A Quantitative Framework for Measuring and Prioritising Technical Debt in Mission Critical Trading Information Technology Services

Research Proposal for MSc Computing Project

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1 Background and Rationale

Technical debt is a well established concept within software engineering and information systems research. It is commonly used to describe the long term cost implications of short term technical decisions. Despite extensive discussion in academic and practitioner literature existing technical debt approaches primarily focus on code level metrics or qualitative classifications. Such approaches offer limited value in complex trading information technology environments where operational reliability depends on tightly coupled services vendor platforms and infrastructure components rather than on internally developed software alone.

Trading information technology services operate under strict availability and performance requirements. Failures may lead to immediate financial loss regulatory exposure and reputational damage. However decisions regarding technical debt remediation are often made without a clear empirical understanding of how technical debt contributes to operational risk. This creates a gap between technical debt theory and its practical application within enterprise level service management.

2 Aim and Objectives

The aim of this research is to design and evaluate a quantitative framework for measuring and prioritising technical debt at the service level within trading information technology environments.

The objectives of the study are to identify measurable indicators of technical debt applicable to trading services to construct a composite technical debt score and to empirically examine the relationship between technical debt indicators and operational outcomes such as incident frequency recovery performance and change failure rates.

3 Methodology

The research will adopt a design science research methodology. A structured literature review will be conducted to identify existing technical debt concepts, measurement approaches, and suitable multi-criteria decision-making models. Based on this review, a set of service-level technical debt indicators will be defined and integrated into a quantitative decision model (such as TOPSIS) to compute a composite technical debt score. A prototype analytical artefact implementing this model will be developed to calculate technical debt scores and rank services. Anonymised historical service management data (e.g. incident volumes, mean time to repair, change failure rates) will then be used to empirically examine whether the resulting technical debt scores correlate with operational performance and risk. The framework and artefact will be evaluated through a case study in a trading information technology context and supported by expert feedback to assess methodological soundness, practical relevance, and limitations.

4 Expected Contribution

This research is expected to contribute empirically validated insight into how technical debt manifests at the service level and how it relates to operational reliability. It aims to support more informed prioritisation of technical debt remediation within mission critical enterprise information technology services.

Word Count: 417

References: