



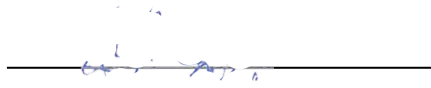
# **A Risk-Based Complexity Metric for Measuring Scope Creep's Effect on Agile Test Automation and QA Efficiency**

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A THESIS  
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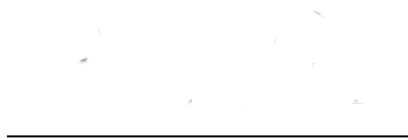
December 2025

I certify that I have read this thesis and that in my opinion it is fully adequate, in scope and in quality, as a thesis for the degree of Master of Science.



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# DECLARATION

This is to certify that the work is entirely my own and not of any other person, unless explicitly acknowledged (including citation of published and unpublished sources). The work has not previously been submitted in any form to the Sri Lanka Institute of Information Technology or to any other institution for assessment for any other purpose.

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# ABSTRACT

## **A Risk-Based Complexity Metric for Measuring Scope Creep's Effect on Agile Test Automation and QA Efficiency**

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Scope creep remains a persistent challenge in Agile software development, often leading to disrupted testing cycles, reduced automation efficiency, and compromised product quality. This research introduces a novel, risk-based complexity metric Scope Creep Impact Metric (SCIM) designed to quantify the impact of requirement volatility on Agile Quality Assurance (QA). The study also proposes a composite QA Efficiency Index to measure testing performance under changing scope conditions. A mixed-methods approach was adopted, combining statistical correlation analysis with expert validation and a retrospective case study. SCIM integrates eight key parameters, including frequency and complexity of scope changes, test coverage loss, defect trends, and execution delays. The QA Efficiency Index aggregates indicators such as defect count, detection rate, regression runtime, and test execution timing.

The findings revealed strong correlations between SCIM and QA disruption metrics, particularly test coverage and runtime. Hypothesis testing confirmed that complexity and risk severity are more predictive of QA inefficiency than change frequency alone. Based on these insights, an Adaptive Scope-Creep Risk Framework for Quality Assurance (ASCR-QA) was developed and validated through simulation. The framework enables Agile teams to detect scope-related risks early, adapt testing strategies, and allocate resources effectively.

This research contributes a structured, empirically grounded methodology for managing scope creep in Agile environments. It offers both theoretical advancement and practical tools for improving QA resilience, supporting more predictable and high-quality software delivery.

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