Cybersecurity Threats in IoT
Towards Secure, Ethical, and Resilient Frameworks

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Introduction

- 25B+ IoT devices by 2030 (Hussain, Abbas and Zeadally, 2022).
- Attack surfaces: healthcare, transport, energy (ENISA, 2023).
- Consequences: privacy, safety, national security (Cisco, 2021).

Research Question

How can integrated frameworks combining technical, regulatory, and human-centric approaches improve IoT cybersecurity resilience in healthcare and critical infrastructure sectors?

Research Problem

- Lack of standards (ENISA, 2023).
- Reactive security (Kolias et al., 2021).
- Low literacy (Finn and Shilton, 2023).
- Innovation vs security (Fjeld et al., 2020).

Aim & Objectives (1/2)

Assess vulnerabilities.

Analyse mitigation (AI, Zero Trust, blockchain).

Aim & Objectives (2/2)

Evaluate ethical/regulatory frameworks.

Propose integrated model.

Validate via case studies.

IoT Threat Landscape

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Device

Weak credentials, default passwords (Alaba et al., 2021).

●●○○○○

Network

Botnets (Kolias et al., 2021).

●●●○○○

Application

Insecure APIs, poor encryption (NIST, 2022).

How to secure your data?

Healthcare ransomware (Hussain et al., 2022).

Industrial IoT sabotage.

Transport hacks (Colonial Pipeline, Jeep).

Smart homes privacy breaches.

Mitigation & Frameworks

Threat	Mitigation	Framework
Device	Secure boot, patching	NIST IoT (2022)
Network	Zero Trust, anomaly detection	ENISA (2023)
Org	Incident response	BCS (2021)
Ethics	Transparency principles	IBM (2022)

Critical Debates

Pros

AI & blockchain breakthroughs (Correa et al., 2023).

Proactive detection.

Cons

Bias, cost, energy inefficiency (Deckard, 2023).

Governance vs industry reluctance (Finn & Shilton, 2023).

Methodology & Design

Systematic literature review (Boza, 2022).

Case studies: Colonial Pipeline, HSE ransomware.

Sources: IEEE, ACM, ENISA, NIST, McKinsey (2022).

Thematic coding & comparative mapping (Dawson, 2015).

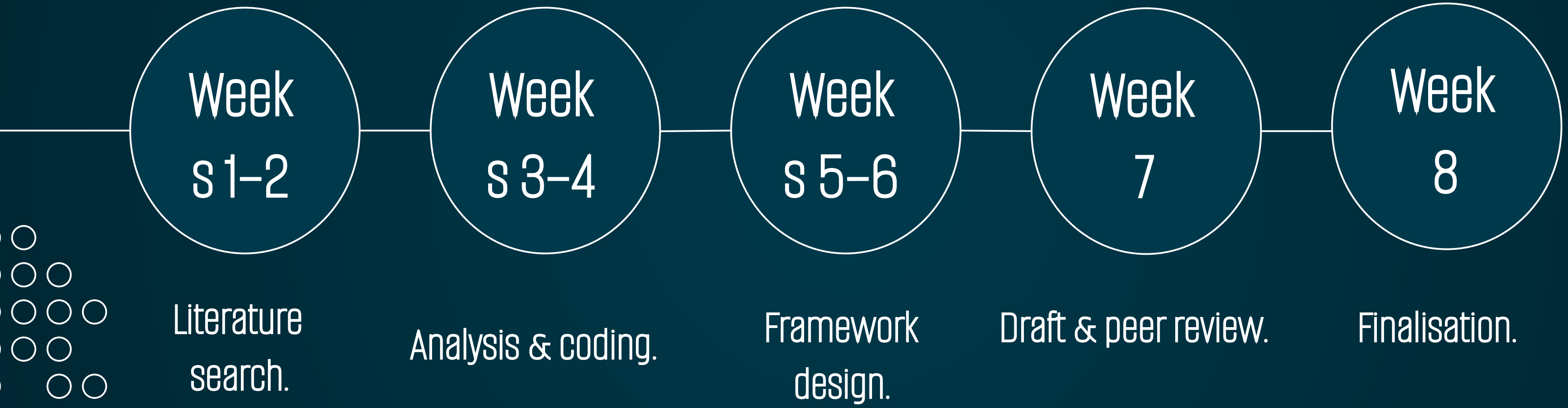
Ethical Considerations

- Secondary data only (low risk).
- Belmont Report (OHRP, 2018).
- Menlo Report (Finn & Shilton, 2023).
- Bias mitigated with inclusion/exclusion criteria (Mavroeidis & Vishi, 2021).

Proposed Artefact

- Layer 1: Device Security.
- Layer 2: Network Controls.
- Layer 3: Governance.
- Layer 4: User Awareness.

Timeline



Weeks 1–2

Literature search.

Weeks 3–4

Analysis & coding.

Weeks 5–6

Framework design.

Week 7

Draft & peer review.

Week 8

Finalisation.

Expected Contribution

Tech
Ethical
Human

Technical + Ethical + Human overlap = Multi-stakeholder Framework.

Addresses standards, awareness, proactive models (McKinsey, 2022; Microsoft, 2021).

Conclusion

- IoT = opportunity + vulnerability (ENISA, 2023).
- Security must be built-in, not bolted-on (Dawson, 2015).
- Needs cross-disciplinary collaboration (Radanliev et al., 2021).

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Thank you!