

# Working Bibliography on Architecture Evaluation

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## Introduction

This document is a bibliography on architecture evaluation, compiled for and by [ISO/IEC JTC1/SC7 WG42, Architecture](#).

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Abstract: Determining whether a system will satisfy critical quality attribute requirements in areas such as performance, modifiability, and reliability is a complicated task that often requires the use of many complex theories and tools to arrive at reliable answers. This report describes a vehicle for encapsulating the quality attribute knowledge needed to understand a system's quality behavior as a reasoning framework that can be used by nonexperts. A reasoning framework includes the mechanisms needed to use sound analytic theories to analyze the behavior of a system with respect to some quality attribute. This report defines the elements of a reasoning framework and illustrates the reasoning framework concept by describing several reasoning frameworks and how they realize these elements.

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Abstract: The architecture of a software intensive system can be defined as the set of relevant design decisions that affect the qualities of the overall system functionality; therefore, architectural decisions are eventually crucial to the success of a software project. The software engineering literature describes several techniques to choose among architectural alternatives, but it gives no clear guidance on which technique is more suitable than another, and in which circumstances. As such, there is no systematic way for software engineers to choose among decision-making techniques for resolving tradeoffs in architecture design. In this paper, we provide a comparison of existing decision-making techniques, aimed to guide architects in their selection. Results show that there is no "best" decision-making technique; however, some techniques are more susceptible to specific difficulties. Hence, architects should choose a decision-making technique based on the difficulties that they wish to avoid. This paper represents a first attempt to reason on meta-decision-making, i.e., the issue of deciding how to decide.

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Neil B Harrison and Paris Avgeriou. "Pattern-Based Architecture Reviews". In: *IEEE Software* 28 (2011), pp. 66–71. DOI: <http://doi.ieeecomputersociety.org/10.1109/MS.2010.156>.

Abstract: Software architecture reviews are effective in identifying potential problems in architectures, however, are expensive, time-consuming, and generally rely on extensive architecture documentation. An architecture review that accommodates projects with very short development cycles, minimal documentation, or frequently changing requirements could be useful if it identifies important architectural issues. We developed a useful, inexpensive architecture review method that uses the architecture patterns in a system to identify important issues in the achievement of quality attributes.

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Abstract: Long-living software systems are sustainable if they can be cost-efficiently maintained and evolved over their entire life cycle. The quality of software architectures determines sustainability to a large extent. Scenario-based software architecture evaluation methods can support sustainability analysis, but they are still reluctantly used in practice.

They are also not integrated with architecture-level metrics when evaluating implemented systems, which limits their capabilities. Existing literature reviews for architecture evaluation focus on scenario-based methods, but do not provide a critical reflection of the applicability of such methods for sustainability evaluation. Our goal is to measure the sustainability of a software architecture both during early design using scenarios and during evolution using scenarios and metrics, which is highly relevant in practice. We thus provide a systematic literature review assessing scenario-based methods for sustainability support and categorize more than 40 architecture-level metrics according to several design principles. Our review identifies a need for further empirical research, for the integration of existing methods, and for the more efficient use of formal architectural models.

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Abstract: Scenario based architectural assessment is a well established approach for assessing architectural designs. However scenario-based methods are not always usable in an industrial context, where they can be perceived as complicated and expensive to use. In this paper we explore why this may be the case and define a simpler technique called TARA which has been designed for use in situations where scenario based methods are unlikely to be successful. The method is illustrated through a case study that explains how it was applied to the assessment of two quantitative analysis systems.

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