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The State of the Art for Blockchain-Enabled Smart-Contract Applications in the Organization

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Agenda

- Background information
- State of the art
- The current gap and research questions
- Literature review method
- Analysis of results
- Discussions

Background information

- **Blockchain –** a distributed ledger that allows participants to write and update records on the ledger
- **Nodes and virtual machines –** nodes that are connected in peers and each participating node has a copy of the ledger
- **Consensus mechanism -** agreed method for adding new records to the blockchain by the participating nodes (voting- and proof-based)
- **Programming smart contracts –** are stored and executed in blockchain nodes

State of the art

- **Organizations face new challenges**
  - information security
  - trust and transparency
  - decentralization of working processes
- **Blocklchain and Smart Contracts new opportunities**
  - security
  - transparency
  - no involvement of a third-party
- **Early Adoption phase**
  - Scientific researches
  - Business projects
  - ICOs
- **Over 1600 Cryptocurrencies**

The current gap and research questions

- **Current gap:**
  - Little is known about the adoption of smart contracts in organizations

- **Research questions:**
  - How to successfully adopt smart contracts in modern organizations?
    - What are the domains of smart-contract applications in established organizations?
    - What are the main benefits of smart-contract applications in these organization domains?
    - What are the issues limiting the gains of smart contract usage in the organizations?

Literature review method

- Systematic literature review method
- 4 phases
  - **Phase 1**: Review of the purpose and protocol of the study
  - **Phase 2**: Searching the literature and practical screening
  - **Phase 3:** The quality appraisal and data extraction is presented
  - **Phase 4:** Analyze the findings

Literature review method: Phase 1

Planning:

- Keywords
- Date period

Literature review method: Phase 2

Search criteria:

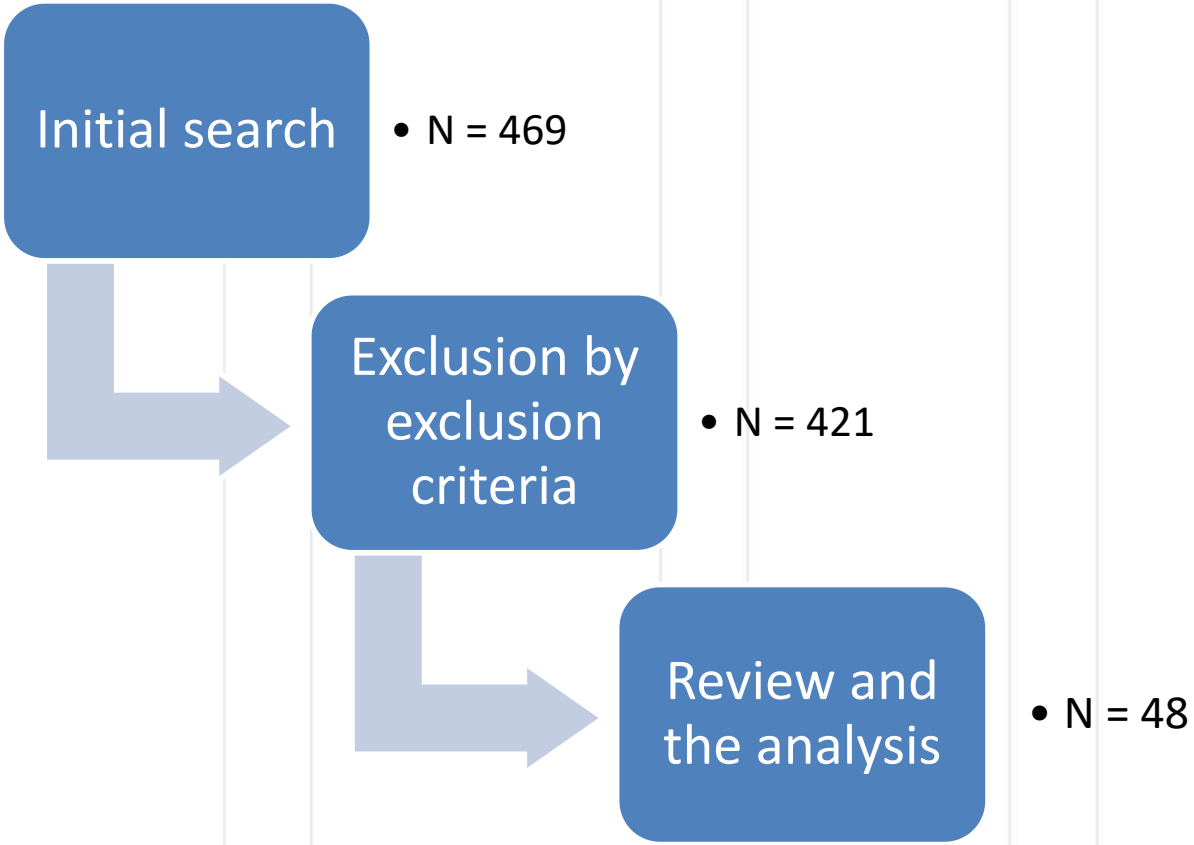
- Google scholar, academic articles
- Journal papers, conference papers, white papers
- 2013 – 2018 years
- Keywords:
  - Smart contract + business
  - Smart contract + organization
  - Smart contract + enterprise
  - Distributed autonomous organization + business
  - Decentralized autonomous organization + enterprise
  - Problem + blockchain
  - Problem + decentralized autonomous organization
  - Problem + smart contract

Literature review method: Phase 2

Exclusion criteria:

- First step:
  - Not relevant to the study
  - Duplicates
  - No full text available
- Second step:
  - High quality white paper?
  - Journal paper?
  - Peer-reviewed conference paper?
  - Article on smart-contract application in an organization?

Literature review method: Phase 2



Literature review method: Phase 3

- **Data extraction** from eligible papers based on the research questions
- **Information collection** from articles to serve as a raw material for the analyses

Literature review method: Phase 4

- **Extraction and combination** of essential facts using quantitative techniques
- **Data analysis**
- **At the final stage:**
  - **81%** are peer-reviewed publication
  - 2017 – **59%**, 2017 and after – **75%**

Analysis of results

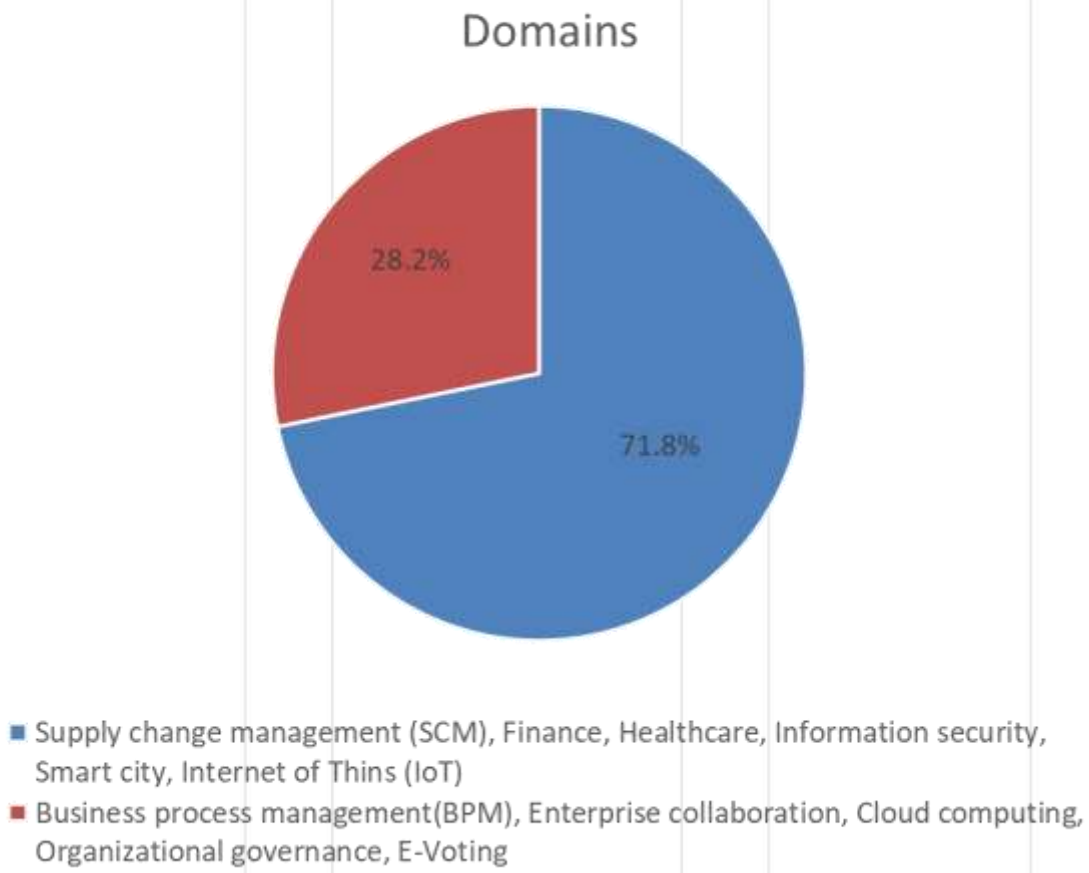
Analysis is based on

- Year of publication
- Type of publication
- Subcategories to identify the properties of the smart contract

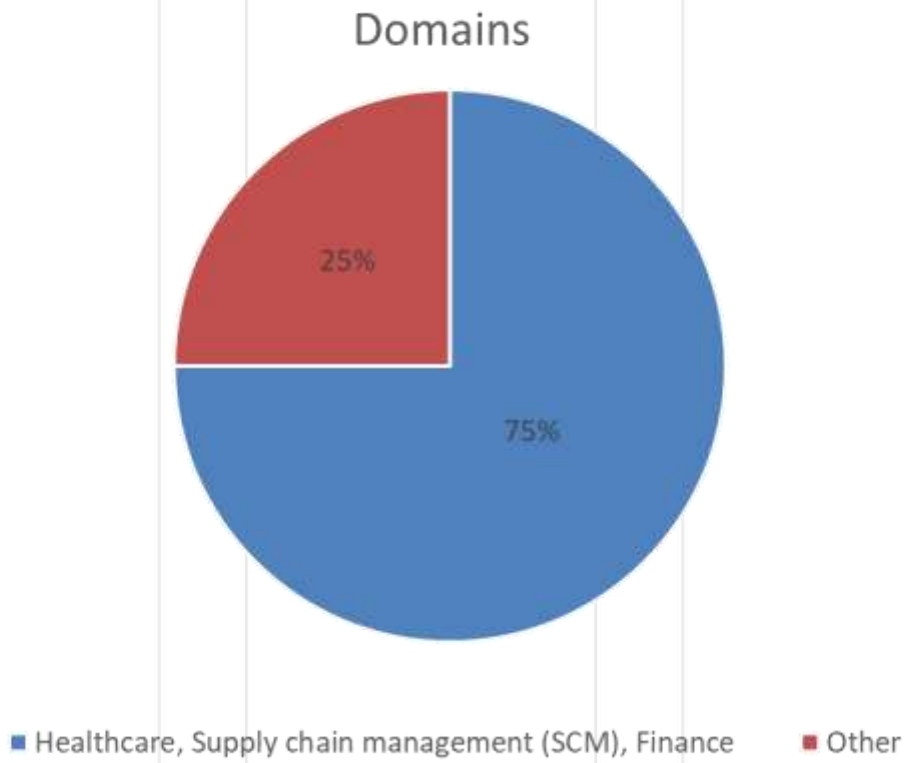
Statistics

- **66.67%** of projects are prototyped in Ethereum
- **87.5%** - projects for private organizations
- **75%** of implemented projects are for private organizations
- **62.5%** working or prototype projects
- **37.5%** theoretical description and proposed frameworks
- **50%** of projects are hosted on Ethereum and Hyperledger Fabrik

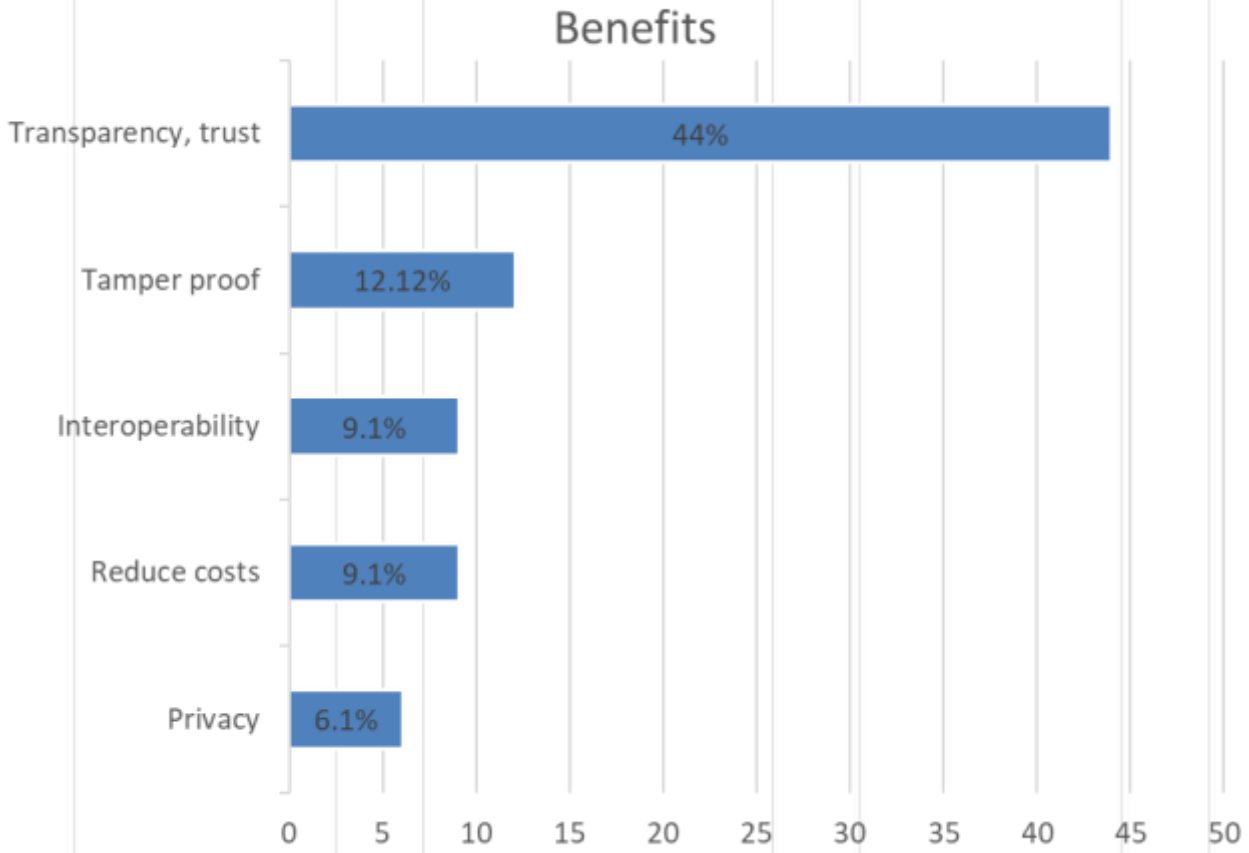
The domains adopting smart-contract applications



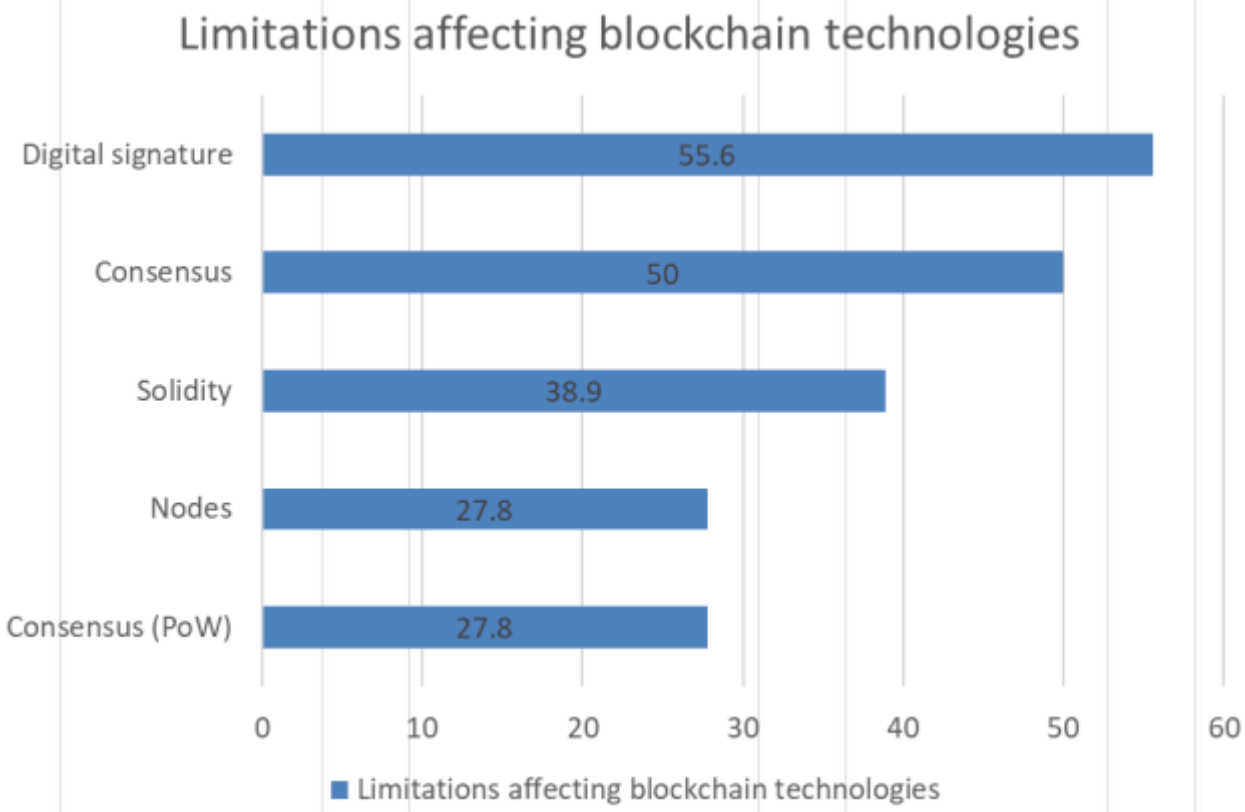
The domains with implemented smart-contract applications



The main benefits of smart-contract applications in these organization domains



The issues limiting the gains of smart contract usage in the organizations



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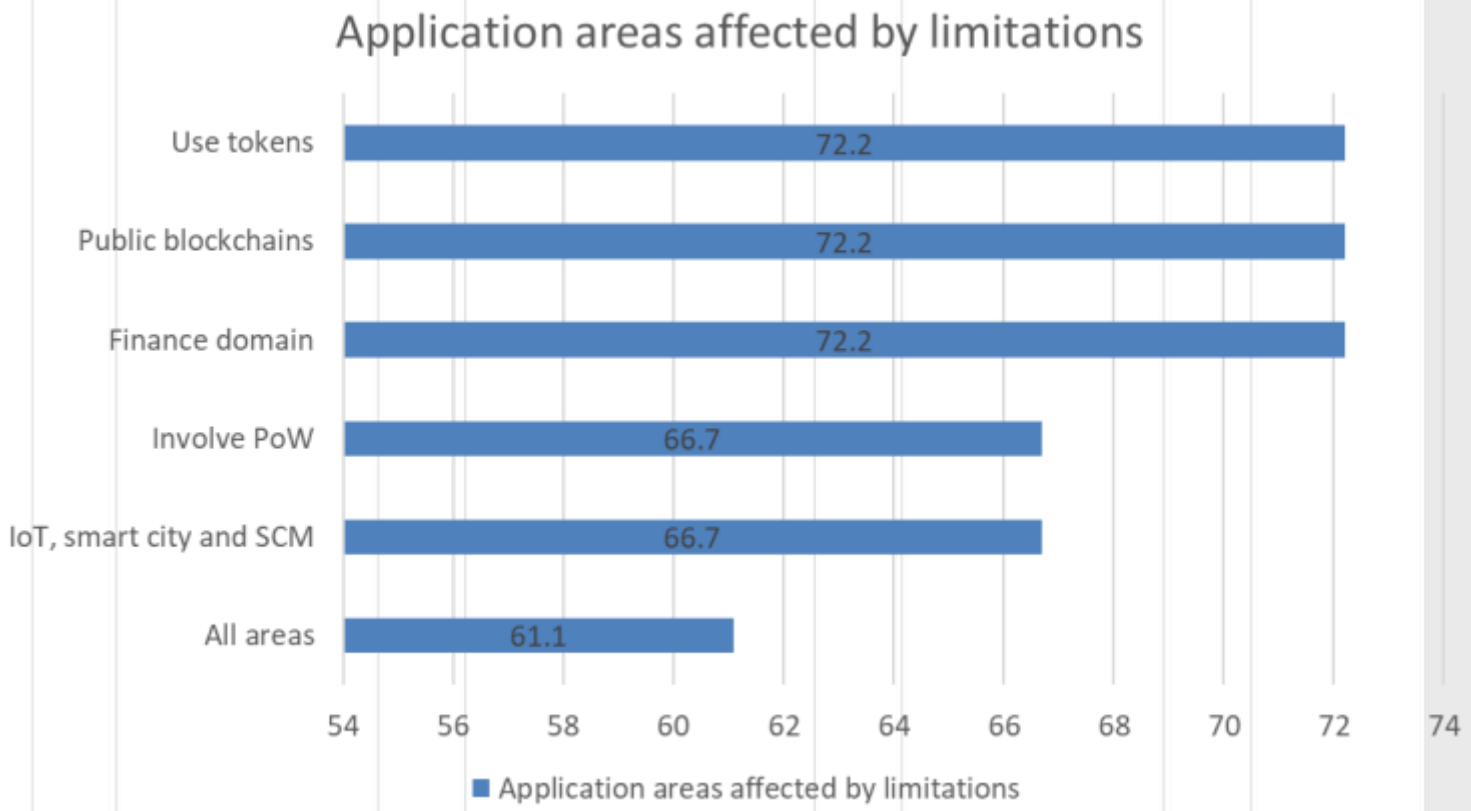
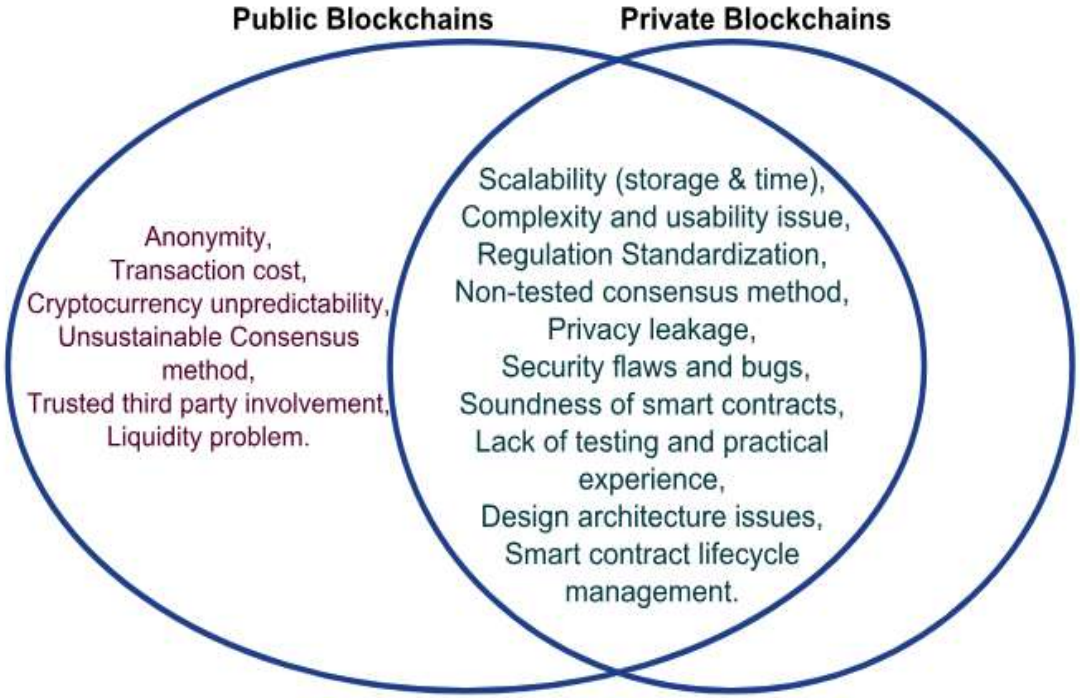
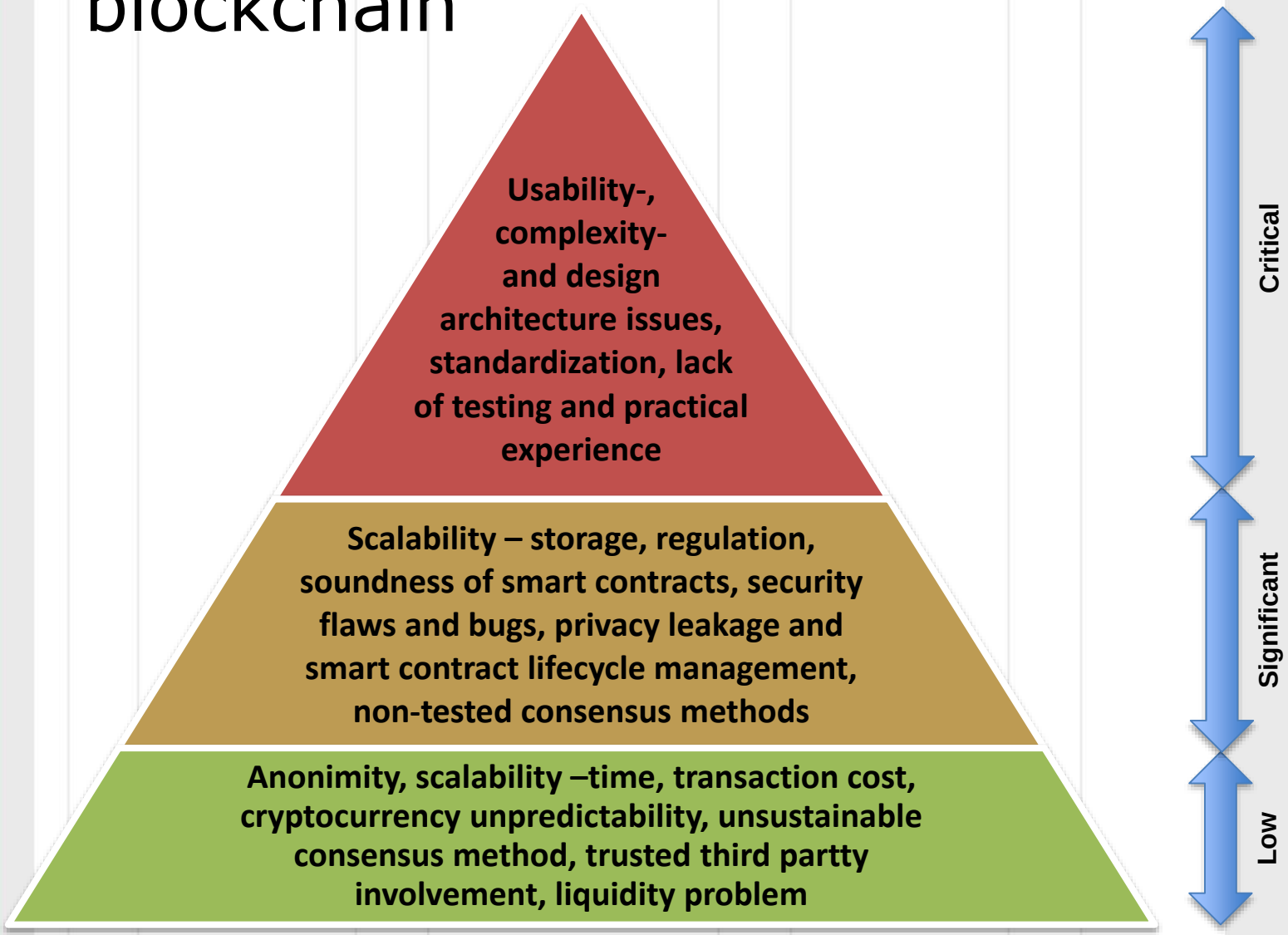


Public and private blockhain networks challenges and limitations

- 50% public blockchain
- 75% of implemented projects in private blockchains



The severity of limitations of blockchain



Discussions

- The idea of smart contracts was first presented in 1994 but serious effort to develop organization-blockchain application start in 2017
- Military applications are usually classified and not available in public domains (1200 results in Google Scholar for “military blockchain applications”)
- Switch to Proof of Stake consensus mechanism to solve time scalability and resource wastage issue (QTUM, Ethereum)
- No fault injection frameworks for testing blockchain implementations
- Choose appropriate consensus to support business requirements
- Overregulation stifles innovation
- Researches of smart contract lifecycle management
- Blockchain cloud platforms (BaaS)

Questions?