

Development of an Information System Framework for Project Monitoring Using Data
Crowdsourcing in Construction Projects

Research Scholar: Anchu Ajayakumar

Supervisor: Dr. Senthilkumar V

Construction projects continue to experience schedule delays, cost overruns, and productivity losses despite the increasing adoption of digital technologies for project monitoring and control. The primary constraint is the absence of a structured understanding of the information required for effective decision-making and the fragmented acquisition of information from diverse sources during the execution phase, resulting in disorganised and inadequately handled information. Existing studies primarily focus on technology-driven monitoring solutions, with limited emphasis on systematically identifying information requirements and integrating multiple information sources. This research addresses these gaps by developing an information-centric framework for execution-phase monitoring and control.

A mixed-method research approach comprising a systematic literature review, semi-structured interviews with construction professionals, and a questionnaire survey was adopted to identify, validate, and prioritise the information attributes required for execution-phase monitoring. The validated information attributes were organised into the four primary resource domains- Men, Materials, Machinery, and Money (4Ms). Potential people, process, and technological (PPT) information sources were identified and mapped to these information attributes to develop a comprehensive multi-source information acquisition framework. The study identified 50 information attributes grouped under 10 information categories across the 4Ms resource domain. Among these, productivity, financial outcomes, planning and scheduling, resource availability, identification and specification, and exceptions and variations emerged as the key information categories for effective project monitoring and control. The findings highlight that construction monitoring still largely relies on people- and process-based information sources, while technology-based sources are used in limited and fragmented ways. Money and material attributes are primarily validated through process-based information sources, while men-related attributes are primarily validated through people-based sources. Attendance monitoring and budget tracking are more widely adopted by technology-based information sources, they exhibit limited structural integration in broader execution phase monitoring activities. The combination of process- and people-based information sources is widely accepted for construction monitoring for better reliability. The proposed framework shifts the focus of construction monitoring from technology-driven implementation to information-driven system design by establishing explicit relationships between execution-phase information requirements and their corresponding acquisition sources. A novel information source credibility score (ISCS) is defined for improving the reliability of information sources in the proposed framework. The research provides a structured foundation for designing integrated digital monitoring systems and supports data-driven decision-making by enabling systematic information acquisition through the combined use of PPT sources. The framework also provides a basis for future intelligent monitoring systems

incorporating advanced digital technologies and artificial intelligence to enhance construction project performance.