The Use of Zero Trust Architecture in Construction Data Management: Future Trends and Future Directions

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Introduction & Background

- Stakeholder relationships are built upon trust, which gives an avenue to more data insecurities in the 4IR (Syed et al., 2022).
- The adoption of digitalisation creates opportunities for hackers to breach networks (Adekunle et al., 2021).
- The attacks come from both insiders and outsiders; thus, a zero-trust architecture is always needed to verify information and user authenticity.

Aim, Objectives, and Scope

- This research aims to highlight the use of zero-trust architecture in enhancing construction data management and to identify the latest trends and key themes to increase awareness within the construction sector

Research Design and Methodology

Research Design

- Bibliometric approach

Data source

- Scopus database
- 4year review period (2021-2025)
- Keywords string used:
- "Zero Trust Architecture" OR "Zero Trust Security" AND "Data Management" OR "information Management" AND "Construction"

Output

- Initial search:100 documents
- Final filtered output: (limit to English, document type, Subject area: Engineering, computer Science, publication year)
- Final output: 57 documents

Analytical tool

Vos viewer version 1.6.19

- Publication by Country analysis
- Keyword co-occurrence analysis

Review Output

- Publication per document type
- Publication per year
- Publication by Country
- Research focus analysis (Co-occurrence keyword analysis)

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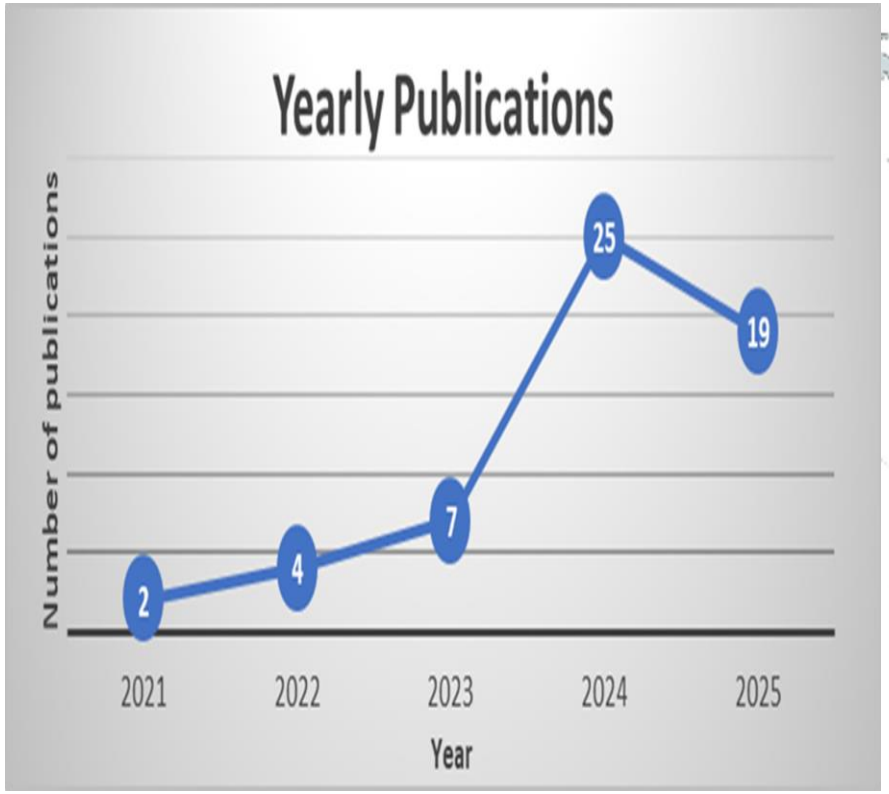
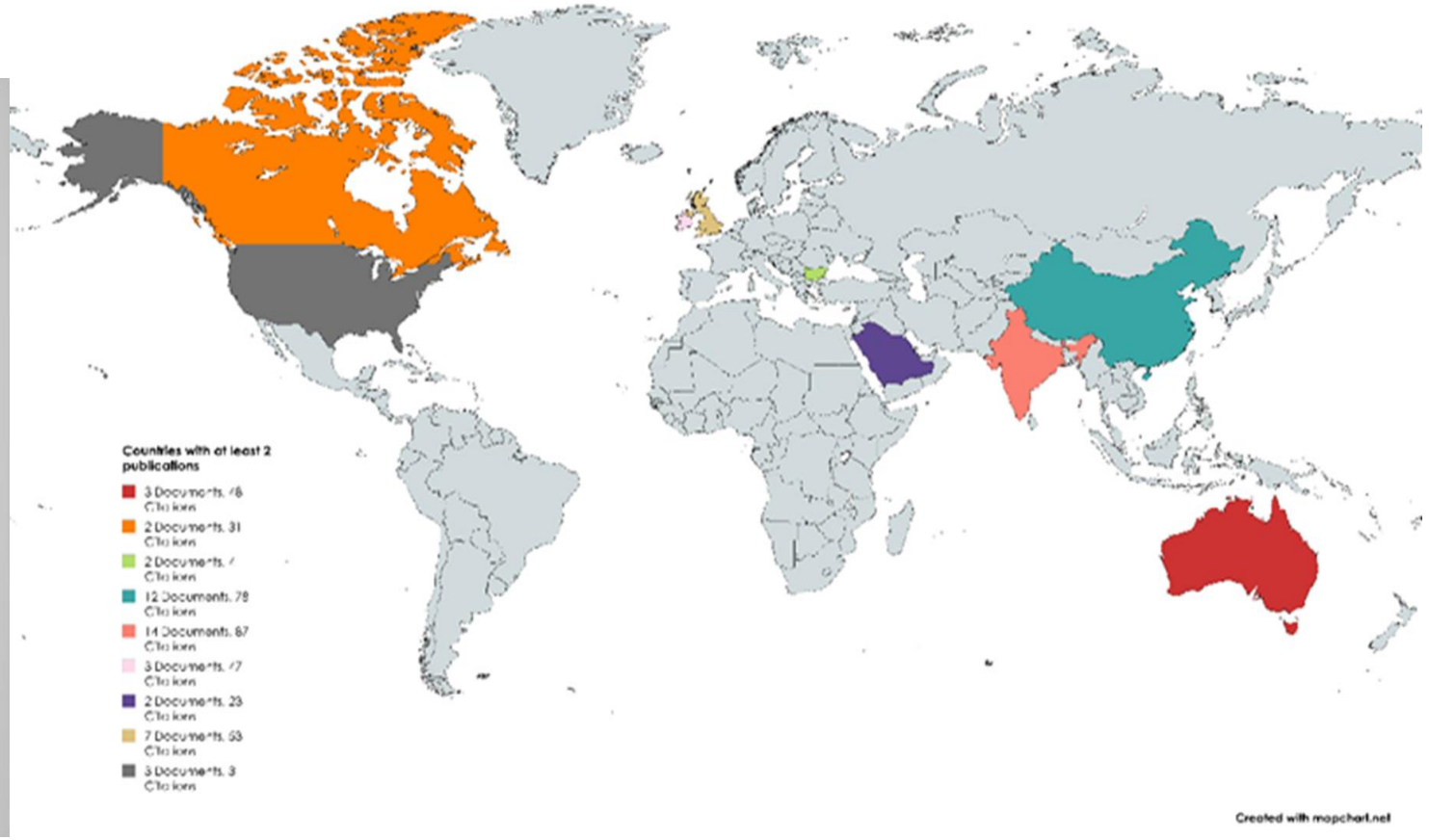
Yearly publication and Global distribution of publications





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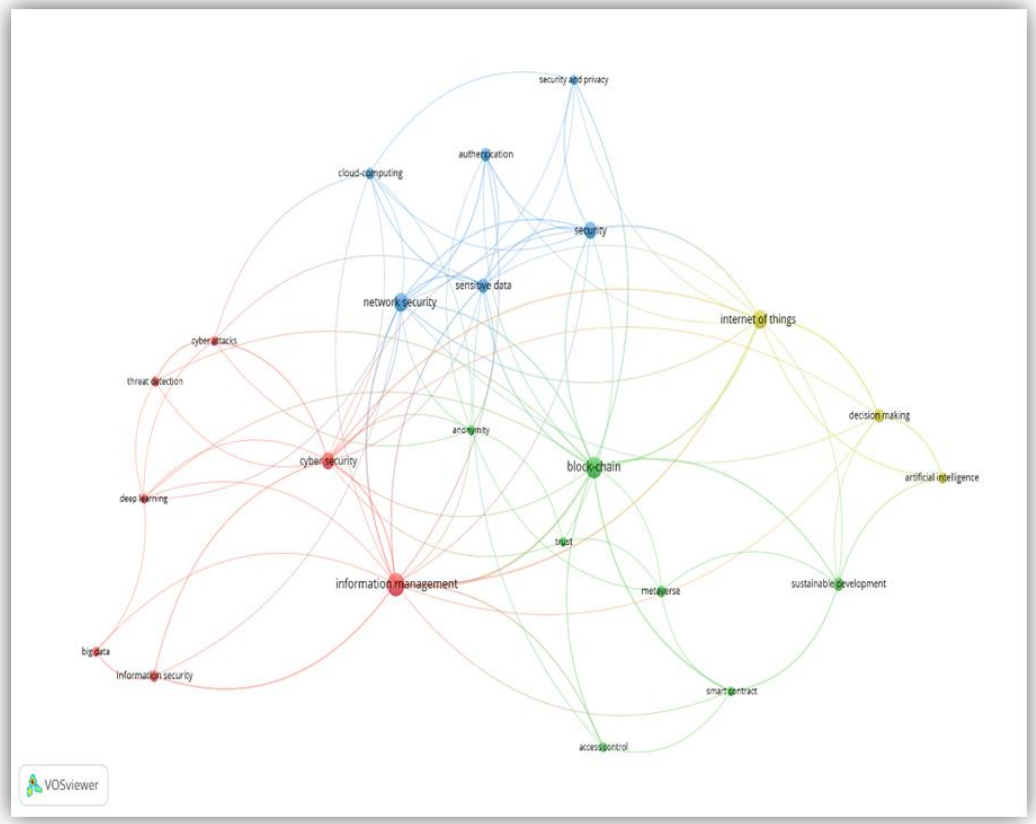
DISCUSSION- ANALYSIS OF KEYWORD CO-OCCURRENCES



Cybersecurity and Data Intelligence in Construction:

Trust, Access, and Decentralized Technologies:

Data Privacy and Cloud Security Management:

AI-driven Decision Making in IoT-enabled Construction

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REVIEW GAP/FUTURE STUDIES

- Rising cyber vulnerabilities across digital construction platforms.
- Need for structured frameworks and clear implementation strategies.
- Limited ZTA research and investment in data security in the Global South.
- Future focus: Align ZTA with industry standards, policies, and cybersecurity training.
- Promote innovation and collaboration while ensuring system resilience.
- Integrate operational and IoT technologies under a unified ZTA model.
- Develop a construction-specific ZTA framework tailored to industry workflows.

Conclusions & Recommendations

- Adopt ZTA to strengthen data security.
- Continuously evolve security architectures and tools to address emerging risks.
- Integrate ZTA with IoT, Blockchain, and AI for enhanced system protection.
- Promote training and capacity building with IT support for effective ZTA implementation.
- Encourage research (Funding)to expand the understanding and practical application of ZTA in construction.
- Develop adaptive trust mechanisms using behavioural, contextual, and device-level data for accurate decision-making.
- Formalise ZTA and BIM-Blockchain-AI systems within national procurement and reporting frameworks.

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