Literature Review Outline

Topic: Application of Microservices Architecture in the Development of Web Applications for the Construction Industry

(Research Methods and Professional Practice)

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1. Introduction

1.1. Focus and aim

To evaluate the applicability and effectiveness of microservices architecture (MSA) in web applications tailored for the construction industry. It intends to examine how MSA mitigates problems related to scalability, agility, integration, and collaborative digitization.

1.2. Audience

Academics, IT system designers, construction technology software developers, and construction company executives considering adopting digital tools into their processes.

1.3. Purpose and significance

There is an emerging trend of embracing digital transformation in construction. Outdated monolithic systems are often overly rigid and perform poorly. MSA appears as such an alternative that provides modularity, fault tolerance, and continuous deployment, which is essential in ever-changing construction environments.

1.4. Methodology of Application of Microservices Architecture in the Development of Web Applications for the Construction Industry.

1.4.1. Databases consulted: IEEE Xplore, ScienceDirect, ACM Digital Library, Google Scholar
1.4.2. keywords used: “microservices architecture”, “construction software”, “DevOps construction”, “cloud native construction apps”, “web applications architecture”, “modular systems in construction”, “BIM microservices,” “IoT construction platforms”

2. Conceptual Foundations

2.1. Definition of Microservices Architecture (MSA)
Core principles: division into separate units, independence of each service, alignment to a business function, and distributed control.

2.2. Evolution from monolithic to microservices

Alongside monolithic and SOA comparisons; increased flexibility of deployment and isolation of failures from other services.

3. Construction Industry’s Technological Demands

3.1. Construction’s digital transformation

Adoption of cloud tools, BIM, IoT, and AI for resource planning, allocating project tasks, and ongoing monitoring.

3.2. Typical web application needs

Remote collaboration features, integration with other data silos, offline settings, and mobile devices access.

4. Microservices Applications in Construction

4.1. Real-world implementations

Containerized applications such as Autodesk Construction Cloud, Procore, and Trimble Connect Docker with API gateways and CI/CD pipelines.

4.2. Domain-specific functions supported

Scheduling, document control, procurement, sensor analytics, safety analytics.

5. Analytical Framework to Synthesise

5.1. Evaluation dimensions

Their scalability, maintainability, speed of deployment, team self-sufficiency, and system robustness.

5.2. Framework perspective

Technical and architectural view of a cloud-native system designed using Agile DevOps paradigm principles.

6. Findings

6.1. Positive outcomes

- Expansion of service coverage
- Compatibility and ease of integration with current systems
- Agile workflows with frequent changes/ updates
- Increased reliability and fault tolerance 6.2. Common limitations
- Considerable baseline intricacy
- Insufficient availability of DevOps professionals in the building industry
- Maintaining expeditious and effortless migration from outdated systems, along with financial impacts

7. Strengths and Limitations

7.1. Strengths

- Well-defined architectural theory foundation
- Abundant cross-industry case studies
- Early incorporation of adoption in construction software products

7.2. Weaknesses

- Few empirical investigations conducted within construction-specific settings
- Absence of concrete set of criteria
- Weak discourse regarding telemetering field devices and integration that doesn't rely on the internet

8. Discrepancies

- Dispute regarding additional operational intricacy versus modular benefits
- Opposing assessment of cost-efficiency for SMEs
- Diversity in cited increments in ability to scale

9. Conclusion and Recommendations

9.1. Conclusions drawn

Adoption MSA greatly aligns with organizational software requirements dominated by contemporary practices in construction industry, where theoretical advantages are appealing but tangible evidence is lacking.

9.2. Recommendations

- Develop services and infrastructure for cloud computing and DevOps
- Employ gradual methods for outdated systems
- Promote collaborations for pilot studies
- Carry out in-depth case studies

10. References