

A Non-Intrusive Model for Capturing Metrics for Early Project Estimation in Agile Environments

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Abstract. *Early estimation is crucial in agile projects, but a lack of detailed initial requirements often makes it inaccurate. While data-driven models improve accuracy, the absence of company-specific databases hinders the reliance on historical data. This work presents a non-intrusive model for capturing key metrics (e.g., software size) in agile settings to facilitate building these databases. The model aims to support a hybrid estimation approach that combines data-driven techniques with expert judgment. Preliminary results highlight the need for automated metric capture to enhance the reliability of early agile estimations.*

1. Introduction

Early estimation is fundamental in agile projects to ensure their feasibility, plan activities, and allocate resources efficiently. Nevertheless, initial estimates are often imprecise, as illustrated by the well-known Cone of Uncertainty [Barry et al. 1981]. This difficulty is accentuated in agile environments due to the changing nature of requirements and the priority given to the early delivery of customer value. While data-driven estimation methods promise objectivity and greater accuracy [Alsaadi and Saeedi 2022], their application in agile organizations is limited by the frequent absence of relevant historical data. Additionally, existing predictive models are often based on outdated information, lack specific organizational context, and employ non-standardized metrics [Rivera et al. 2024]. The agile philosophy, focused on maximizing customer-delivered value (as defined in the Agile Manifesto [Beck et al. 2001]), can generate resistance in teams to adopt complementary activities, such as project metric collection, if their immediate value is not evident. In this context, our research addresses the lack of non-intrusive mechanisms for metric capture, a factor that significantly hinders the adoption of hybrid estimation approaches that integrate both data and expert judgment. Therefore, the general objective of this research is to develop an inherently non-intrusive model for capturing key software metrics (size and quality) and development process metrics (effort and productivity) in agile projects, and to facilitate the creation of historical databases for hybrid estimation models to improve their accuracy and reliability. To achieve this objective, we seek to answer the following research questions:

- How can agile teams non-intrusively capture key software size and quality metrics, as well as team effort and productivity metrics, to create historical databases?

- What impact does the availability of historical data have on the accuracy of estimations in agile projects?
- How can a hybrid estimation approach that combines historical data-based methods with expert judgment be integrated into agile environments?

2. Methodology

We will conduct this research in three phases: (1) **Understanding** through a literature review and diagnosing professional practice. (2) **Designing and Calibrating** the non-intrusive capture model and its prototype. (3) **Validating and Evaluating** through a case study in a real agile environment.

3. Preliminary Results and Proposal

Preliminary findings reveal a strong dependence on expert judgment, resulting in inconsistent estimations and a scarcity of historical data for data-driven methods. To address this, we propose an automated tool that captures key metrics (size, quality, effort, productivity) nonintrusively by integrating with agile tools. This tool will enable the construction of standardized historical databases, facilitating the integration of hybrid estimation models that combine data and expert judgment to improve accuracy and reliability, utilizing automated tools and a continuous feedback mechanism.

4. Next Steps

- *Model Design*: Define key metrics, data flow, and non-intrusive integration criteria.
- *Model Extension*: Investigate the incorporation of additional data sources.
- *Implementation and Calibration*: Develop a prototype and calibrate it using post-mortem projects.
- *Experimental Evaluation*: Evaluate the model's effectiveness in an agile environment and collect team feedback.

5. Conclusions

This research proposes a non-intrusive model for capturing key metrics in agile projects. It seeks to overcome the lack of historical data and facilitate the adoption of hybrid estimation approaches. We expect this model to improve the accuracy and reliability of estimations in agile environments, optimizing planning and resource allocation.

References

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