifecycles-with-dlt-can-evidenced-based-practice-be-supported-by-participatory-action-research-methods



10

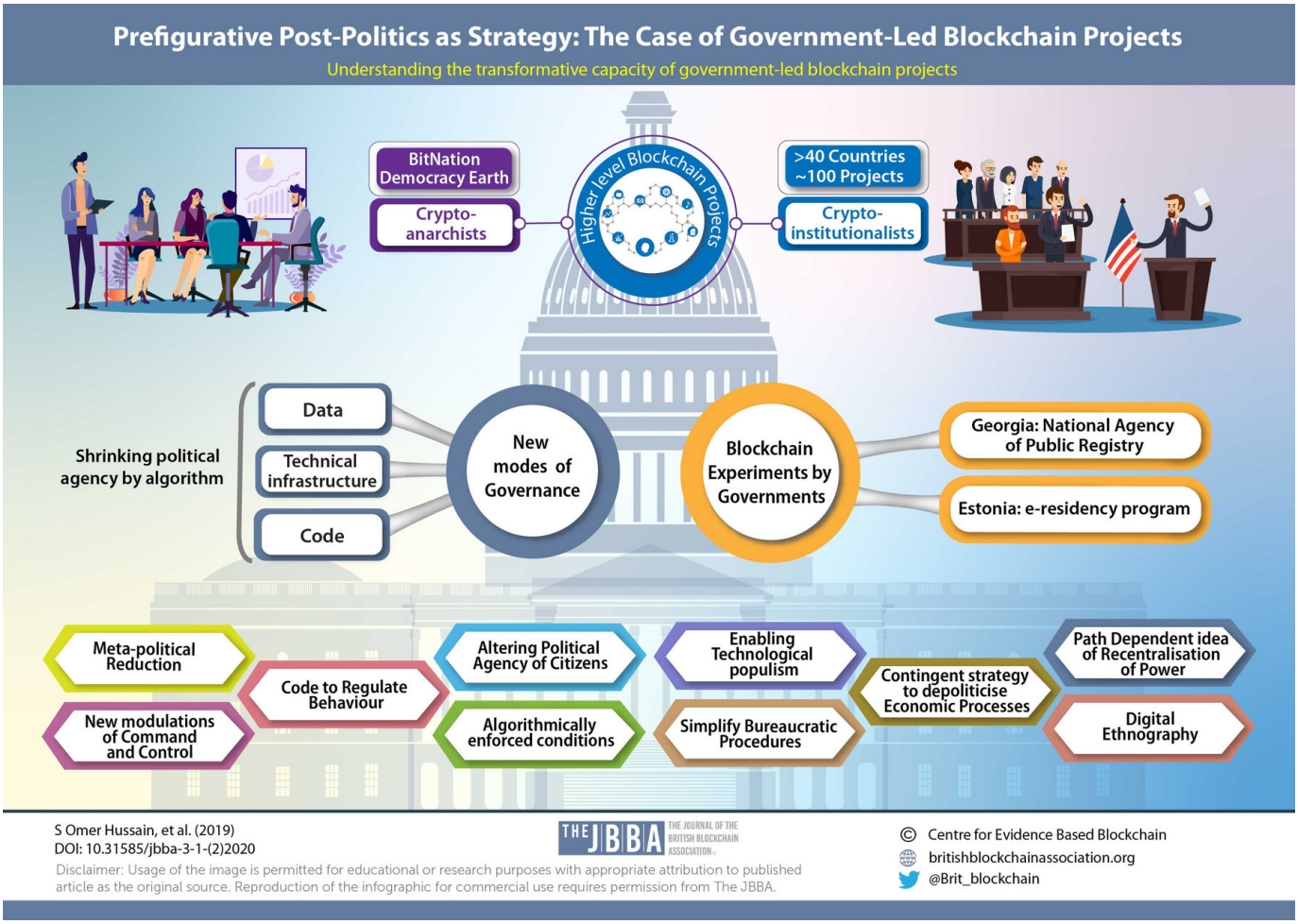
DIRECT RESOURCES TO PROGRAMMES AND POLICIES BACKED BY RESEARCH AND ENCOURAGE PROMISING PROGRAMMES TO BUILD THEIR OWN RESEARCH BASE

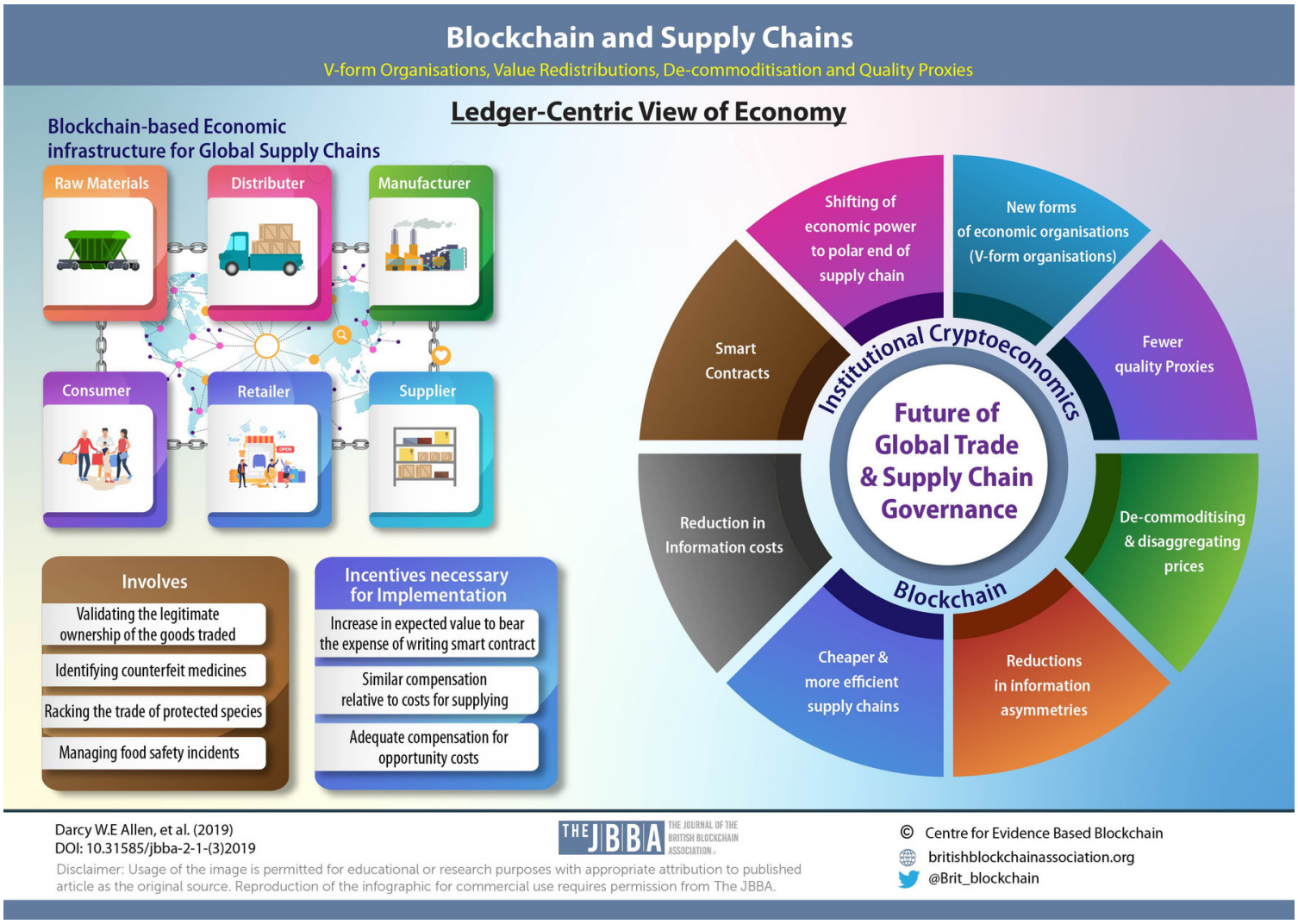
All resources must be directed to promote the development and testing of specific and targeted DLT pilots, keeping in view both proximal and distal outcomes. (Hussain, et al 2019). The resources must be directed to projects, programmes and policies that are backed by high-quality research. The interventions that have successfully demonstrated evidence of impact should be encouraged to build their own research base, nexus and consortiums.

A National blockchain roadmap must provide a robust infrastructure to design new and innovative DLT systems based on testable hypotheses and empirical data. The outcome of these pilots and the lessons learnt should feed into the further refinement of NBR.

References:

Prefigurative Post-Politics as Strategy: The Case of Government-Led Blockchain Projects: *https://jbba.scholasticahq.com/article/11203-prefigurative-post-politics-as-strategy-the-case-of-government-led-blockchain-projects*





Blockchain and Supply Chains: V-form Organisations, Value Redistributions, De-commoditisation and Quality Proxies:
https://jbba.scholasticahq.com/article/7556-blockchain-and-supply-chains-v-form-organisations-value-redistributions-de-commoditisation-and-quality-proxies

11

UTILISE THE POTENTIAL OF BLOCKCHAIN FOR GOVERNMENT AND PUBLIC SERVICES

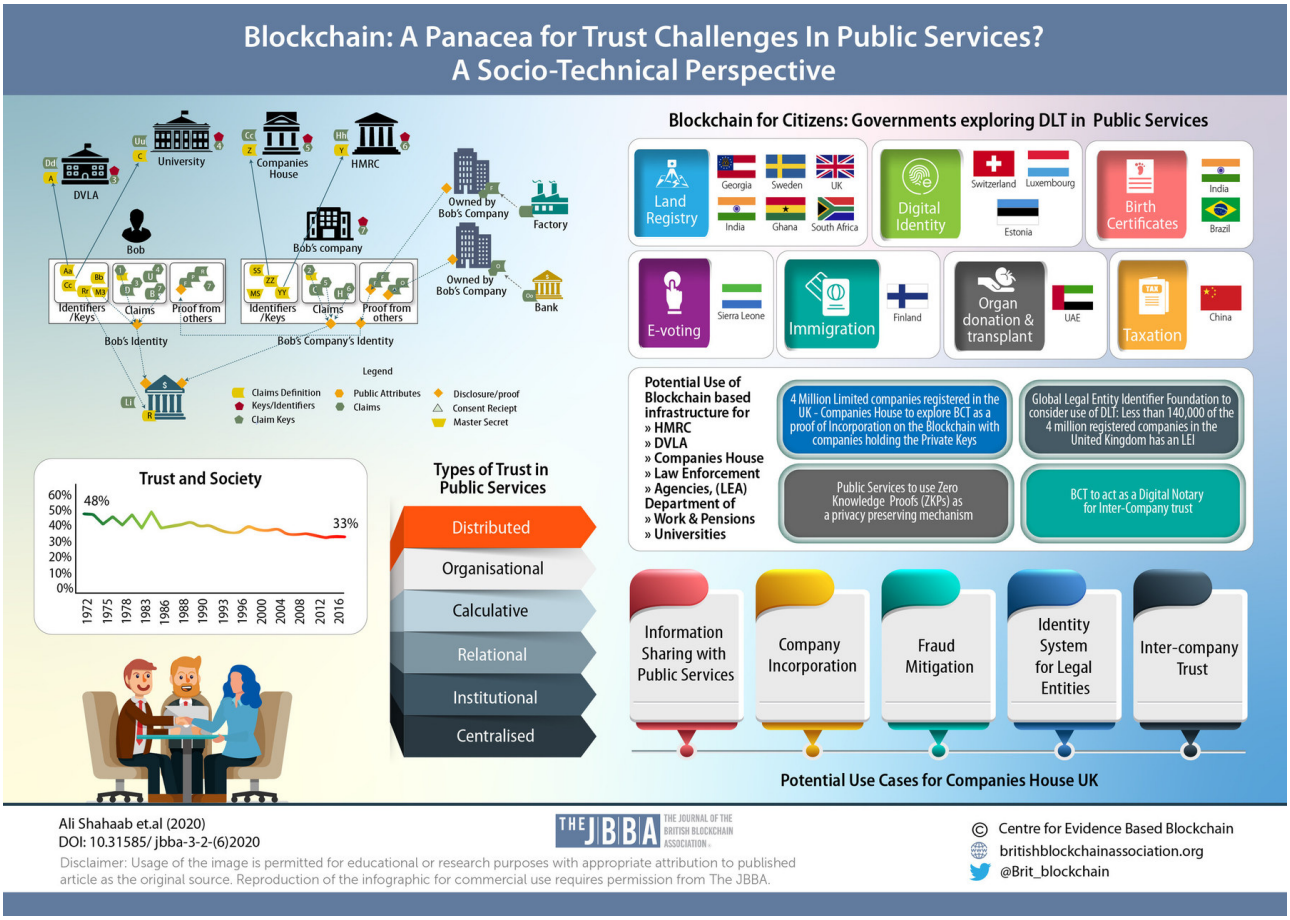
Blockchain is already transforming the infrastructure of a host of government and public sector applications. The governments around the world have successfully explored the potential of blockchain to benefit operations in the context of the broader society, including land registration (Georgia, UK, Sweden, India, South Africa), digital identity management (Switzerland, Estonia, Luxembourg), birth certificates (Brazil), immigration (Finland), organ donation and transplant (UAE), taxation (China), and many others. One example of such adoption is the potential for Companies House to explore the use of DLT to manage UK companies' registration records, according to research published in the JBBA (Shahaab., et al 2020). We recommend that the NBR explore the multidisciplinary application and far-ranging impact of blockchain for public services through stakeholder engagement.

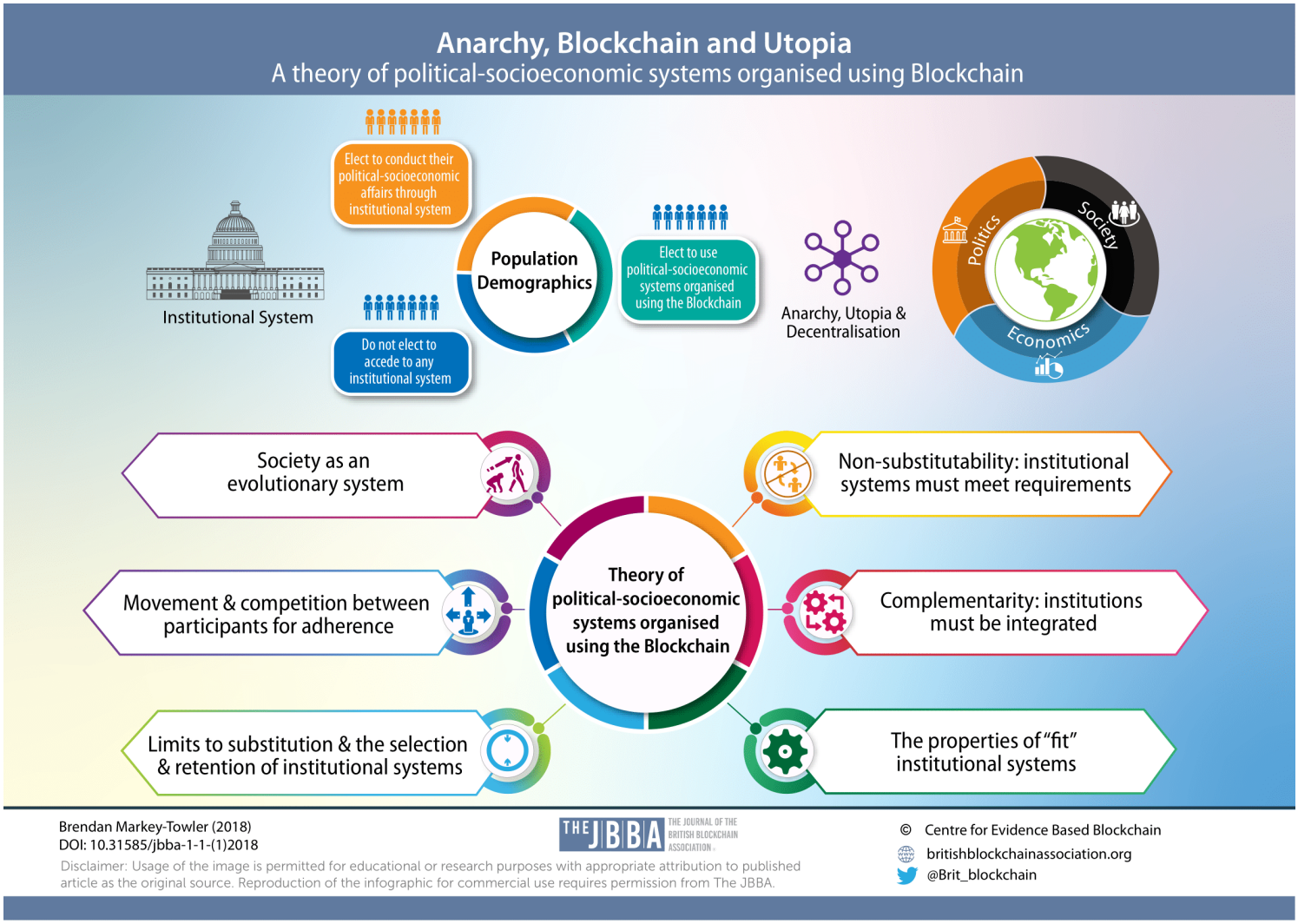
References:

Blockchain - A Panacea For Trust Challenges In Public Services? A Socio-technical Perspective: *https://jbba.scholasticahq.com/article/14128-blockchain-a-panacea-for-trust-challenges-in-public-services-a-socio-technical-perspective*

Blockchains for Government: Use Cases and Challenges: *https://dl.acm.org/doi/fullHtml/10.1145/3427097*

GOV.UK - Use of distributed ledger technologies to verify the provenance of goods: *https://www.gov.uk/government/publications/use-of-distributed-ledger-technologies-to-verify-the-provenance-of-goods*





A Theory of Political-Socioeconomic Systems organised using Blockchain:
https://jbba.scholasticahq.com/article/3400-anarchy-blockchain-and-utopia-a-theory-of-political-socioeconomic-systems-organised-using-blockchain

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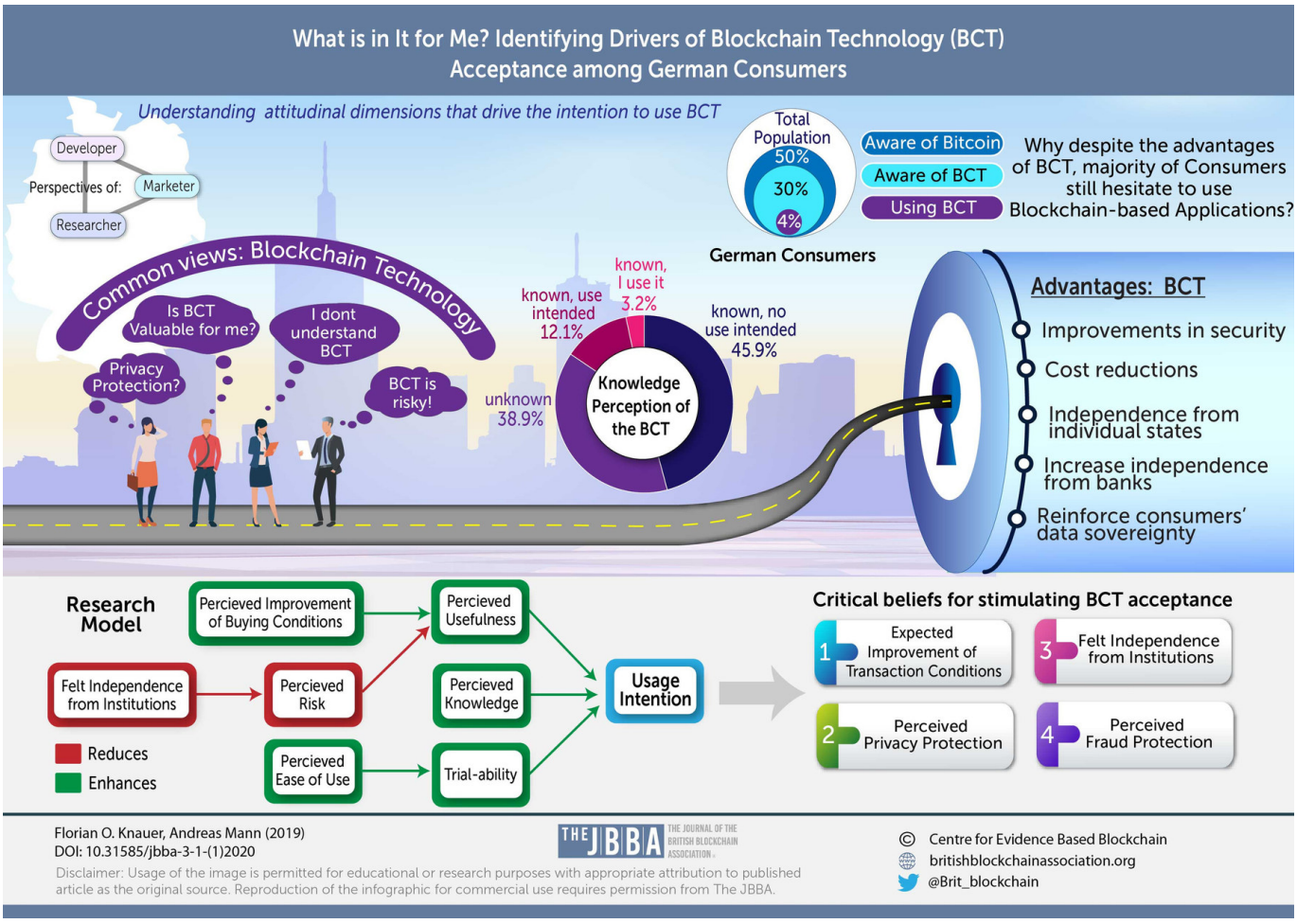
BUILD CONSENSUS AMONG STAKEHOLDERS AND IDENTIFY BARRIERS TO BLOCKCHAIN ADOPTION

The key drivers of blockchain technology acceptance among consumers must be identified, and the layers of 'abstraction' between consumers and technology interfaces must be minimised. The first task is to identify stakeholders and engage with them in a bi-directional manner by addressing their concerns and expectations, as well as offering support and resources to build sustainable applications (Mann., et al 2019).

A dialogue must be encouraged between public services, policymakers, and vendors. Any consensus must focus not just on outcomes but also on building processes and ongoing relationships with stakeholders. The government must ensure that all initiatives—including academic outputs, policy developments, and broader economic impacts—are aligned with the proposed national blockchain roadmap. Strategies must be developed to establish blockchain execution frameworks in existing stakeholder networks to ensure all components work together coherently. A recognition of commonality must be proactively established and agreed upon among the various stakeholders. This includes shared mission, vision, goals, roadmap and key deliverables to enhance synergy.

References:

What is in It for Me? Identifying Drivers of Blockchain Acceptance among German Consumers: https://jbba.scholasticahq.com/article/10484-what-is-in-it-for-me-identifying-drivers-of-blockchain-acceptance-among-german-consumers



13

DRAW ON NATIONS' 'COLLECTIVE WISDOM': GARNER SUPPORT THROUGH COLLABORATION WITH OTHER COUNTRIES

The NBR should embrace a collaborative approach with international players, build new links and connections with market leaders, and share best practices to learn from other countries that have successfully implemented blockchain in their socio-economic infrastructures. A global platform such as the Blockchain Associations Forum provides a platform for an exchange of ideas, resources and shared objectives, as well as an interconnected bridge to support harmonisation efforts in the spirit of inclusion, diversity, and collaboration.

The UK must adopt a culture of learning to identify the DLT interventions and strategies that are most likely to be effective over an extended period of time. All interconnected links must be managed over time to ensure continued alignment with the overarching vision proposed in the roadmap.

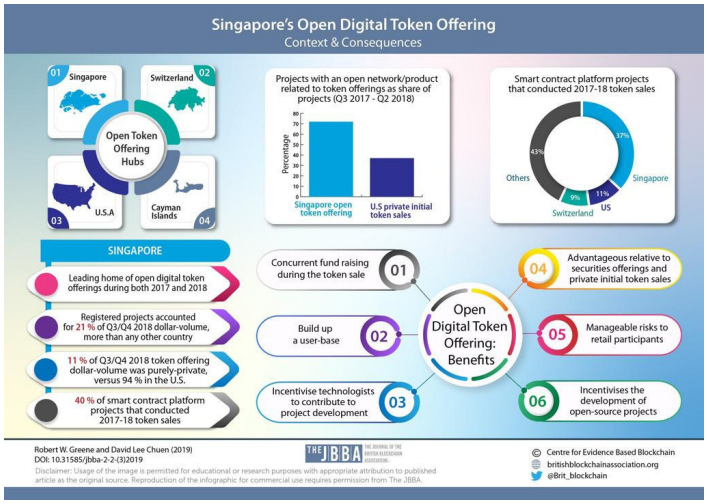
References:

The Blockchain Associations Forum:
The Blockchain Associations Forum (BAF)

Centre for Evidence Based Blockchain (CEBB) Africa Summit

Singapore's OpenToken offerings: Context and Consequences





BLOCKCHAIN ASSOCIATIONS FORUM

14

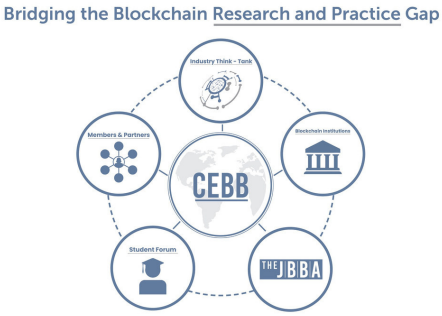
STRIVE TO BECOME A "CENTRE OF EXCELLENCE" IN DISTRIBUTED LEDGER TECHNOLOGIES

The UK has established itself as a leader in the field of blockchain with a world-class portfolio of initiatives, including the Journal of the British Blockchain Association (JBBA), Financial Conduct Authority's regulatory sandbox, the Centre for Evidence-Based Blockchain (CEBB), Blockchain International Scientific Conferences (ISCs), Blockchain Fellowships (FBBA), Blockchain All-Party Parliamentary Group APPG, et al. We have the potential to become an international centre of excellence for blockchain. An NBR must build on our national capacity to advance blockchain knowledge and research, and policymakers must engage with a broad range of relevant stakeholders. National think tanks such as the BBA could take an active leadership role by promoting and supporting the synthesis, transfer, and utilisation of evidence to identify best practices for blockchain.

The NBR must ensure that systems are established to ensure a steady pace of incremental improvement. A proactive approach must be taken to address the ethical, societal, environmental, technical, and operational challenges posed by the deployment of distributed ledgers.

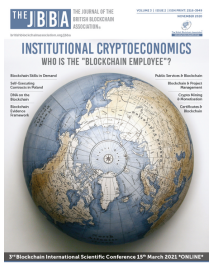














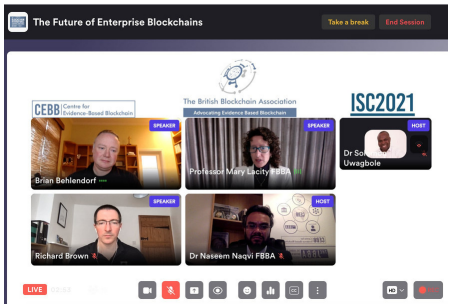
2nd Blockchain International Scientific Conference ISC2020, UK (11 March 2020)











15

CONDUCT REGULAR EVALUATIONS OF BLOCKCHAIN BASED PROGRAMMES

Public services and blockchain vendors should be held accountable to taxpayers and must ensure that their blockchain solutions consistently deliver on their promises. Randomised controlled trials (RCTs) and systematic reviews should be used to evaluate DLT interventions to ensure that they remain cost-effective, up-to-date, and suited to their intended purpose. Based on the philosophical foundations and consumer-centred interventions of blockchain technology, it is important that accountability and support mechanisms are established (Naqvi., et al 2020) to facilitate blockchain pilots and start-ups as they move from basic sciences to distribution. The initial evaluation should include Evidence Based Blockchain's **PCIO Framework (Problem - Comparison - Intervention - Outcome)** and ask the following three questions:

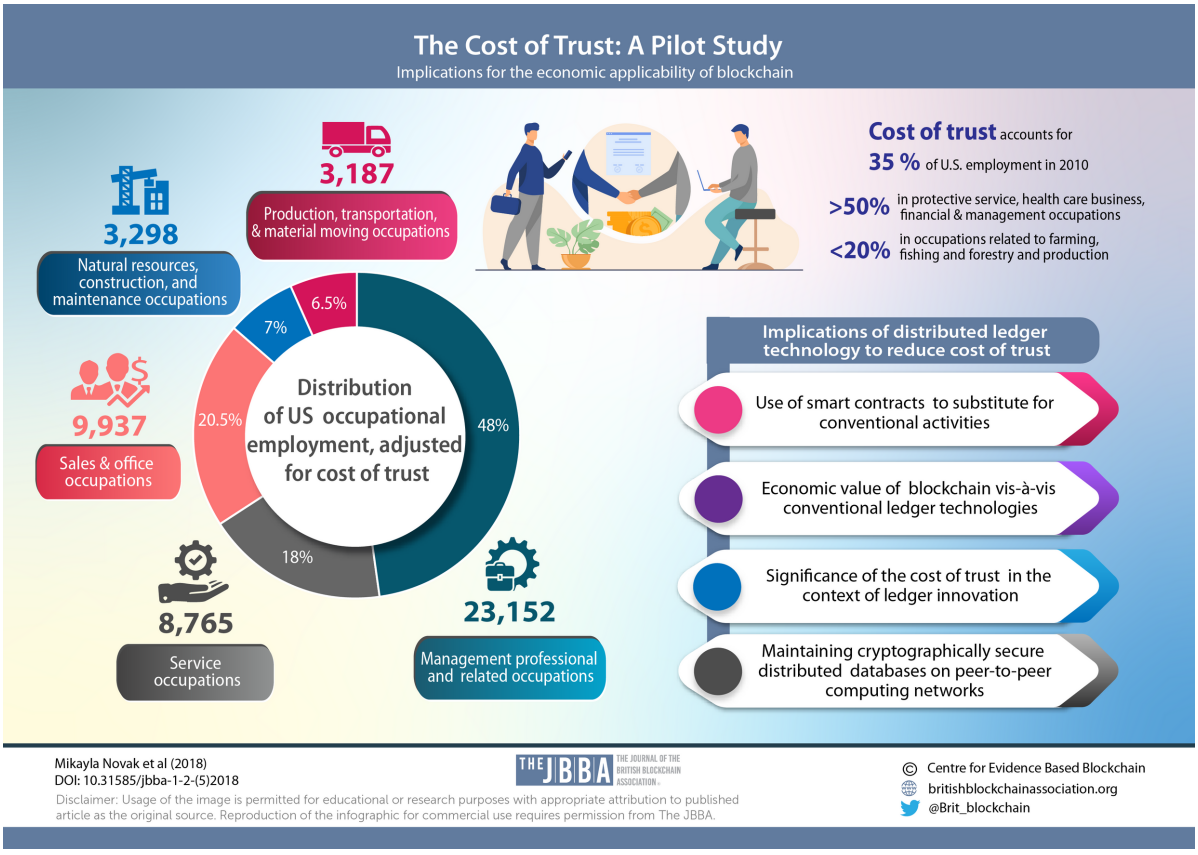
CAN it work? (Efficacy)
DOES it work? (Effectiveness)
Is it WORTH It ? (Efficiency)

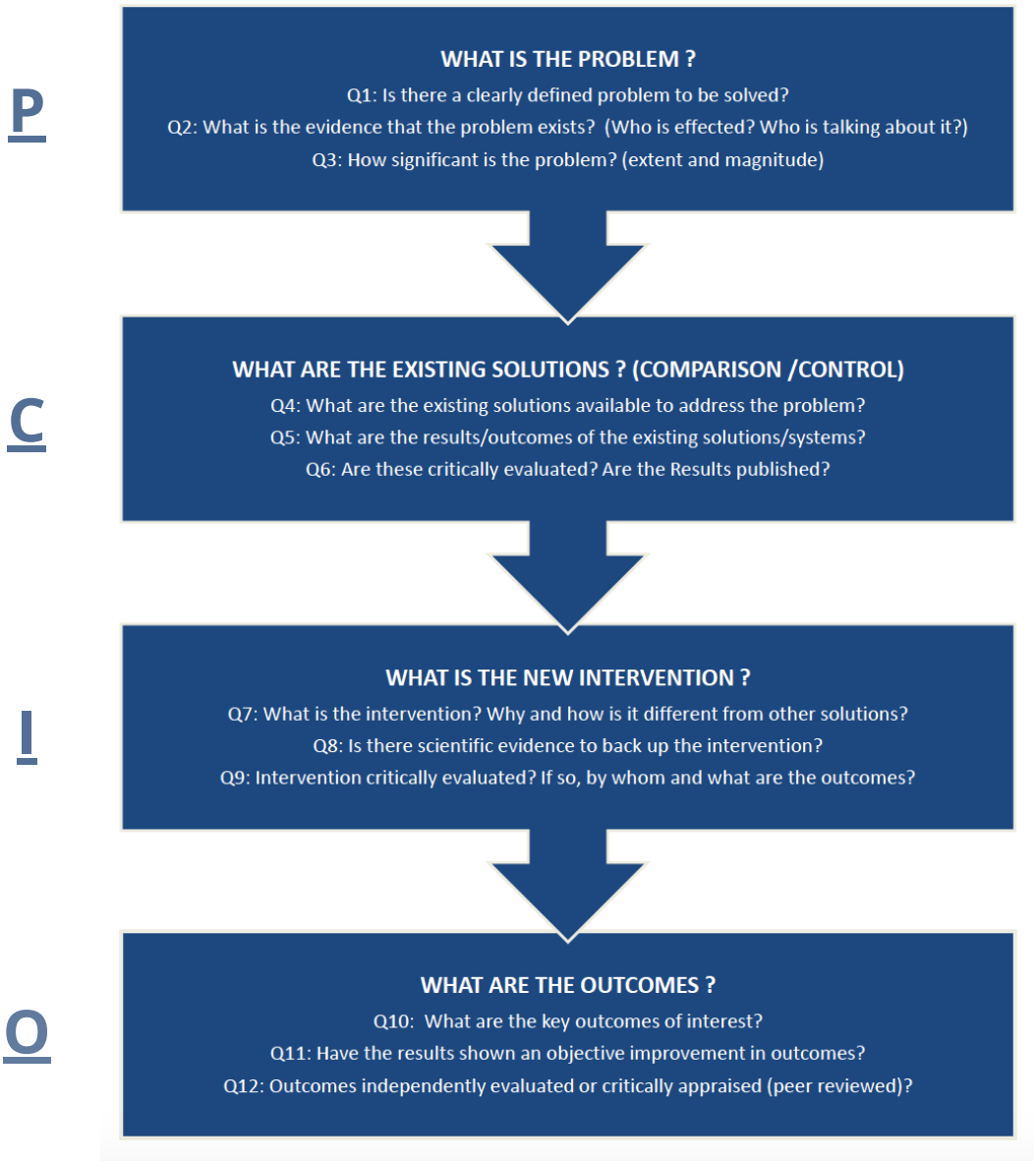
References:

Parameters for Building Sustainable Blockchain Application Initiatives
https://jbba.scholasticahq.com/article/7758-parameters-for-building-sustainable-blockchain-application-initiatives

Evidence-Based Blockchain: Findings from a Global Study of Blockchain Projects and Start-up Companies
https://jbba.scholasticahq.com/article/16795-evidence-based-blockchain-findings-from-a-global-study-of-blockchain-projects-and-start-up-companies

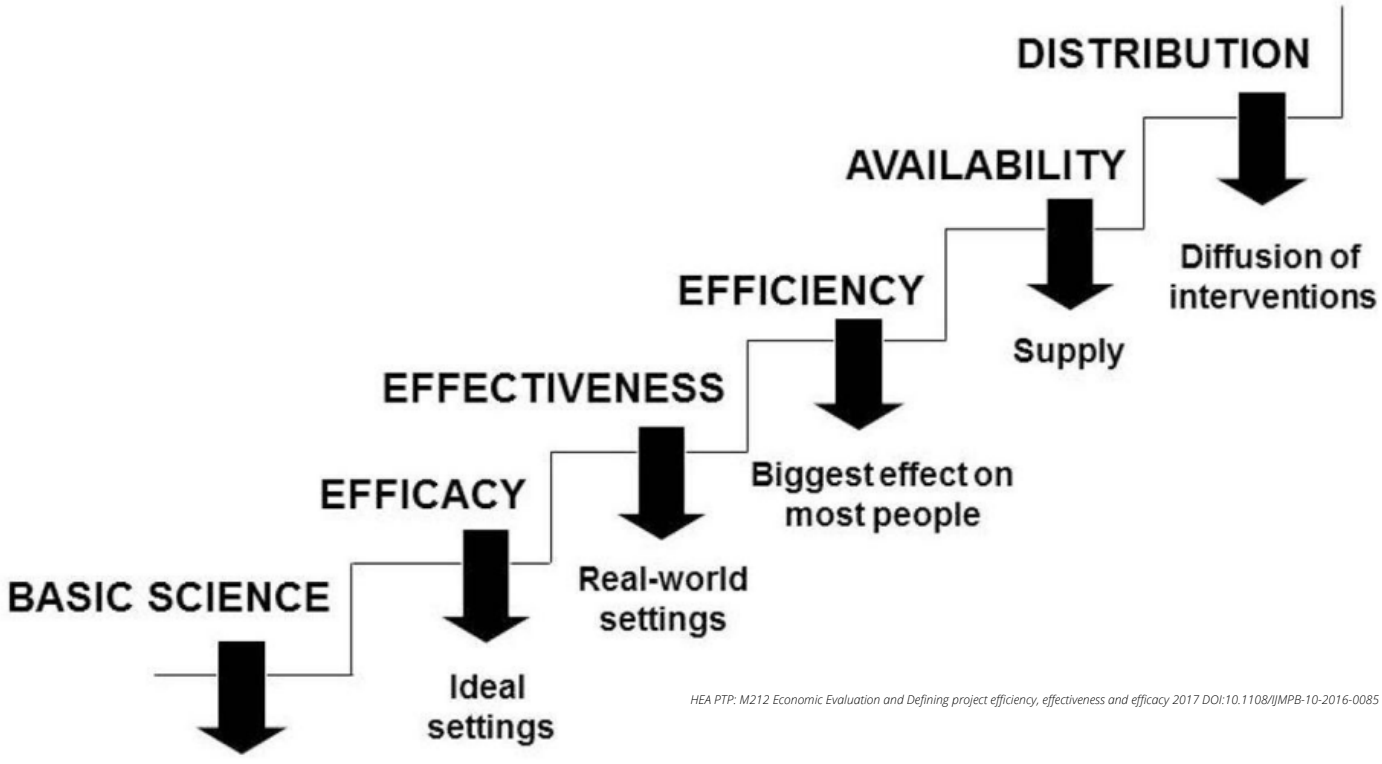
The cost of Trust: A Pilot Study:
https://jbba.scholasticahq.com/article/5037-the-cost-of-trust-a-pilot-study





PCIO Framework of Evidence Based Blockchain

Evidence Based Blockchain:
https://jbba.scholasticahq.com/article/16795-evidence-based-blockchain-findings-from-a-global-study-of-blockchain-projects-and-start-up-companies



HEA PTP: M212 Economic Evaluation and Defining project efficiency, effectiveness and efficacy 2017 DOI:10.1108/IJMPB-10-2016-0085

16

ESTABLISH A LONG-TERM ROAD MAP FOR INDUSTRY GROWTH AND WORKFORCE PLANNING

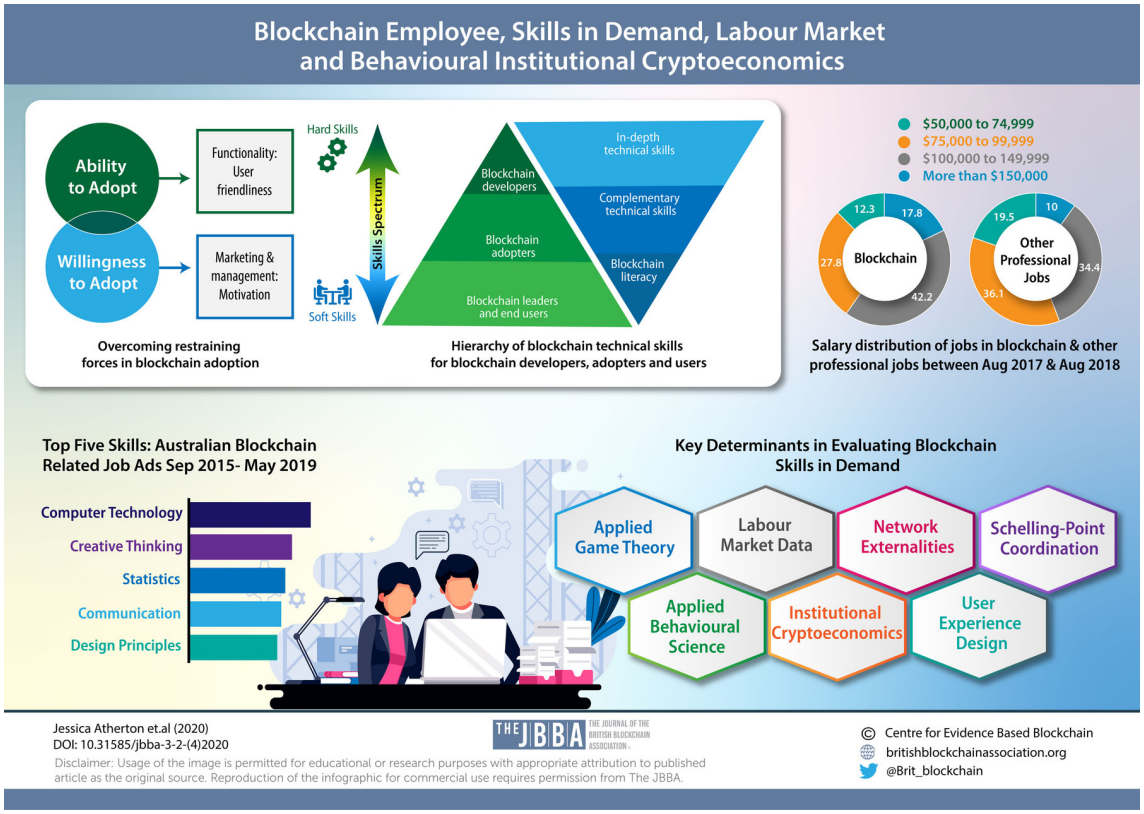
Blockchain technology has created new market employment opportunities. According to the latest research on the blockchain labour market data, blockchain expertise was the most in-demand skill set in 2020 (Atherton., et al 2020) and there has been a 300–500% annual increase in the global demand for blockchain developers. In Great Britain, start-up companies pay new blockchain developers and junior developers up to $60,000 per year and large enterprises pay up to $140,000 per year (The Global Blockchain Employment Report, 2021).

The UK must position itself as an attractive hub for the blockchain and crypto assets employment market. It is critical to focus on the training, recruitment, and retention of the best and the brightest minds in blockchain technology to boost the economy and create jobs. Support and training for soft skills such as creativity, communication, and leadership must also be emphasised. The government must ensure that measures are established to nurture an environment that is supportive of blockchain and crypto-asset enterprises. Such measures could include regulatory certainty, employment permits/visas, tax relief, funding and grants, and business support.

References:

Who is the Blockchain Employee? Exploring Skills in Demand using Observations from the Australian Labour Market and Behavioural Institutional Cryptoeconomics:
https://jbba.scholasticahq.com/article/13390-who-is-the-blockchain-employee-exploring-skills-in-demand-using-observations-from-the-australian-labour-market-and-behavioural-institutional-cryptoeconomics

The Global Blockchain Employment Report:
https://theblockchainacademy.com/wp-content/uploads/sites/6/2021/04/2021-Global-Blockchain-Employment-Report.pdf



17

BUILD SECURE CYBER INFRASTRUCTURES FOR BLOCKCHAIN APPLICATIONS

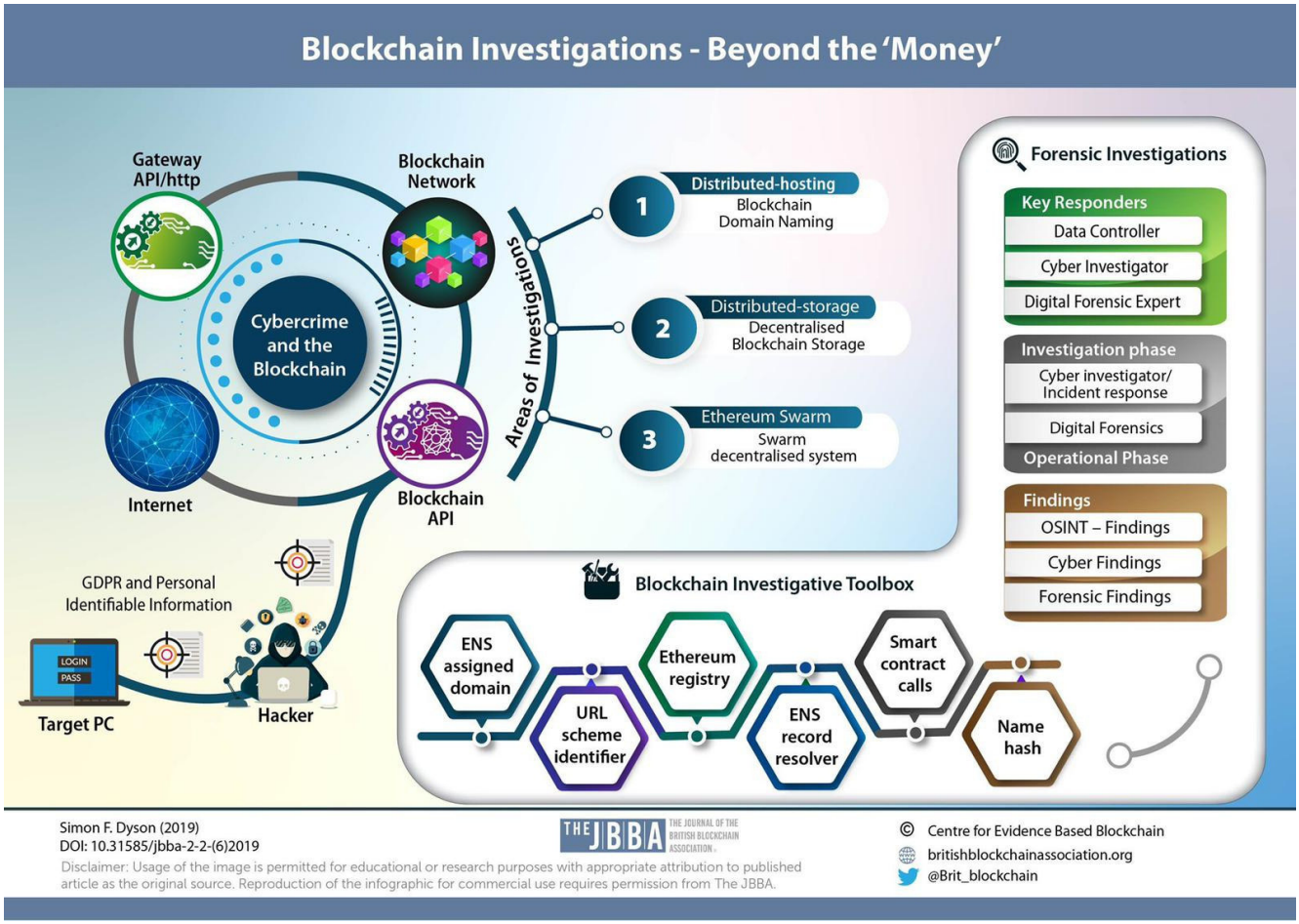
Cybercriminal activity costs $6 trillion globally, which makes it the third largest economy in the world (behind the USA and China). Blockchain technology relies on cryptographic security; however, it is a common misconception that all facets of blockchain technology applications are inherently secure by design. Some blockchains are immutable, but their application programming interfaces (APIs) and external access points may be vulnerable to sensitive data hacks and leaks that could result in substantive financial damage to blockchain firms (Dyson 2019).

Therefore, it is vital to ensure the security of blockchain cyber infrastructures and APIs and to provide blockchain technology vendors with resources, training, and a forensic 'toolbox' in case of a security breach.

References:

The Challenges of Investigating Cryptocurrencies and Blockchain Related Crime: *https://jbba.scholasticahq.com/article/5779-the-challenges-of-investigating-cryptocurrencies-and-blockchain-related-crime*

Blockchain Investigations - Beyond the 'Money': *https://jbba.scholasticahq.com/article/10027-blockchain-investigations-beyond-the-money*



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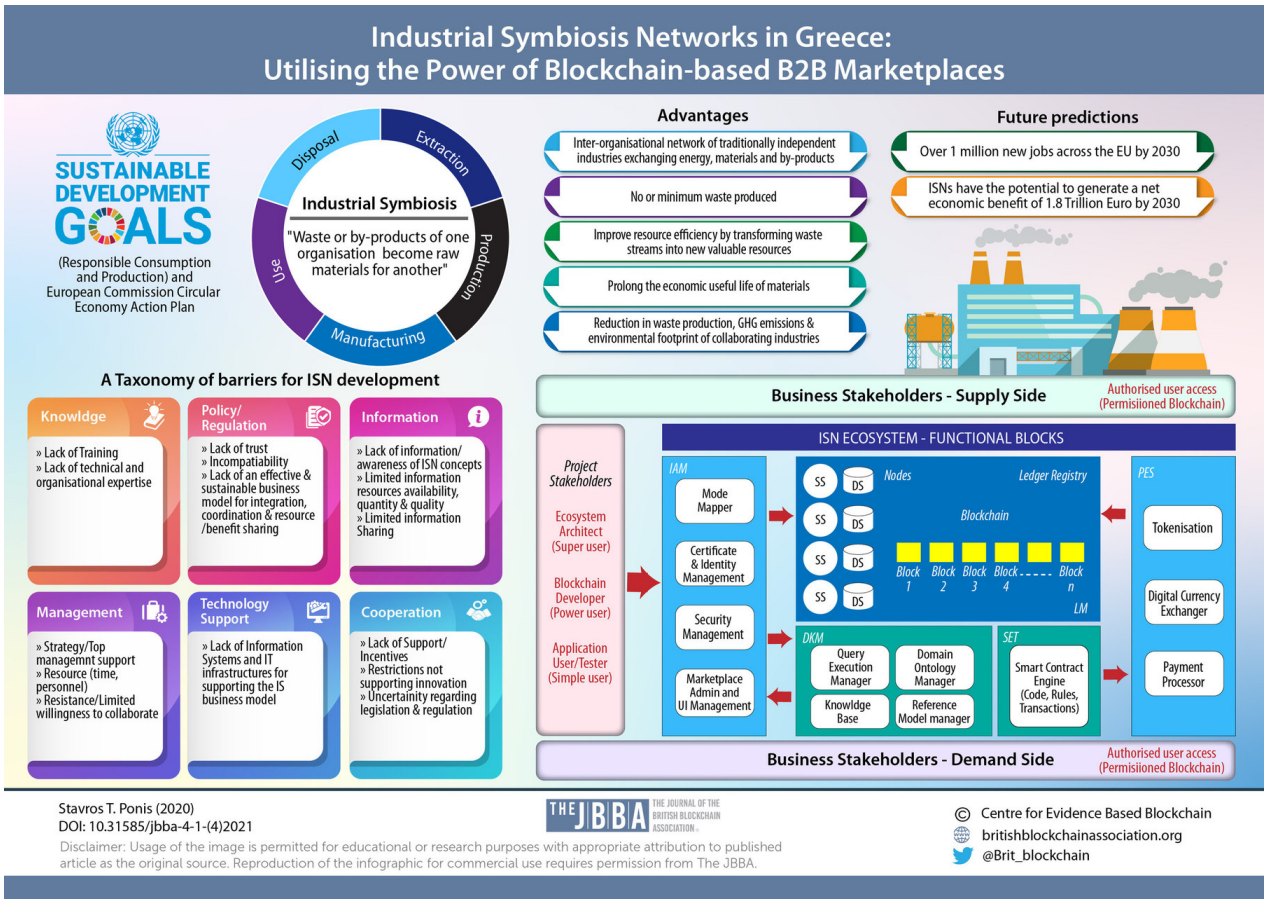
WORK TOWARD THE UNITED NATIONS SUSTAINABLE DEVELOPMENT GOALS(SDG)

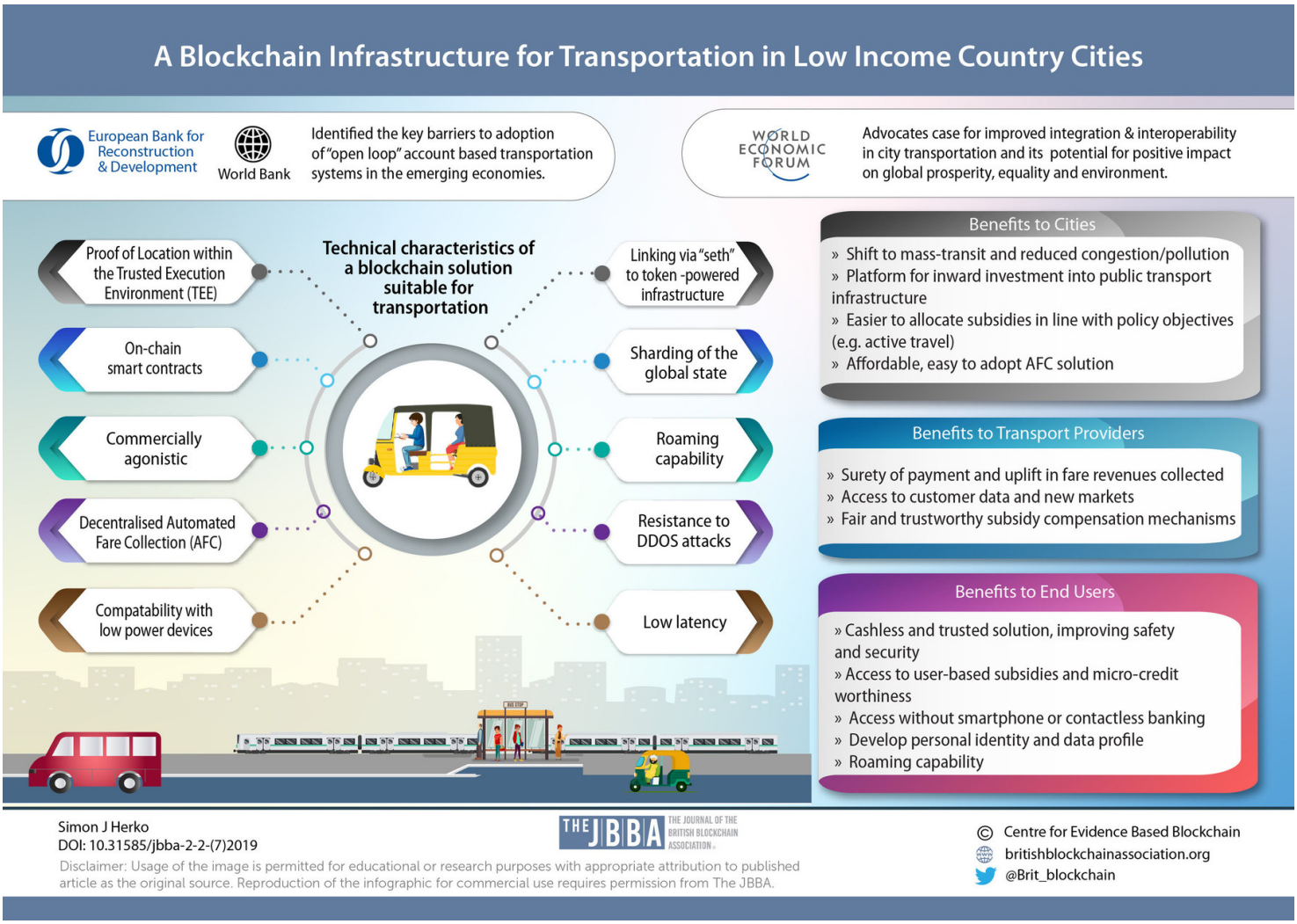
Blockchain technology has the potential to accelerate the achievement of the United Nations Sustainable Development Goals (UN SDGs) by creating US$ 12 trillion in market opportunities and 380 million new jobs. Taking action on climate change alone would result in savings of US$26 trillion by 2030 (Business and Sustainable Development Commission, 2017; Better Business Better World: Report of the Global Commission on the Economy and Climate, 2018). The Sustainable Development Goals were adopted by all United Nations Member States in 2015. Sustainable Development Goal 12—'Responsible Consumption and Production'—calls for a substantial reduction in waste generation through prevention, reduction, reuse, and recycling. Under this initiative, companies are encouraged to adopt sustainable practices and integrate sustainability information into their reporting cycles, and the aim is to achieve sustainable global management and resource efficiency by 2030. The research cited below refers to some of the practical applications of blockchain toward UN SDGs (Ponis 2020), (Chen 2018).

References:

Industrial Symbiosis Networks in Greece: Utilising the Power of Blockchain-based B2B Marketplaces: *https://jbba.scholasticahq.com/article/18206-industrial-symbiosis-networks-in-greece-utilising-the-power-of-blockchain-based-b2b-marketplaces*

UN Secretary-General's Strategy for Financing the 2030 Agenda: *https://www.un.org/sustainabledevelopment/sg-finance-strategy/*





An example of Blockchain for UN SDGs (9 - 13):

Industry, Innovation & Infrastructure, Reduced Inequalities, Sustainable Cities and Communities, Responsible Consumption and Production, Climate Action

https://jbba.scholasticahq.com/article/10235-a-blockchain-infrastructure-for-transportation-in-low-income-country-cities-and-beyond

19

DEVISE EVIDENCE BASED POLICIES ON DIGITAL CURRENCIES

With Decentralised Finance and Central Bank Digital Currencies (CBDCs) set to impact the way we manage our finances, it is prudent that UK NBR should guide an evidence-informed approach to digital assets. *"Evidence-Based rulemaking is not yet the norm in Crypto regulation"*, said SEC Commissioner, Hester Pierce, in her keynote speech at the British Blockchain Association's Annual International Conference on March 15, 2021.

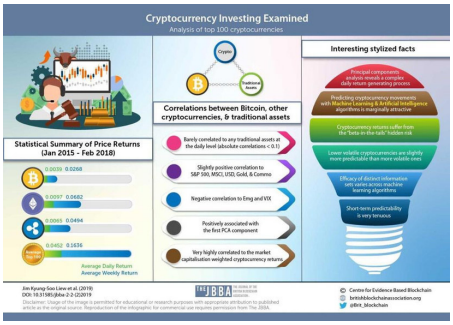
It is pertinent to explore and address the pain points around the national-level adoption of digital assets. For example, how do we ensure self-sovereignty and financial privacy around Central Bank Digital Currencies (CBDCs)? How do we integrate CBDCs with the existing systems to achieve a more efficient payment and settlement system for international trades and securities? How do we design a stable currency system that serves the underserved segment of the payments and cross-border remittances ecosystem? Given the UK's expertise and available resources, a CBDC or expressly, a Central Bank Authorised Digital Currency (CBADC), with privacy protection cryptography would offer certain advantages, such as a reduction in corporate inclusion costs with lower counter-party risks, reduction in counterparty risk, thus lowering operations' cost, stimulating innovation and creating jobs, new business models and financial products and lower the cost of entry barriers.

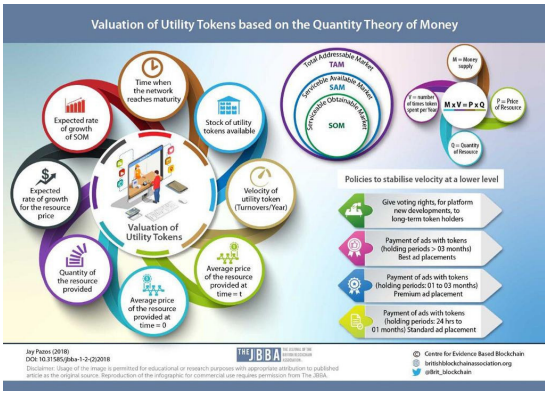
The Cryptoassest SSG (*page 32*) would work closely with all market stakeholders of the ecosystem, namely: Financial Conduct Authority (FCA), Bank of England, HM Treasury, crypto-asset developers and issuers, liquidity providers and trading platforms, financial intermediaries, payments and merchant service providers, custodial wallet providers, et al.

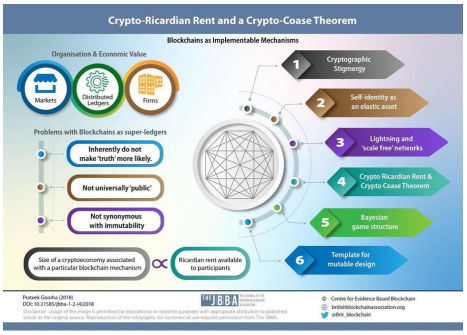
References:

Paper, Plastic, Peer-to-Peer: Remarks at the British Blockchain Association's Conference "Success Through Synergy - Next generation Leadership for Extraordinary Times":
https://www.sec.gov/news/speech/peirce-paper-plastic-peer-to-peer-031521

Central bank digital currencies: foundational principles and core features:
https://www.bis.org/publ/othp33.htm

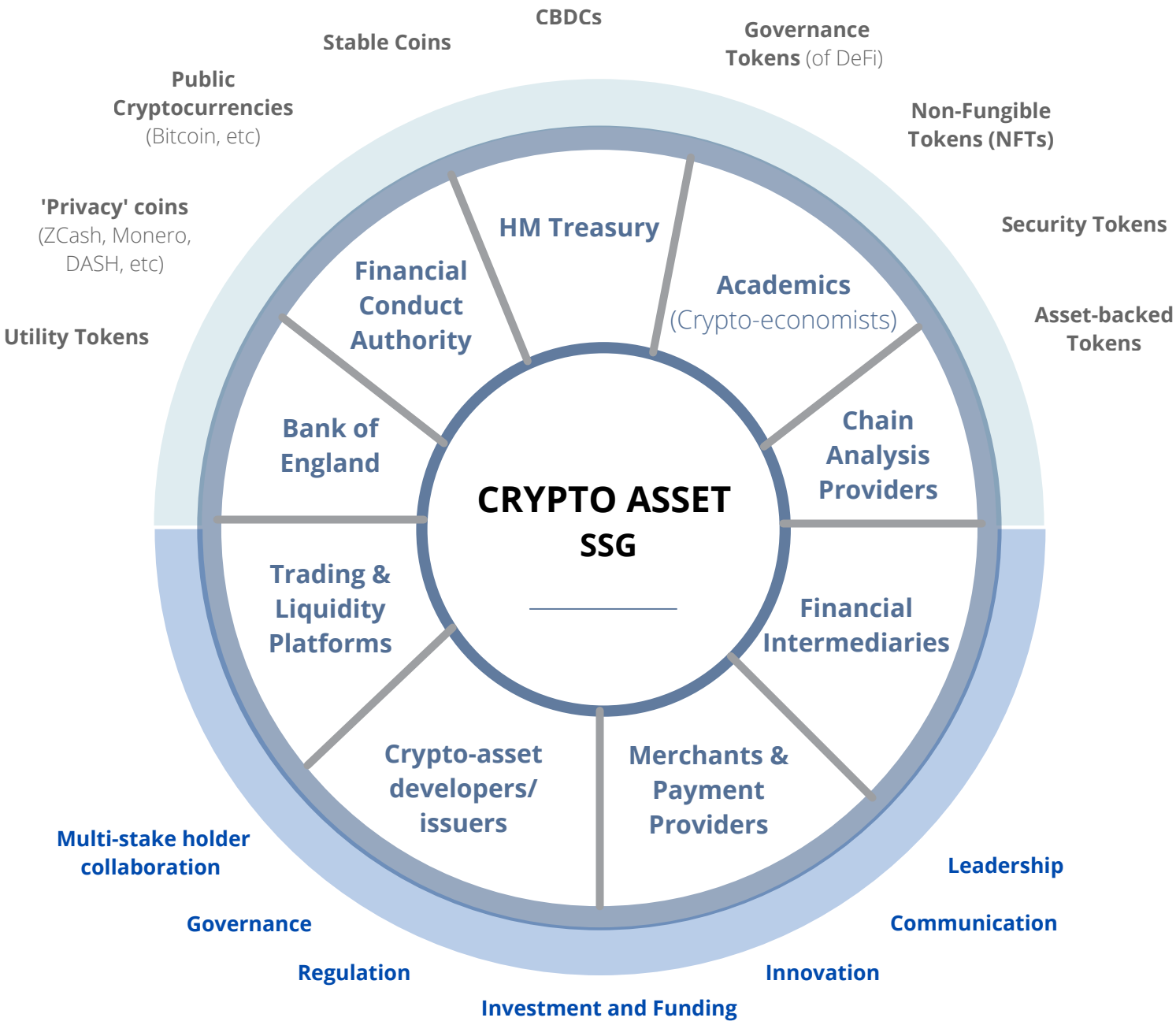






CRYPTO ASSET SUB-SPECIALITY STEERING GROUP (SSG)

(PROPOSED ARCHITECTURE)



20

DEVELOP A FUTURISTIC VISION OF BLOCKCHAIN AND DISTRIBUTED LEDGERS

The UK NBR should develop a futuristic vision of distributed ledgers. Blockchain technology is moving at a breath-taking pace. Future threats loom, such as the impact of quantum computing on distributed ledgers (Campbell 2020). However, an exciting new plethora of market opportunities and trends exist, including non-fungible tokens (NFTs) (Uribe 2020), decentralised finance (DeFi), Blockchain-as-a-Service (BaaS), Decentralised Autonomous Organisations (DAOs), enterprise blockchains (K. Yuthas 2021), et al. DeFi currently accounts for more than $100 billion in assets, and the NFTs market surged to more than $2.2 billion in the first quarter of 2021.

The NBR must be responsive, flexible, and dynamic to the innovative blockchain industry developments. The Emerging Tech SSG should provide evidence-based expertise and guidance to capitalise on the emerging DLT trends.

References:

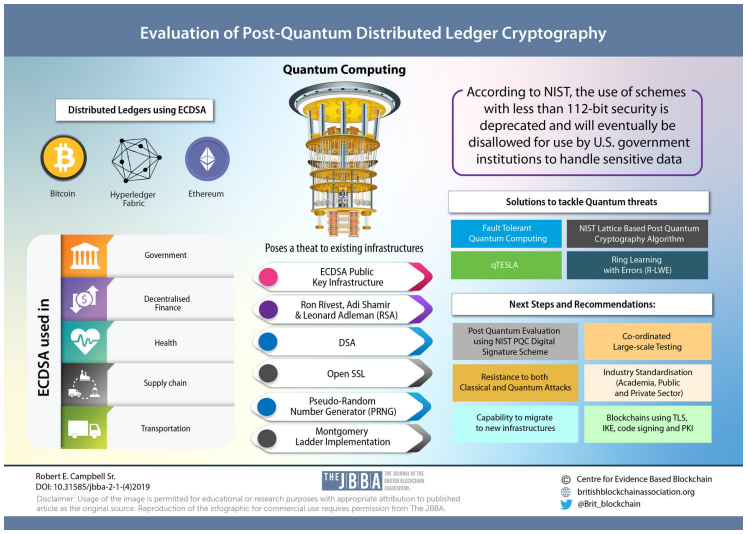
Evaluation of Post-Quantum Distributed Ledger Cryptography:
https://jbba.scholasticahq.com/article/7679-evaluation-of-post-quantum-distributed-ledger-cryptography

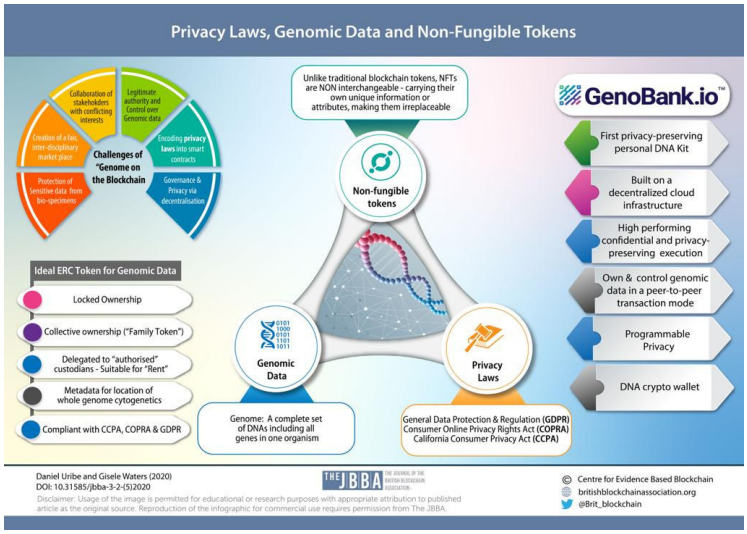
Transitioning to a Hyperledger Fabric Quantum-Resistant Classical Hybrid Public Key Infrastructure:
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The Need for Cyber Resilient Enterprise Distributed Ledger Risk Management Framework:
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Privacy Laws, Genomic Data and Non-Fungible Tokens:
https://jbba.scholasticahq.com/article/13164-privacy-laws-genomic-data-and-non-fungible-tokens

Strategic Value Creation through Enterprise Blockchain:
https://jbba.scholasticahq.com/article/21638-strategic-value-creation-through-enterprise-blockchain





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Advisors and Members of The British Blockchain Association
Fellows of The British Blockchain Association
Editorial Board Members of The JBBA
Authors of The JBBA
Members of The Blockchain Associations Forum
BBA's global network of partners and ambassadors in 100+ countries and territories

The British Blockchain Association (The BBA) was established in 2017. It is a non-profit, neutral industry think-tank advancing evidence-based adoption of Distributed Ledger Technologies. The Centre for Evidence Based Blockchain operates under the auspices of the BBA. The JBBA is the world's first scientific peer-reviewed blockchain research journal available both in print and online. The BBA works in collaboration with the UK's Department for International Trade, The BBC, British embassies, UK Blockchain APPG, UNDP, Commonwealth Africa Anti-Corruption Centre CAACC, and other international ecosystem stakeholders.

Disclaimer: The recommendations in this report should not be taken to represent the official policy or opinion of the UK government unless this is specifically stated.

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