



**Título:** Architectural technical debt calculation: a systematic mapping study

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**Resumo:**

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Context: In large-scale software systems, software architecture's complexity is challenging. As new features and bug fixes increase, it becomes more difficult to control the software complexity, increasing the effort with software maintenance and evolution. In this circumstance, Architectural Technical Debt (ATD) is one of the leading Technical Debt (TD) that causes more impact in maintaining complex software systems. Objective: We conduct a Systematic Mapping Study (SMS) to identify the cost to fix ATD items to help find what the community has been studying about it. Method: An SMS was performed based on a set of five research questions. In total, 57 studies dating from 2012 to 2020 were evaluated. Results: We found the following: (i) the three main ATD types are System-level structure quality issues, Architecture Smells, and Architectural compliance issues; (ii) the main unit of ATD measures is defined in terms of architecture smell, software architecture rules violated, complexity metrics, and modularity metrics; (iii) the main

ATD monitoring use release and version analysis; (iv) the most cited tools are SonarQube, Arcan, Understand, and many tools developed by owners. Besides, the main methods cited are source code analysis, architectural smells, and modularity violations; (v) the main way to calculate the cost to fix ATD are formulas based on time (hour, days, or months) associated with specialist evaluation and formulas to calculate effort in a release. Conclusion: The results of this mapping study can help to identify points that still require investigations on how to calculate the effort to fix ATD items..

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