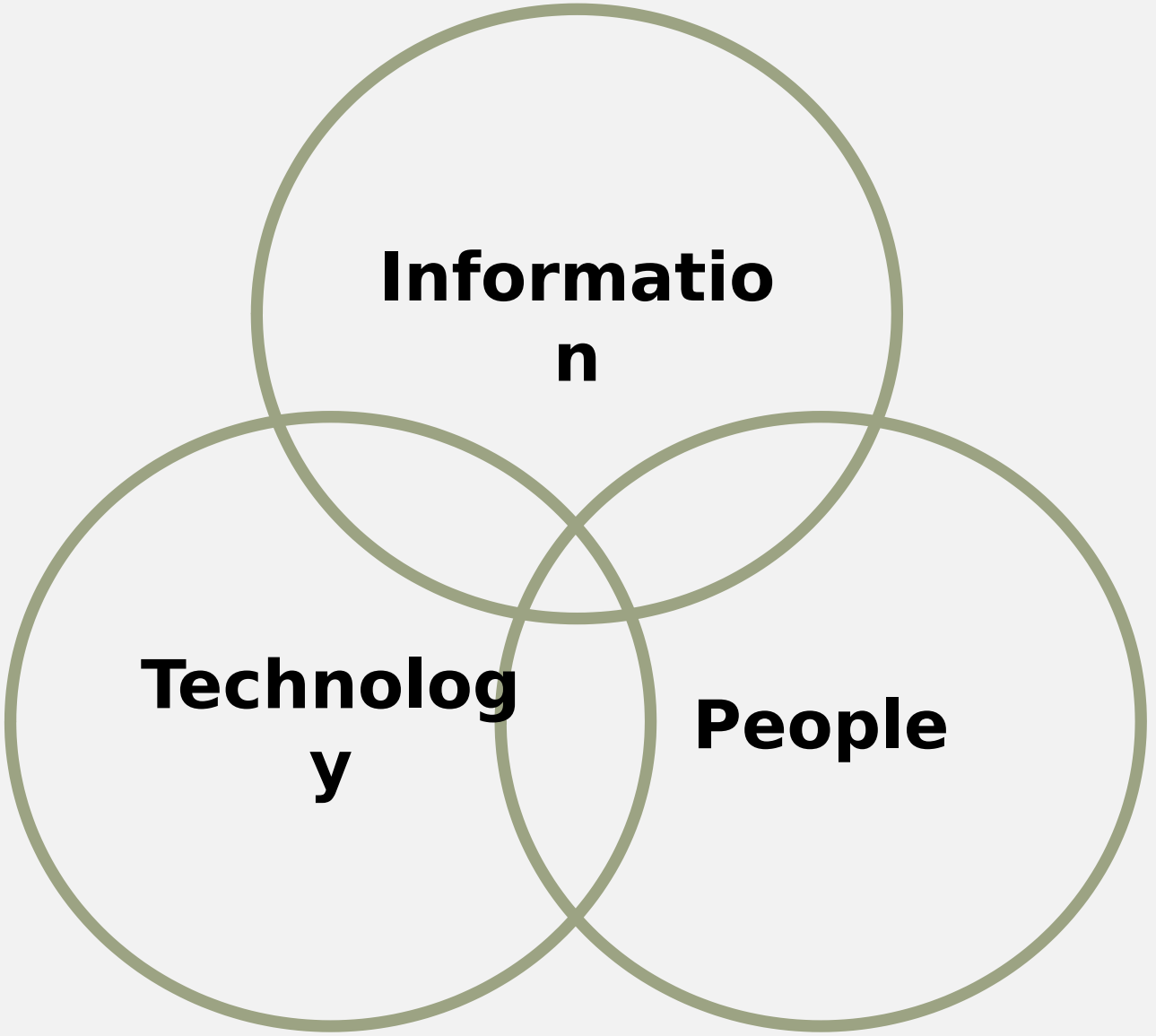
The UMD College of Information Studies (the iSchool)



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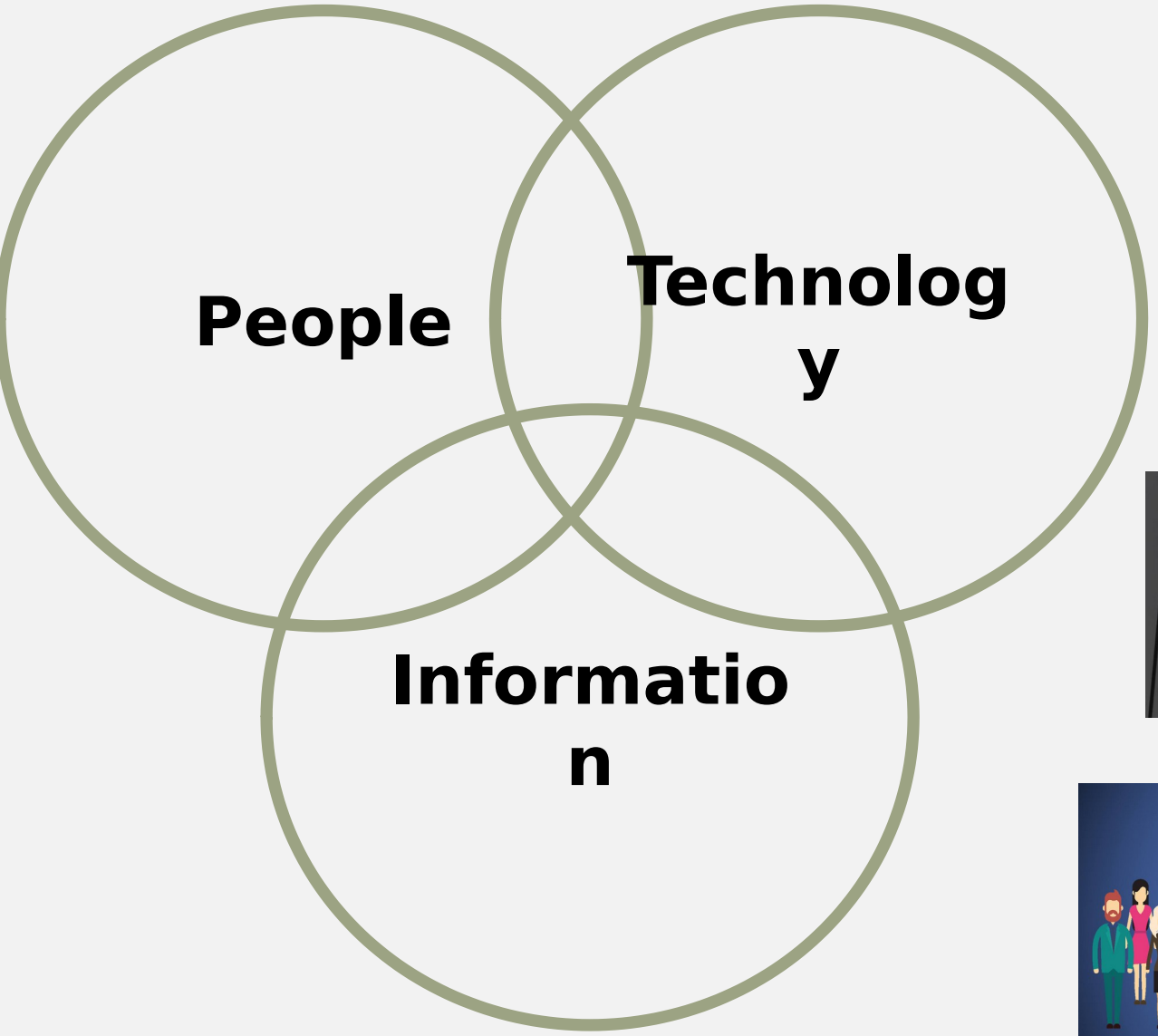
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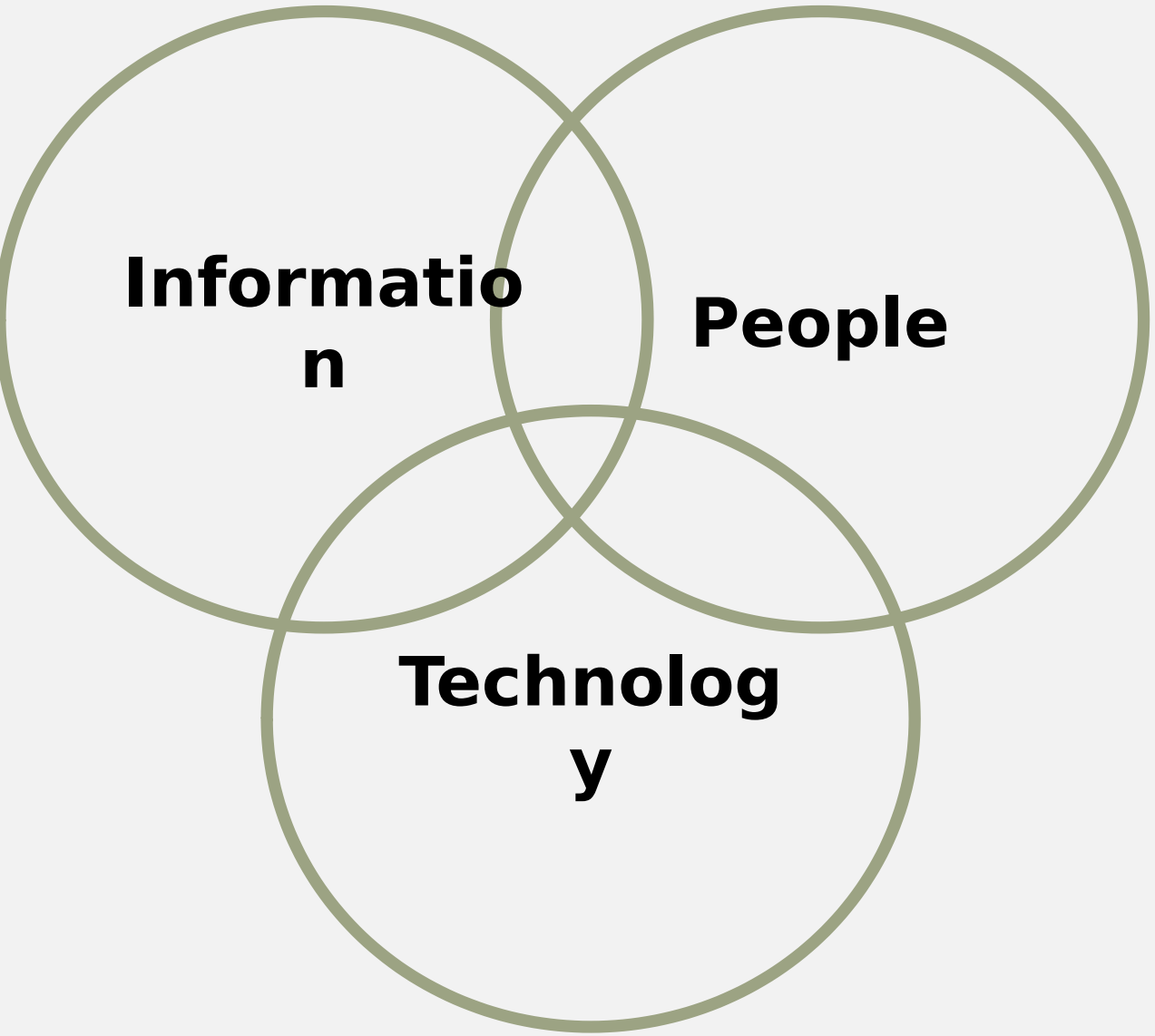

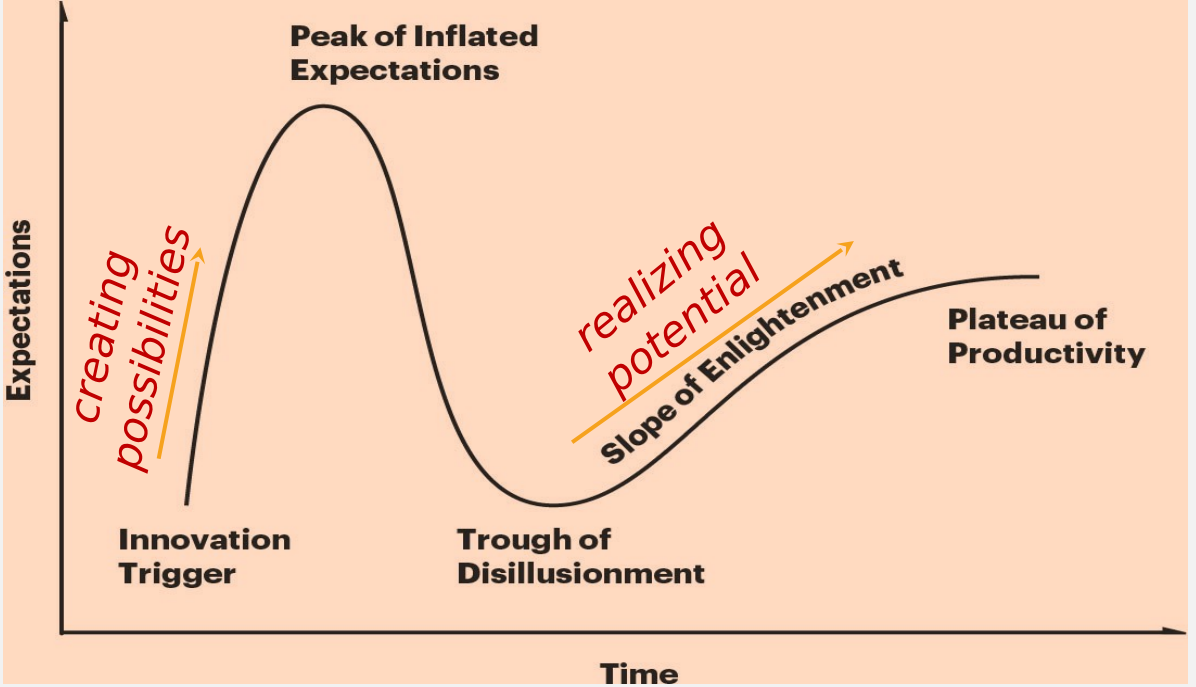

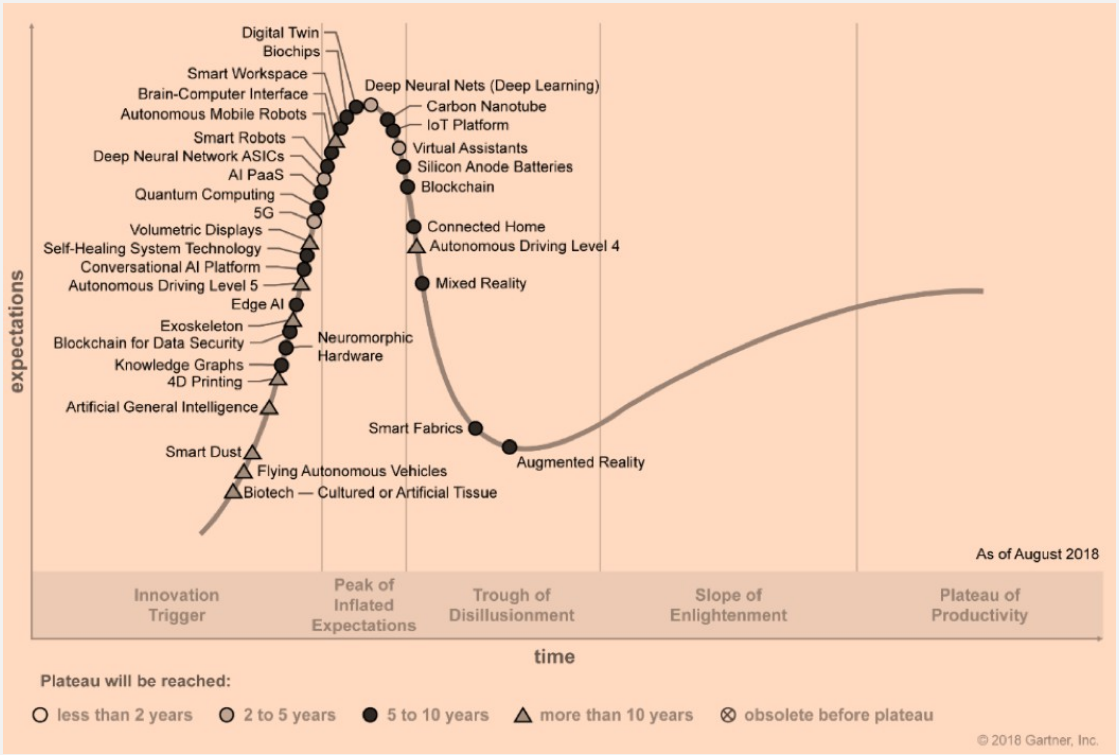

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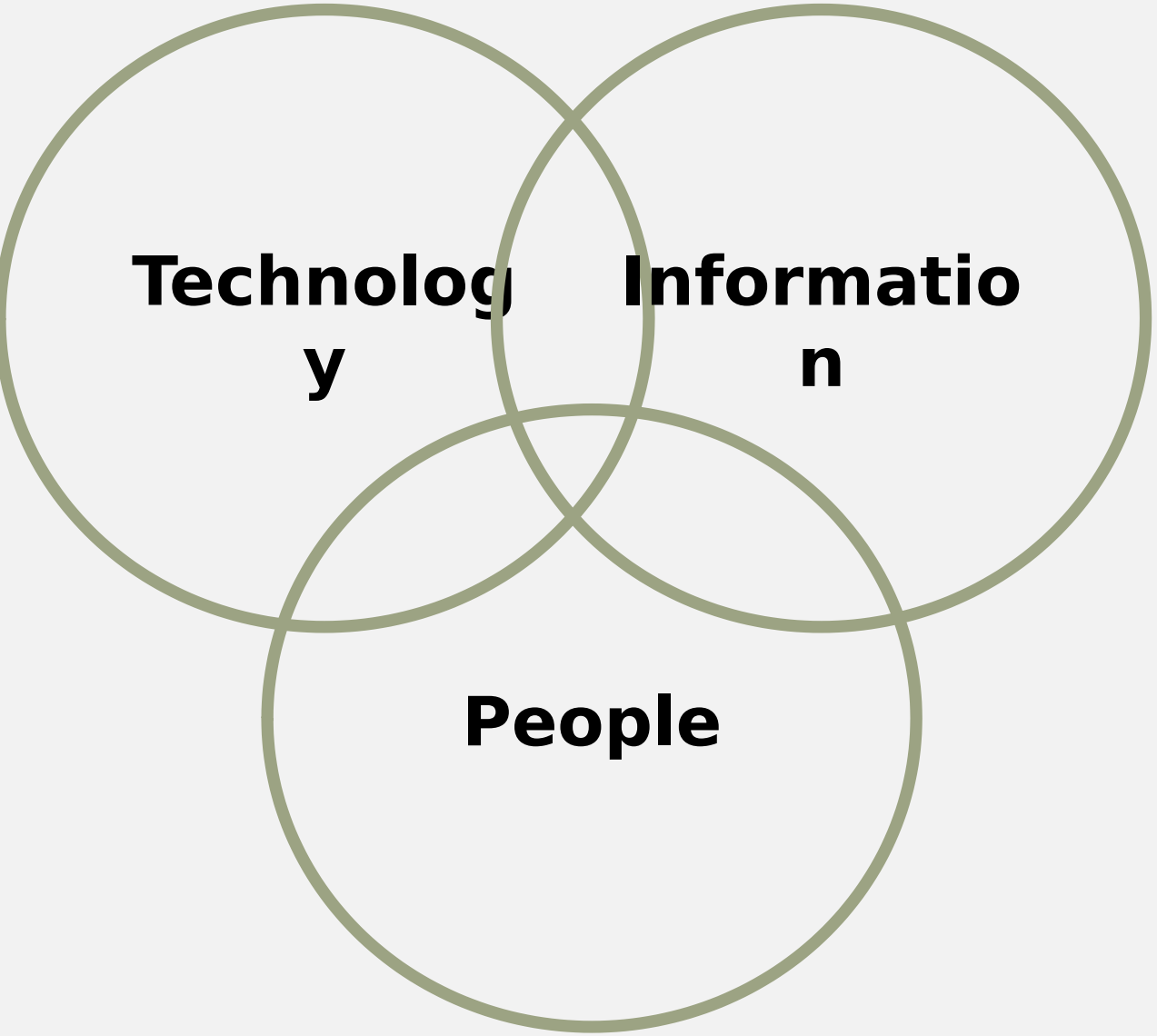
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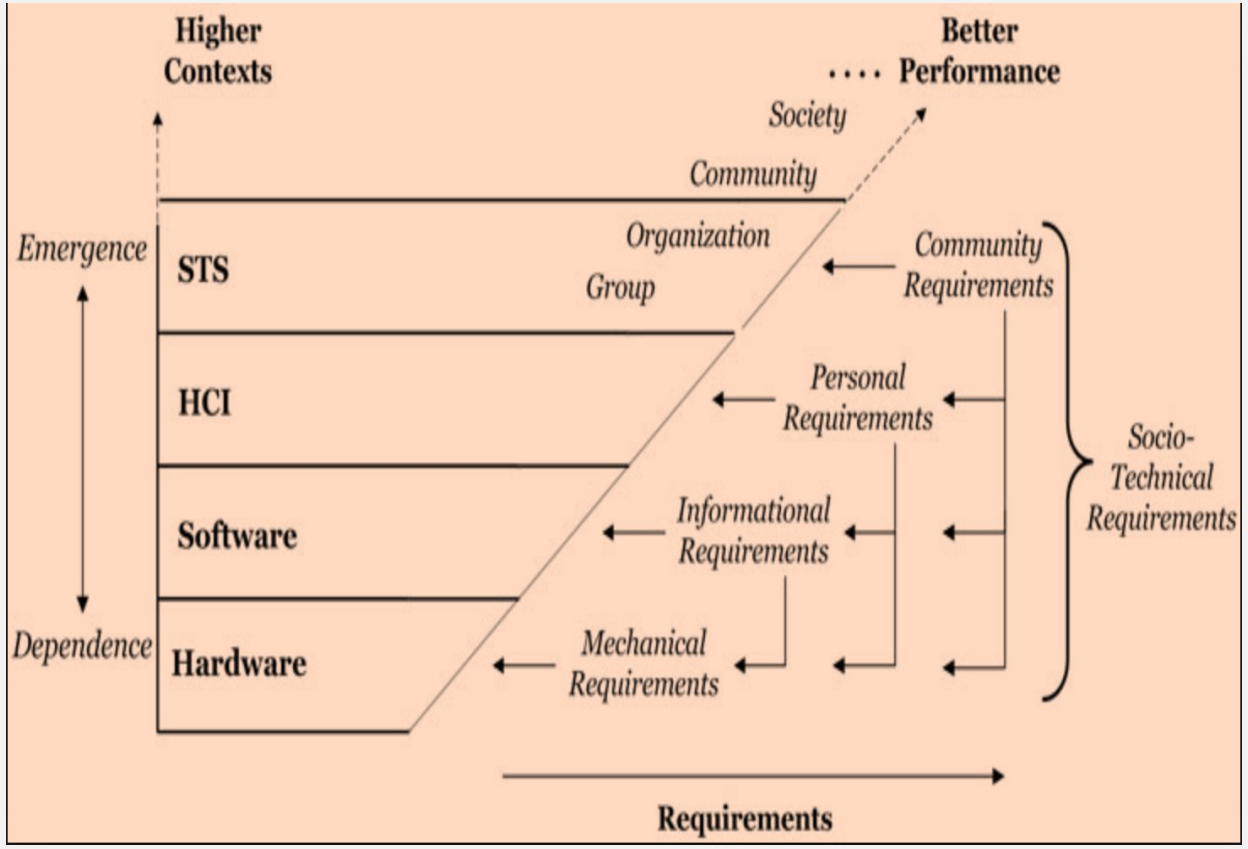
Higher
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Better
Performance
Society
Community
Organization
Group
Emergence
STS
HCI
Software
Hardware
Dependence
Community
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Requirements

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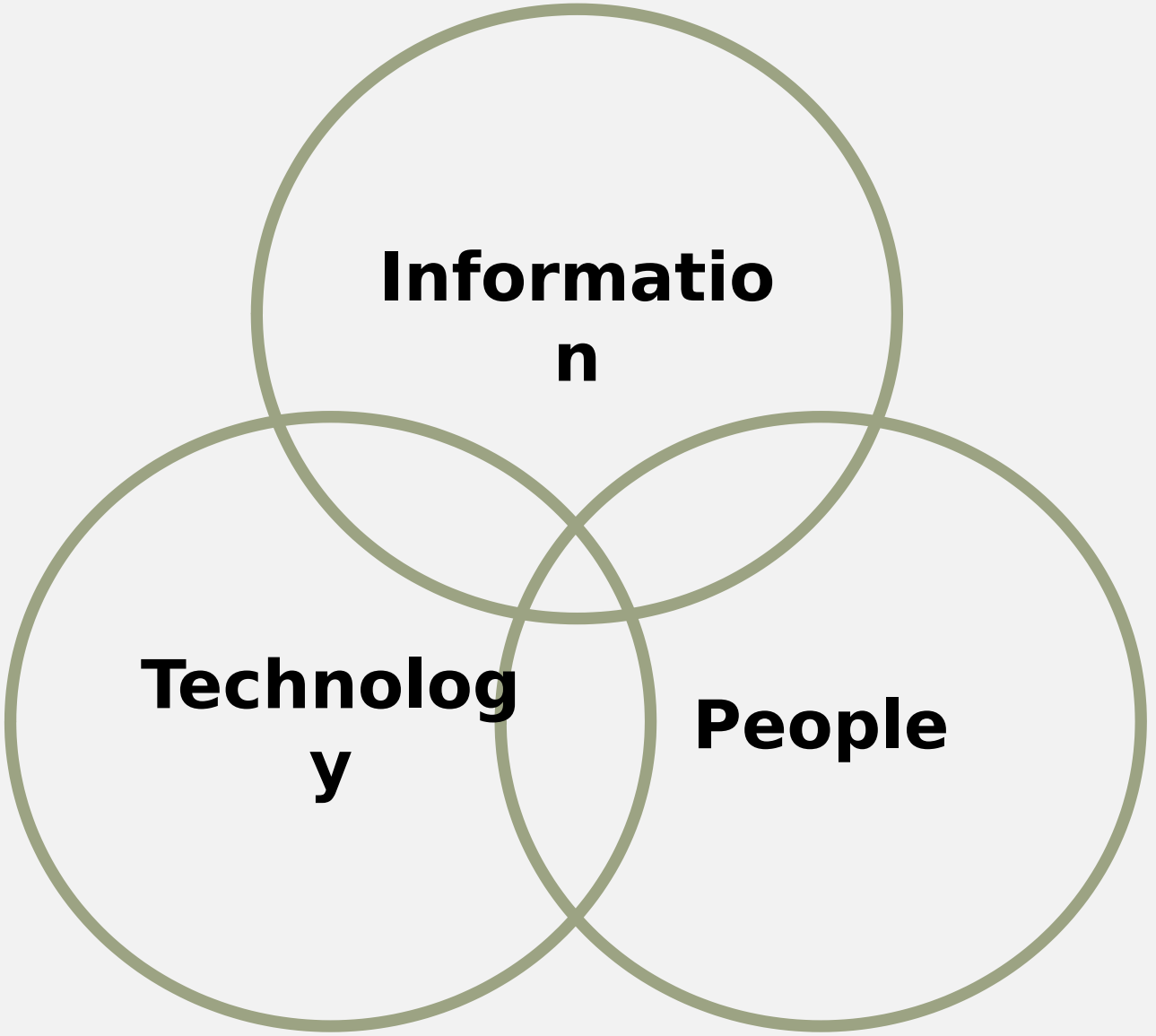

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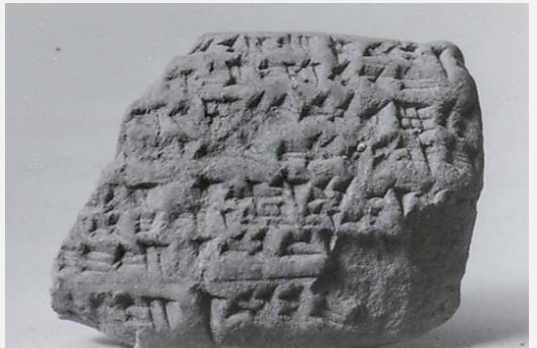
SOCIOTECHNICAL SYSTEMS PERSPECTIVE: PREMISES

- The mutual constitution of people and technologies
- Contextual embeddedness
- Importance of collective action
- Therefore:
  - Examine not just the technological system not just the social system or both side-by-side
  - Investigate when the two systems interact and the phenomena that emerge



MUTUAL CONSTITUTION

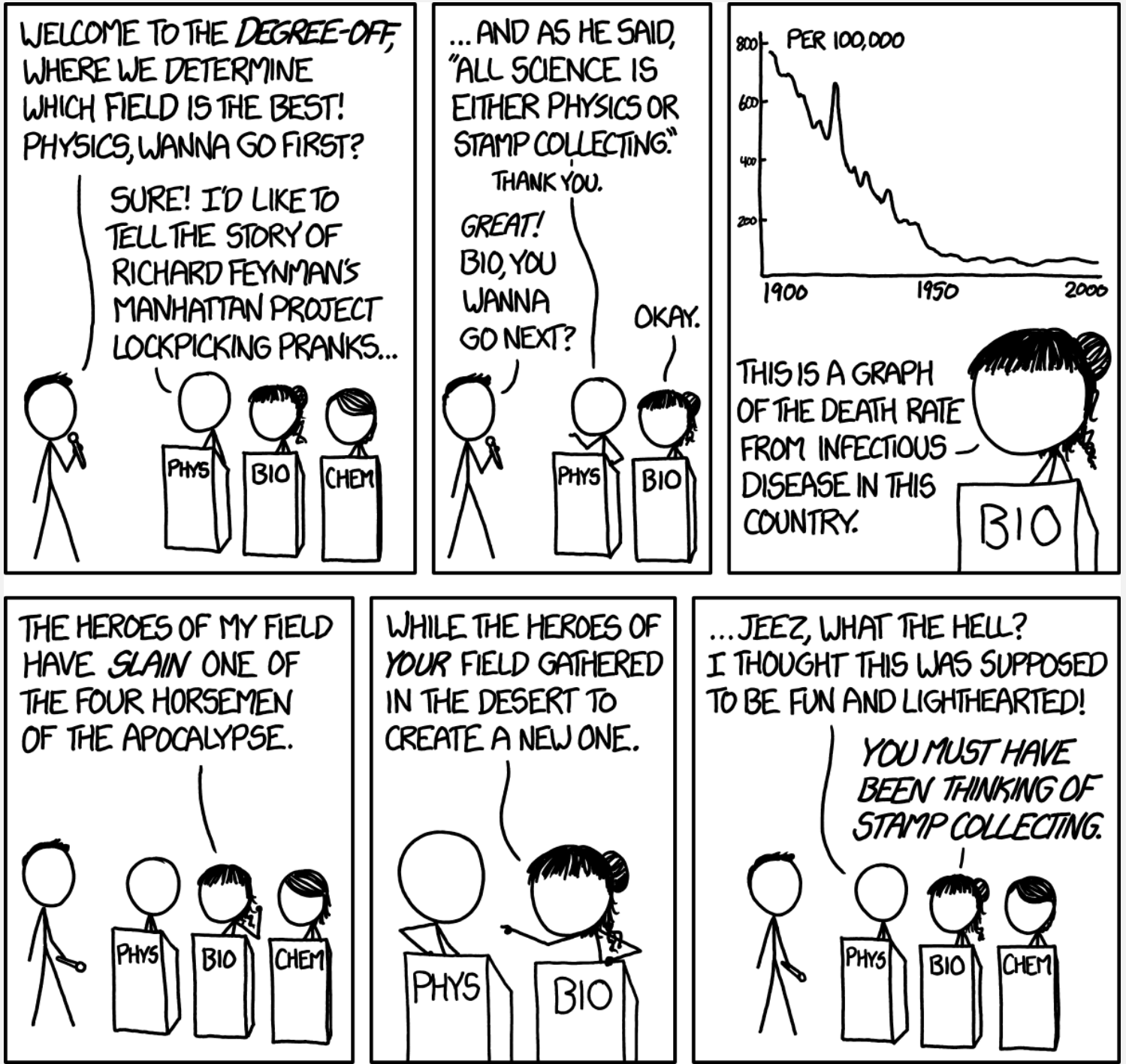
- Both humans and technologies have some ability to act (agency)
  - Directionality can go in both ways
  - Actions are not deterministic and are dependent on context
- Focus is on co-evolution of the technical and social
- Therefore attend to:
  - Material triggers
  - Actions of social groups
  - Pressures from contextual influences
  - Complex processes of development, adoption, adaptation, and use of new technologies in people's social worlds

CONTEXT: TECHNOLOGIES ARE SOCIALLY SITUATED

- Technologies embedded in a social context that adapts to them and reshapes them through design, development, deployment, and use
- Decontextualizing technologies limits our understanding
- Complex social processes embed technological innovation within organizational and so
- Temporal dimension matters

COLLECTIVE ACTION BY MULTIPLE PARTIES

- Different goals create conflict
- Shared goals energize the design, development, deployment, and use of new technologies



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COLLECTIVE ACTION BY MULTIPLE PARTIES

- Different goals create conflict
- Shared goals energize the design, development, deployment, and use of new technologies

SOCIOTECHNICAL SYSTEMS RESEARCH

- Foregrounds the complexity and uncertainty of technologically-involved change
- Adopts process logic to investigate the reciprocity and co-evolution of the contextual interactions and outcomes
- Focuses on heterogeneous networks of institutions, people, and technological artifacts that play roles in th design, development, deployment, uptake, and uses o any particular technology

DESIGNING EFFECTIVE SOCIO-TECHNICAL SYSTEMS

- Non-deterministic, but there are path dependencies
- A sociotechnical perspective allows mindful shaping of the co-evolution of:
  - Technologies
  - Policies
  - Organizations
  - Institutions
- Increased probability of reaching desired goals

Bus Inf Syst Eng 59(6):385–409 (2017)
https://doi.org/10.1007/s12599-017-0506-0

STATE OF THE ART

A Blockchain Research Framework

What We (don't) Know, Where We Go from Here, and How We Will Get There

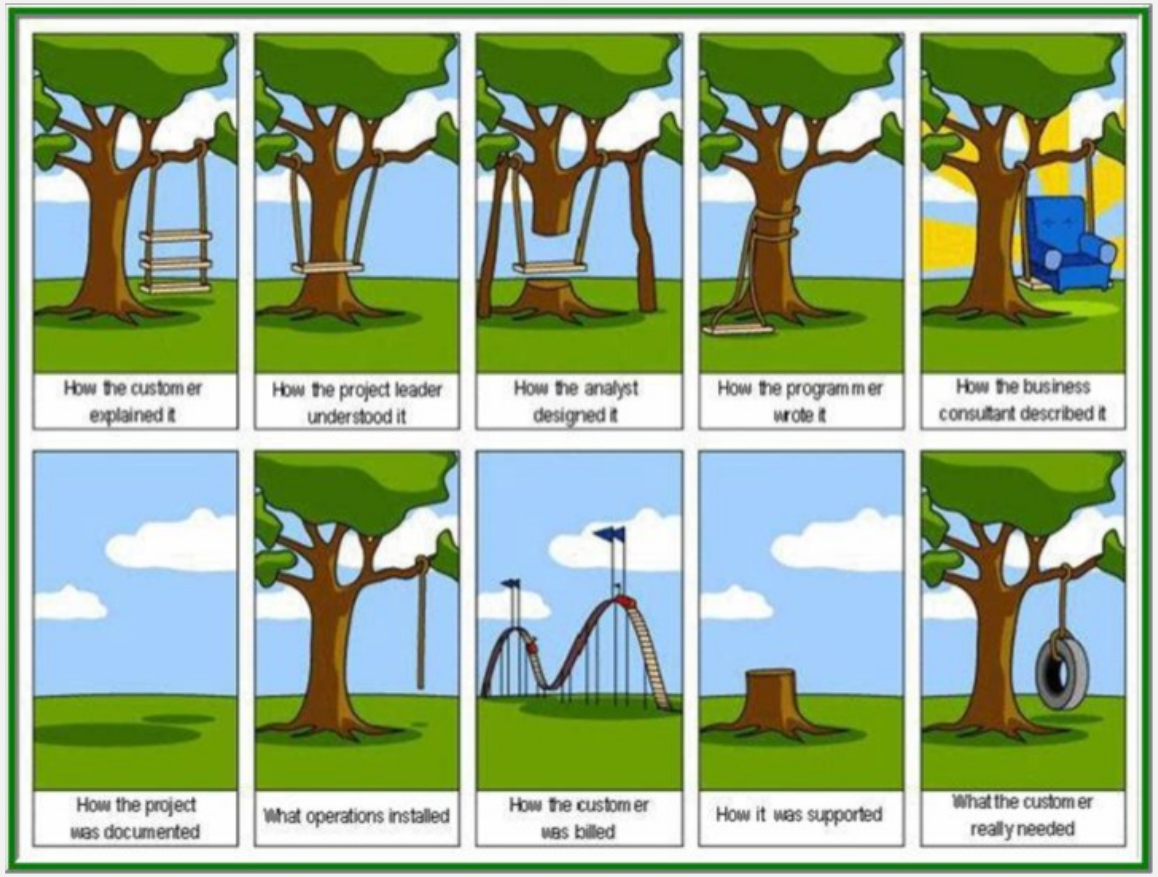
Marten Risius · Kai Spohrer

A grid of research questions categorized by

- **Activities by developers and users**: *design and features*, *measurement and value*, *management and organization*

and

- **Levels of analysis upon which these activities yield influence**: *users and society, intermediaries, platforms, firms and industry*



Level of analysis	Activities		
	Design and features	Measurement and value	Management and Organization
Users and society	How do blockchain features and design affect the interaction between users and technology adoption? How do different features constrain or unchain usage?	What are the benefits and costs of using blockchain technology for the individual user and the society?	How to balance user privacy and legal demands? Why and how do users perceive transactions with humans or artifacts as sufficiently trustworthy?
Intermediaries	How do alternative blockchain features and designs enact different intermediary services? How do specific features complement existing intermediaries?	How can blockchain systems maximize their role as a transaction intermediary? What are the value propositions and the limitations of blockchain technology compared to established intermediary services providers?	How do existing intermediary service providers position themselves towards blockchain technology? Which business transactions can be outsourced to blockchain systems?
Platforms	How do blockchain platforms differ regarding features and designs? How can different blockchain systems complement each other to overcome individual constraints?	How can blockchain systems enhance their dissemination among users and linkage with operating systems? What are the complementary benefits of blockchain systems to established information systems?	How can decentralized blockchains establish and govern innovative ecosystems? What are the effects of hard forks? How can they be managed or prevented?
Firms and industries	How can firms utilize blockchain features for their own business processes? What blockchain features are relevant for different company divisions or industry branches? What type of blockchain is best-suited for the respective purposes?	How does blockchain provide added value for companies to conduct transactions within the company or with customers, other companies, stakeholders and the government? Which markets, industry branches, business models or corporate divisions are more likely to be affected by blockchain?	How do organizations act under different blockchain based regimens of data privacy/confidentiality? How does decentralized control work in industry-wide blockchain systems? Can new forms of organization be managed effectively on a blockchain? If so, how and why?

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Level of analysis	Activities		
	Design and features	Measurement and value	Management and organization
Users and society	Abramova and Böhme (2016)	Beck et al. (2016)	De Filippi (2016)
	Fabian et al. (2016)	Nguyen (2016)	Kiviat (2015)
	Yli-Huumo et al. (2016)	Pilkington et al. (2017)	Maesa et al. (2016)
	Walch (2017)		
Intermediaries	Gipp et al. (2016)	Korpela et al. (2017)	Fujimura et al. (2015)
	Hashemi et al. (2016)	Feng (2016)	Lewenberg et al. (2015)
	Juels et al. (2016)	Zhang and Wen (2015)	Raskin (2016)
	Kosba et al. (2015)		Reyes (2017)
	Mainelli and Smith (2015)		
	Watanabe et al. (2015)		
	Yasin and Liu (2016)		
	Zhang et al. (2016)		
Platforms	Danezis and Meiklejohn (2016)	Hayes (2016)	Cocco and Marchesi (2016)
	Gervais et al. (2016)	Lindman et al. (2017)	Decker and Wattenhofer (2013)
	Glaser and Bezzenberger (2015)	Sanda and Inaba (2016)	Dennis and Owen (2015)
	Kazan et al. (2014)	Xu et al. (2016)	Dwyer (2015)
	Tschorsch and Scheuermann (2016)		Reyes (2016)
	Walsh et al. (2016)		Rückeshäuser (2017)
	Watanabe et al. (2016)		Zou et al. (2016)
	Xu et al. (2017)		
	Zhu et al. (2016)		
Firms and industries	Aitzhan and Svetinovic (2016)	Ainsworth and Shact (2016)	Beck and Müller-Bloch (2017)
	Brandon (2016)	Azaria et al. (2016)	Bell (2016)
	Glaser (2017)	Brenig et al. (2016)	Caytas (2016)
	Mettler (2016)	Christidis and Devetsikiotis (2016)	Lee (2016)
	Morisse (2015)	Morini (2016)	McJohn and McJohn (2016)
	Wörner et al. (2016)	Nofer et al. (2017)	Paech (2016)
		Lee and Pilkington (2017)	Peters et al. (2015)
		Sikorski et al. (2017)	Shackelford and Myers (2016)
		Yermack (2017)	Vogel (2015)
		Yuan and Wang (2016)	

COLLEGE OF INFORMATION STUDIES

Level of analysis	Activities		
	Design and features	Measurement and value	Management and Organization
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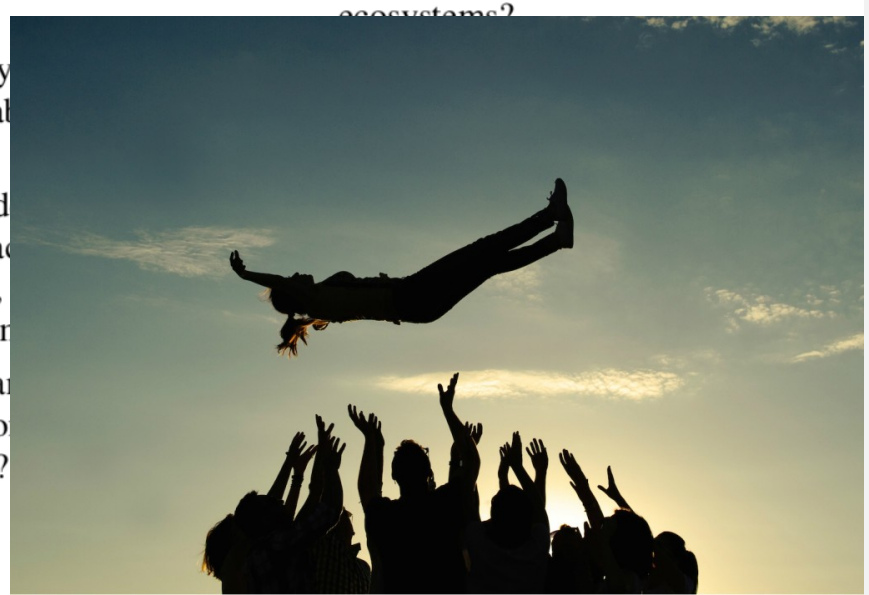
How do blockchain features and design affect the interaction between users and technology adoption?



Perceived Benefit and Risk as Multidimensional Determinants of Bitcoin Use: A Quantitative Exploratory Study

Completed Research Paper

Svetlana Abramova
University of Münster
Münster, Germany
svetlana.abramova@uni-muenster.de

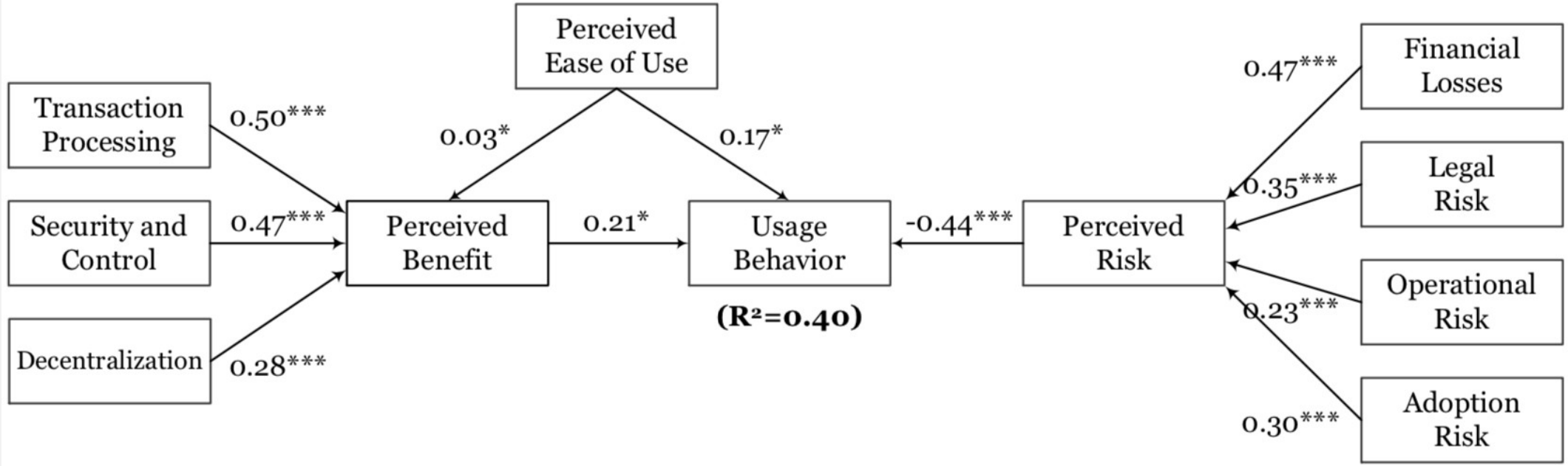
Rainer Böhme
University of Innsbruck
Innsbruck, Austria
rainer.boehme@uibk.ac.at

Abstract

Over recent years, the innovative decentralized payment system Bitcoin has received much attention in practice and academia. Despite a growth of transaction volume and an increasing attention in the area of e-commerce, there is little academic research examining the factors influencing adoption. To fill this research gap, this paper documents an exploratory study of the key determinants and inhibitors of Bitcoin use. Drawing upon the Technology Acceptance Model and a literature review, we integrate various benefits and risks of Bitcoin use to form the multidimensional constructs Perceived Benefit and Perceived Risk. We propose and empirically test a theoretical model that explains the use of Bitcoin as an online payment system for legitimate purchases and money transfers. Furthermore, we recognize several conceptual and methodological development potentialities for technology acceptance theories in the context of decentralized and sharing economy systems.

Keywords: Bitcoin, blockchain, decentralization, information technology adoption, perceived benefit, perceived risk, payment system, electronic commerce

Measure	Items		
Gender	Male (n=81; 94.2%)	Female (n=2; 2.3%)	Not specified(n=3; 3.5%)
Age	15-24 (n=8; 9.3%) 25-34 (n=34; 39.5%) 35-44 (n=21; 24.4%)	45-54 (n=13; 15.1%) 55-64 (n=3; 3.5%) >65 (n=3; 3.5%)	Not specified (n=4; 4.7%)
Education	Elementary school (n=11; 12.8%) College/associate (n=7; 8.1%) High school (n=13; 15.1%)	Bachelor (n=20; 23.2%) Master (n=26; 30.2%) PhD (n=3; 3.5%)	Not specified (n=6; 7.0%)
Knowledge about Bitcoin[3]	Medium (n=43; 50%)	Advanced (n=38; 44.2%)	Expert (n=5; 5.8%)



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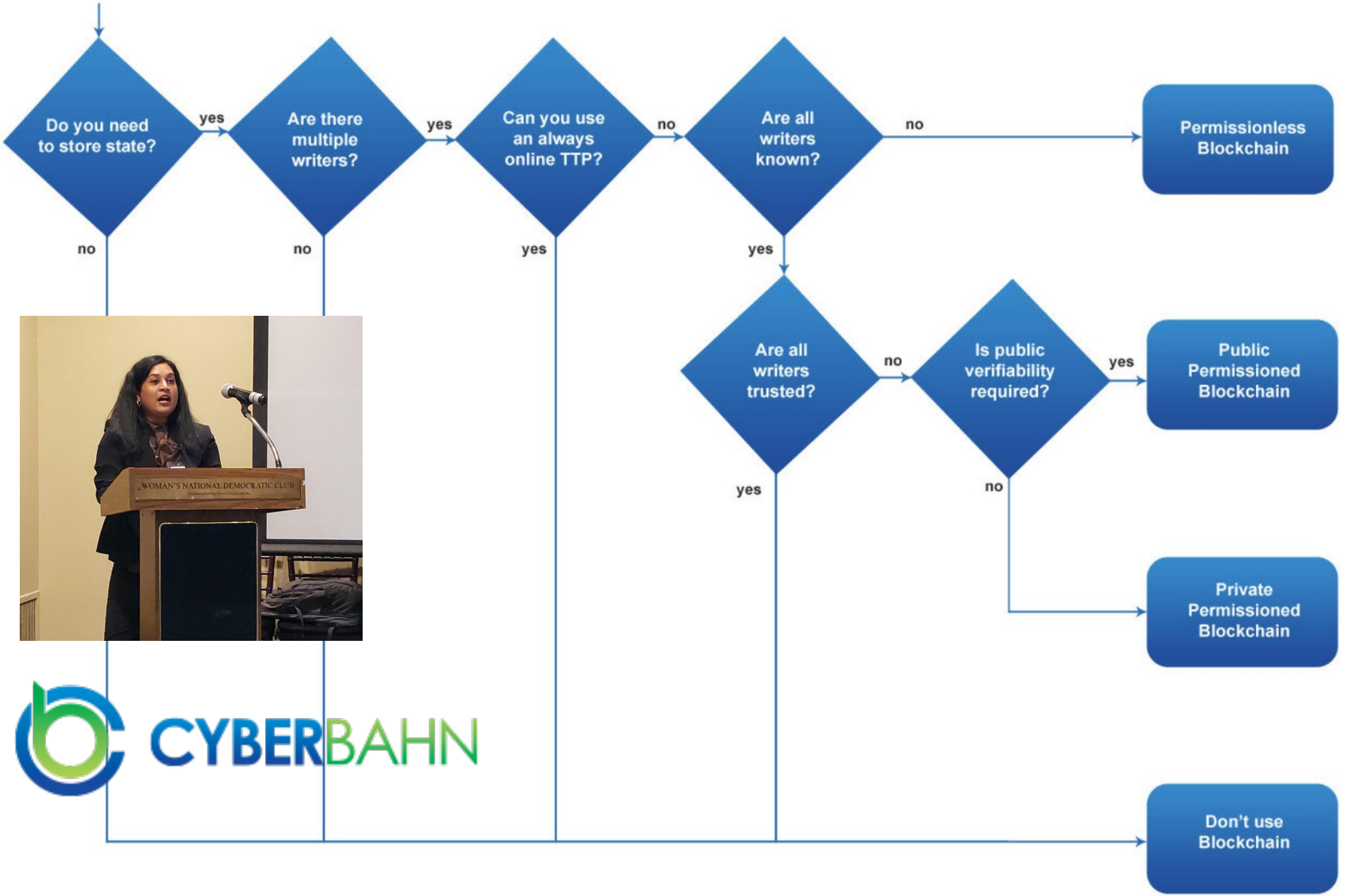
What type of blockchain is best-suited for the respective purposes?

	Permissionless Blockchain	Public Permissioned Blockchain	Private Permissioned Blockchain	Central Database
Throughput	Low	High	High	Very High
Latency	Slow	Medium	Medium	Fast
Number of readers	High	High	High	High
Number of writers	High	Low	Low	High
Number of untrusted writers	High	Low	Low	None
Consensus mechanism	Mainly PoW, some PoS	Supports multiple approaches but mostly uses BFT protocols (e.g. PBFT [6])	Supports multiple approaches but mostly uses BFT protocols (e.g. PBFT [6])	None
Centrally managed	No	Yes	Yes	Yes
Censorship	Censorship Resistant (Anonymous consensus)	Not Censorship Resistant	Not Censorship Resistant	N/A
Validators	All are Dynamic Membership Multi-party Signature(DMMS) validators (not always known writers)	Mostly known DMMS validators	Legally accountable validators	Only trusted validators
Assets Suitability	Suitable for on-chain assets (virtual bearer asset) e.g. , bitcoin/ether	Bearer asset becomes registered asset	Suitable for off-chain assets (securities, fiat, titles)	Suitable for online/offline assets
Settlement Finality (Irreversible)	Yes	No	No	No

We differentiate between permissionless, permissioned blockchains and a centralized database. Note that a permissioned blockchain can be public, for example if public verifiability of the content is desired.


Do you need to store state?
yes
Are there multiple writers?
yes
Can you use an always online TTP?
no
Are all writers known?
no
Permissionless Blockchain
no
no
yes
yes
Are all writers trusted?
no
Is public verifiability required?
yes
Public Permissioned Blockchain
yes
no
Private Permissioned Blockchain
Don't use Blockchain

WOMAN'S NATIONAL DEMOCRATIC CLUB

CYBERBAHN

Level of analysis	Activities		
	Design and features	Measurement and value	Management and Organization
Users and society	How do blockchain features and design affect the interaction between users and technology adoption? How do different features constrain or unchain usage?	What are the benefits and costs of using blockchain technology for the individual user an the society?	id e
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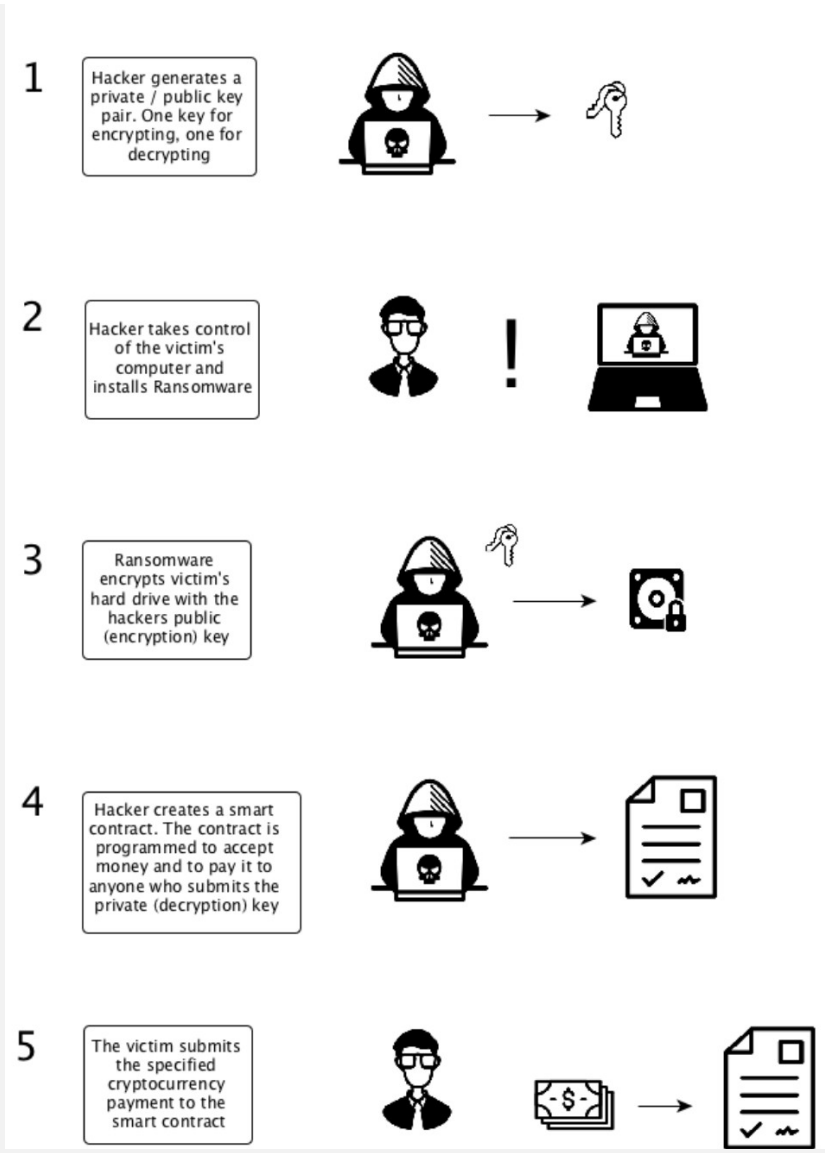
How do specific features complement existing intermediaries?

The Ring of Gyges: Using Smart Contracts for Crime

Ari Juels
Jacobs Institute, Cornell Tech
juels@cornell.edu

Ahmed Kosba
Univ. of Maryland
akosba@cs.umd.edu

Elaine Shi
Cornell Univ.
runting@gmail.com



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Smart contracts will make ransomware more profitable, part 2

Jeffrey Ladish Follow
Jun 8, 2018 · 8 min read

Criminal smart contract construction and defense

Level of analysis	Activities		
	Design and features	Measurement and value	Management and Organization
Users and so	How do blockchain features and ...een ...ain	What are the benefits and costs of using blockchain technology for the individual user and the society?	How to balance user privacy and legal demands? Why and how do users perceive transactions with humans or artifacts as sufficiently trustworthy?
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	...r to ...s?	What are the complementary benefits of blockchain systems to established information systems?	What are the effects of hard forks? How can they be managed or prevented?
Firms and industries	...n features for thei... processes? What blockchai... relevant for di... divisions or in... What type of bl... suited for the respective purposes?	How does blockchain provide added value for ...es, ...ely to	How do organizations act under different blockchain based regimens of data privacy/confidentiality? How does decentralized control work in industry-wide blockchain systems? Can new forms of organization be managed effectively on a blockchain? If so, how and why?

"A hacker broke into our computer and, in an act of random kindness, organized our student files."

Can new forms or organization be managed effectively on a blockchain? If so, how and why?

Welcome to

swarm. city

Governance in the Blockchain Economy: A Framework and Research Agenda. Roman Beck, Christoph Müller-Bloch, John Leslie King. *Journal of the Assoc. for Information Systems*

Decision rights: *decision management rights*, *decision control rights*

determines degree of centralization

Accountability

contracts and legal frameworks governed by institutions

ctures

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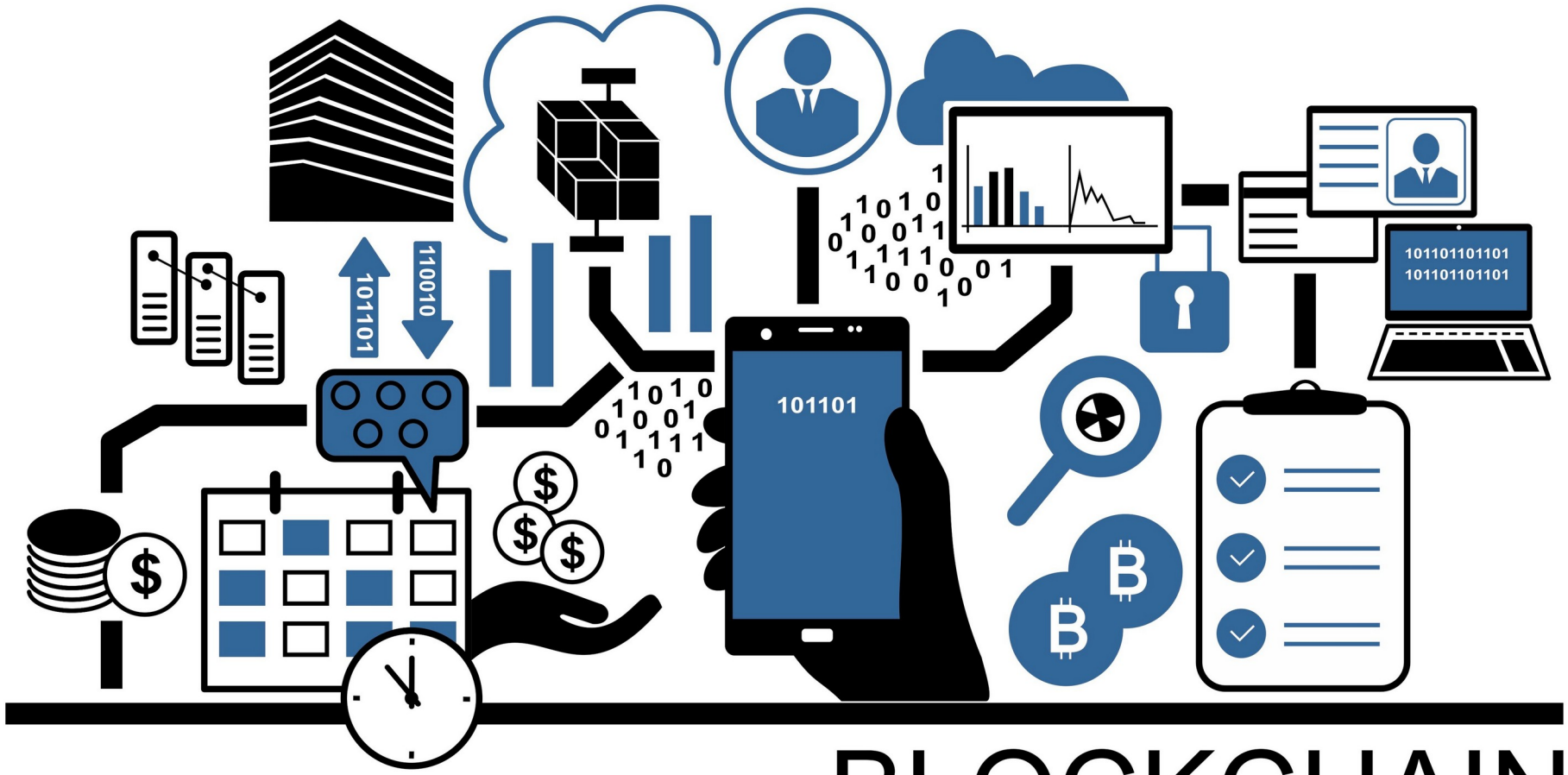
Table 4. Research Agenda for Governance in the Blockchain Economy

Dimension	Research Questions
Decision rights	• How are decisions made in the blockchain economy? • How are decision management rights and decision control rights allocated? • How is disagreement about decision-making resolved in the blockchain economy? • What is the role of ownership in the blockchain economy?
Accountability	• How is accountability determined in the blockchain economy? • How is identity engrained in the blockchain economy? • How is transaction enforcement embedded in the blockchain economy? • How are disputed transactions resolved in the blockchain economy? • How is trust affected by the blockchain economy? • What is the role of institutions in the blockchain economy?
Incentives	• How is consensus incentivized in the blockchain economy? • How does incentive alignment work in the blockchain economy? • How is system use incentivized in the blockchain economy? • How is system development and maintenance incentivized in the blockchain economy? • How do business models shape the blockchain economy?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BLOCKCHAIN