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## Proposing and empirically validating change impact analysis metrics

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## **Propositions**

belonging to the thesis

### **Proposing and Empirically Validating Change Impact Analysis**

#### **Metrics**

by **Elvira-Maria Arvanitou**

1. The importance of keeping the cost of maintenance low has been highlighted in the literature with empirical evidence, suggesting that the cost of this phase is approximately 50%-75% of the total cost of software development.
2. Change Impact Analysis can be useful both before and after the application of the change. Before the application of the change, it can be useful for effort estimation, whereas after the application of a change, it can be useful for test case selection.
3. Change impact analysis is based on the quantification of change proneness and instability, and aims at making decisions on which changes to perform, how and when.
4. Although instability and change proneness are closely related concepts that can be characterized as two sides of the same coin, there may be cases in which they are not correlated.
5. Change Impact Analysis is important in all development phases, such as implementation, architecture and requirements level.
6. In the literature, Change Impact Analysis quantification suffers from three limitations: (a) there are no metrics in the architecture and requirements level, (b) some metrics exist, however they do not combine change proneness and instability, and (c) there is a lack of tools that automate the process of quantifying change proneness and instability.
7. To assess change proneness and instability, a metric selection process should be performed, based on application domain, development phase, available tools and level of empirical evidence.
8. The different characteristics of software artifacts produced in each development phase impose the introduction of a different metric for each development phase.
9. Assessing change proneness and instability should be based upon both historical data and the underlying structure of the system. Using only one of these aspects does not reach an adequate level of accuracy.
10. Although many metrics exist in the literature and many researchers claim that no further metrics are required, our work has revealed that metrics dedicated to change proneness and instability are necessary.