A Practical Approach for Reliable Pre-Project Effort Estimation

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Outline

- Central research question
- Problem statement
- Solution idea
- Future work
Central research question

• How to perform a **precise Estimation** of a software development project **at an early phase** of the project / before the project begins?

• We propose a practically successful approach:
  • By **combining** the **Use Case Point Method** with the **COCOMO estimation method**.
  • By using the **Use Case Brief Method** at an early phase of the project / before the project begins.
Problem statement

• In **current state** of art model-based estimation methods utilize a combination of the **Function Point Method** and the **COCOMO estimation method** for effort calculation.
  
  • However a **thorough understanding of the requirements** of the system (that is necessary to count Function Points) can not be totally archived in early phases.

• An approach for **solving this problem** is to use the “Use Case Point Method”.
  
  • **Use case descriptions** can be provided by business experts.
Problem statement

• The classical Use Case Point Method derives effort estimates by enriching the counted number of Unadjusted Use Case Points with cost drivers.

• However the approach has following limitations:
  • The parameters of the Use Case Point Method are not thoroughly calibrated.
  • The “Project Productivity Factor” falls short of taking the non-linear diseconomies of scale into account.
  • The data required for the “Fully-Dressed Use Cases” is not available during project preparation.
Problem statement

• In modern iterative and incremental system development “Fully-Dressed Use Cases” are not available in early or pre-project phases. We suggest to rely on “Use Case Briefs” instead.

“Use Case Briefs” have following characteristics:

• The degree of detail is what we expect from a pre-project requirement elicitation.

• They are described from a business standpoint.
Problem statement

• In summary, we can identify **two major challenges** for effort estimations on a rudimentary pre-project set of requirements.
  
  • First, a need for a thoroughly **calibrated** parametric estimation model.
  
  • Second, the necessary **countable** content of use cases must be clearly identified.
Solution idea

• We propose the combination of the sizing part of the Use Case Point Method and the COCOMO estimation method.
  • By aligning use case points with the Function Point Method.

• The idea would allow a straightforward application of COCOMO II with the use cases.
  • Determination of the unadjusted use case points and conversion into unadjusted function points.
  • Transformation of the function point value into SLOC using a backfiring table.
  • Application of COCOMO II to estimate effort.
Solution idea

Example calculation:

Schofield et al. 2013:

• 161 Unadjusted Function points = 71 Unadjusted Use Case Points
• → Normalization factor: 2.27

Project to estimate:

• E.g. 250 UUCP counted
• (250 UUCP * 2.27 FP per UUCP) * 53 SLOCs per FP ≈ 30 kSLOC
• Use the kSLOC for a COCOMO II estimation
Solution idea

- However during the pre-project requirement elicitation phase “Fully-Dressed Use Cases” are not available.
  - Therefore we may use the “Use Case Briefs”.

- Therefore, we propose the following extension of the estimation:
  - Counting of the use case transactions from a business standpoint as described by the use case briefs.
  - If possible: Counting of the other systems which interact with the main system to identify more “Actors”.
  - If possible: Refining the transaction count for use cases that are on the threshold to average/complex.
Solution idea

- **Easy counting** rules for Use Case Briefs
- Estimate any project environment with COCOMO’s 22 **detailed parameters, calibrated** by a thorough regression analysis
- **Customers: evaluate bids** from potential providers, avoid falling pray to a pricing to win strategy
- **Providers: Demonstrate capability** to conduct the project within time and budget, use the COCOMO benchmark to make the offer transparent
Future work

• The proposed combination of the Use Case Point Method and the COCOMO estimation method brings in an additional conversion stage.
  
  • Companies can build up their own calibration database to gain the conversion factor.
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