

Literature Review Plan: Microservices Architecture in Construction Industry Web Applications

1. What is the focus and aim of your review? Who is your audience?

- **Focus:** To examine how microservices architecture (MSA) has been applied in developing web applications for the construction industry.
- **Aim:**
 - To explore the benefits, limitations, and practical implementation of MSA in construction-focused web platforms.
 - To evaluate how MSA addresses specific challenges in construction IT systems (e.g. scalability, integration of tools, data heterogeneity).
- **Audience:** Academics in computer science and software engineering, IT professionals in the construction sector, and postgraduate students exploring digital transformation in construction.

2. Why is there a need for your review? Why is it significant?

- **Need:**
 - The construction industry has lagged in digital transformation compared to other sectors.
 - Current monolithic software models struggle with integration, maintenance, and scalability in complex construction environments.
- **Significance:**
 - MSA has the potential to enhance system modularity, improve DevOps integration, and facilitate better deployment of construction software tools.
 - Helps inform software developers and decision-makers in construction tech companies on the architectural approaches that best support long-term digital sustainability.

3. What is the context of the topic or issue? What perspective do you take? What framework do you use to synthesise the literature?

- **Context:**
 - The industry's increasing use of Building Information Modelling (BIM), project management tools, and collaboration platforms necessitates agile and scalable software systems.
- **Perspective:**
 - Technological and practical: examining software engineering principles applied in a real-world, domain-specific context.

- **Framework:**
 - **Thematic synthesis**, focusing on themes such as scalability, deployment flexibility, data flow, domain-driven design, security, and integration.
 - Also references **software architectural quality attributes** (e.g., maintainability, performance, reliability) to evaluate benefits.

4. How did you locate and select sources for inclusion in the review?

- **Databases:** IEEE Xplore, ScienceDirect, ACM Digital Library, Google Scholar.
- **Keywords:** “microservices architecture,” “construction industry software,” “web applications,” “DevOps in construction,” “digital transformation construction IT.”
- **Criteria:**
 - Published between 2015–2024.
 - Peer-reviewed journal articles and reputable industry white papers.
 - Case studies and empirical research prioritised over conceptual only.
 - Construction-specific systems preferred over general microservices articles unless foundational.

5. How is your review structured?

1. **Introduction and Rationale**
2. **Methodology for Source Selection**
3. **Conceptual Foundations of Microservices Architecture**
4. **Digital Challenges in the Construction Sector**
5. **Application of Microservices in Construction Web Apps**
6. **Benefits, Limitations, and Case Study Evidence**
7. **Discussion of Gaps, Discrepancies, and Future Opportunities**
8. **Conclusion and Recommendations**

6. What are the main findings in the literature on this topic?

- **Benefits** of MSA in construction software:
 - Improves modularity and enables faster development cycles.
 - Enhances integration between BIM, scheduling, ERP, and procurement systems.
 - Facilitates continuous delivery and containerization using Docker/Kubernetes.

- **Use cases:**
 - Project management platforms adopting microservices to support role-based access, document management, and real-time collaboration.
 - IoT and sensor data platforms in construction sites benefiting from service decoupling.
- **Industry tools** like Autodesk Forge and Procore beginning to offer microservice-ready APIs.

7. What are the main strengths and limitations of this literature?

- **Strengths:**
 - Rich documentation of MSA benefits in general software architecture.
 - Emerging but detailed construction case studies exist.
 - Increasing interest in DevOps and CI/CD in construction systems.
- **Limitations:**
 - Few long-term evaluations specific to construction industry.
 - Most studies are theoretical or focused on pilot implementations.
 - Lack of comprehensive data on cost-benefit analysis of migration from monolithic to MSA in this sector.

8. Are there any discrepancies in this literature?

- **Yes:**
 - Some papers advocate full microservices adoption, while others recommend hybrid models (e.g., microservices + modular monolith).
 - Conflicting results on whether MSA improves performance in low-resource environments (e.g., small firms or developing regions).
 - Debates around security risks introduced by service decentralisation.

9. What conclusions do you draw from the review? What do you argue needs to be done as an outcome of the review?

- **Conclusions:**
 - MSA has strong potential for modernising construction software, especially in supporting modular growth and integration.
 - It supports innovation and faster product delivery but requires organisational readiness and skilled DevOps teams.

- **Recommendations:**

- More empirical studies and cross-sector comparisons are needed.
- Developers should use domain-driven design and containerization strategies.
- Construction firms need to invest in software training and integration strategies to fully exploit MSA.