Research Proposal Outline

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

(Research Methods and Professional Practice)

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Slide 1: Title Slide

Review Title:

Application of Microservices Architecture in Construction Industry Web Applications Development

Slide 2: Introduction

- ✓ Digital transformation in construction industries entails a range of new digital technologies that merge with existing fields.
- ✓ Focuses on Microservices Architecture (MSA) as a modular scalable design strategy for software development.
- ✓ Explore the extent to which MSA fulfils construction-specific demands and requirements during web application frameworks development.

Slide 3: Research Aims and Questions

- ✓ In what ways does the MSA enhance construction web application scalability and maintenance?
- ✓ What are the systemic socio technical architectural difficulties, organizational issues as well as intra-team communication barriers within construction?
- ✓ How do systems designed using MSA integrate ensure seamless real-time collaboration?

Slide 4: Background And Context

- ✓ The traditional construction industry's software solutions tend to be both monolithic as well as fragmented.
- ✓ Increasing sophistication of project management and BIM (Building Information Modelling).
- ✓ Adoption of DevOps driven cloud-native construction IT trends.

Slide 5: Methodology and Source Criteria

- ✓ IEEE Xplore, Scopus, ACM Digital Library and Google Scholar.
- ✓ Microservices in Construction, Web Applications in ConTech, MSA for BIM.
- ✓ Peer-reviewed journals alongside grey literature industry reports and case studies published between 2015-2025.

Slide 6: Overview Of Microservices Architecture (MSA)

- ✓ Definition – Services that are adequately decoupled from each other such that they can be deployed independently without coordination at system level.
- ✓ Advantages over monolithic systems include improved modularity, enhanced scalability reinforced resilience.
- ✓ Technologies used: Docker, Kubernetes, REST APIs, gRPC

Slide 7: Use Cases in the Construction Sectory

- ✓ Planning and scheduling apps (e.g. Trimble Connect real-time collaboration tools Autodesk Construction Cloud)
- ✓ Collaboration in real-time throughout the project lifecycle.
- ✓ Clash detection alongside IoT-enabled integration with BIM systems.

Slide 8: Benefits for Web Applications in Construction

- ✓ Ease of Integration: Incorporate complex systems such as models, enterprise management systems and even CRM platforms or sensors.
- ✓ Flexibility: No downtime during upgrades due to continual deployments.
- ✓ Growth: Individually scale services based on the load for each project.

Slide 9: User and Stakeholder Needs

- ✓ Stakeholders: Project managers, architects, contractors, site engineers
- ✓ Requirements: Access in real-time as well as offline, comprehensive error management
- ✓ APIs specific to the domain are required alongside a need for user-focused design.

Slide 10: Innovations Enabled by MSA

- ✓ Smart dashboards for measuring KPIs relevant to the projects.
- ✓ AI/ML microservices designated for risk or cost estimation predictive services.
- ✓ Real time communication service APIs.

Slide 11: Architectural and Technical Challenges

- ✓ Service orchestration complexity along with proper monitoring set up.
- ✓ Need sophisticated CI/CD pipelines.
- ✓ Inter-service communication (example: over HTTP) causes performance bottlenecks.

Slide 12: Organisational and Adoption Challenges

- ✓ Systems built on older paradigms which do not accommodate microservices.
- ✓ Absence of DevOps culture alongside microservices-knowledge gaps.
- ✓ IT staff training combined with construction personnel upskilling.

Slide 13: Policy, Compliance, and Interoperability

- ✓ Controversy surrounds standards compliance such as ISO 19650 for BIM.
- ✓ The demand unmet by proprietary interfaces needing more extensible programmable interfaces.

- ✓ Concerns regarding cybersecurity when using distributed systems alongside the structurally fragile authentication systems.

Slide 14: Critical Evaluation and Synthesis

- ✓ Literature confirms MSA enhances scalability and adaptability
- ✓ Cultural considerations and cost remain obstacles in adoption within construction.
- ✓ Practical implementations tend to be a mix of MSA with older monolithic systems.

Slide 15 Conclusion

- ✓ Master Service Agreements strongly influence construction processes shifts to digital frameworks.
- ✓ Facilitates collaborative application development that is modular and scalable.
- ✓ But it should be noted, readiness, strategy design, and infrastructure are critical success factors.

Slide 16: Suggestions and Areas for Further Development

- ✓ Focus on training DevOps specialists along with cloud architecture services.
- ✓ Within the context of MSA design, ensure systems are strategically built to embrace cross-system collaboration.
- ✓ Advocate for experiential learning through pilot projects across construction companies.
- ✓ Harmonise integration styles alongside API schemas.