Naming the Pain in Requirements Engineering

Design of a Global Family of Surveys and first Results from Germany

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| ID      | Metric (NFR)          | Description                                                   |
|---------|-----------------------|----------------------------------------------------------------|
| 01030307| Usability (NFR)       | A system component shall save user's edits whenever possible. |
| 01030301| Performance (NFR)     | The perceived response time shall not be too high.            |
Requirements Engineering in practice we have investigated

A Case Study on the Application of an Artefact-Based Requirements Engineering Approach

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Abstract

We have investigated the application of artefact-based requirements engineering (RE) approaches in practice. Our goal is to understand the challenges and limitations of using artefact-based RE in real-world projects. We have conducted a case study on the application of an artefact-based RE approach in a large software development project. The artefacts used in this approach are defined in a formal specification language and are used to support the development process.

Keywords: Requirements engineering, Artefact patterns, RE process, RE project

Introduction

Requirements engineering (RE) is a crucial activity in software development. It involves the identification, analysis, and specification of requirements. A widespread framework for RE is the four-vessel model, which is based on the concept of requirements processes [1].

Requirements engineering is a complex and challenging task. It requires a high level of abstraction and a deep understanding of the domain. The artefacts used in RE are often defined in a formal specification language, which makes them more difficult to understand and use [2].

In this paper, we present a case study on the application of an artefact-based RE approach in a large software development project. The artefacts used in this approach are defined in a formal specification language and are used to support the development process.

Field study on requirements engineering: Investigation of artefacts, project parameters, and execution strategies

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Article history:
Received 22 December 2010
Revised 25 August 2011
Accepted 7 September 2011
Available online 13 September 2011

Keywords:
Requirements engineering
Execution strategies
Artefact patterns
Field study

Abstract

Context: Requirements Engineering (RE) is a critical discipline mostly driven by uncertainty, since it is influenced by the customer domain or by the development process model used. Volatile project environments restrict the choice of methods and the decision about which artefacts to produce in RE.

Objective: We aim to investigate RE processes in successful project environments to discover characteristics and strategies that allow us to elaborate RE tailoring approaches in the future.

Method: We perform a field study on a set of projects at one company. First, we investigate by content analysis which RE artefacts were produced in each project and to what extent they were produced. Second, we perform qualitative analysis of semi-structured interviews to discover project parameters that relate to the produced artefacts. Third, we use cluster analysis to infer artefact patterns and analyse RE execution strategies, which are the responses to specific project parameters. Fourth, we investigate by statistical tests the effort spent in each strategy in relation to the effort spent in change requests to evaluate the efficiency of execution strategies.

Results: We identified three artefact patterns and corresponding execution strategies. Each strategy covers different project parameters that impact the creation of certain artefacts. The effort analysis shows that the strategies have no significant differences in their effort and efficiency.

Conclusion: In contrast to our initial assumption that an increased effort in requirements engineering lowers the probability of change requests or project failures in general, our results show no statistically significant difference between the efficiency of the strategies. In contrast to our initial assumption that an increased effort in requirements engineering lowers the probability of change requests or project failures in general, our results show no statistically significant difference between the efficiency of the strategies. In contrast to our initial assumption that an increased effort in requirements engineering lowers the probability of change requests or project failures in general, our results show no statistically significant difference between the efficiency of the strategies. In contrast to our initial assumption that an increased effort in requirements engineering lowers the probability of change requests or project failures in general, our results show no statistically significant difference between the efficiency of the strategies.
Problem Statement

- Investigations in RE **remain isolated**
- **Generalisations difficult** as no (grounded) empirical survey basis available
  - **Continuous replications** necessary to steer (problem-driven) research
Basic idea: Internationally distributed collaboration
Objectives

Establishment of an open and generalisable survey basis for RE
„Naming the Pain in Requirements Engineering“ (NaPiRE)
  ➡ Expectations and status quo in RE
  ➡ Problems and needs in RE

Approach: Structured family of surveys
  1. Yearly collaborative instrument design
  2. Yearly independent surveys in different countries
  3. Yearly collaborative synthesis and publication

Principles
  – Openness and transparency
  – Anonymity, but closed
  – Instrument based on theory and expectations
Our approach

- **Preparation**
  - Conceptualisation of research questions
  - Initial creation of questionnaire

- **Validation**
  - Internal validation
  - Implementation / correction
    - Online Survey
    - Industrial pilot
  - External validation

- **Initiation**
  - Creation of questionnaire
  - Validation
  - Preparation

- **International Replication**
  - Germany
  - Conceptualisation of research questions

- **International Communities**
  - Presentation & discussions at communities

- **Replication**
  - Creation of questionnaire
  - Validation
  - Preparation

- **Implementation / correction**
  - Survey Report
  - Final reporting

- **Synthesis**
  - Data analysis & interpretation
  - Final reporting

- **Dissemination**
  - Planning
  - Replication

- **PROMISE Repository**
  - Yearly RE Community Report
Our approach

We are here...

Actually, we are reaching this point...
In your survey, we will be interested in the following aspects:

1. **What are the expectations on a good RE?**
2. **How is RE defined, applied, and controlled?**
3. **How is RE continuously improved?**
4. **Which contemporary problems exist in RE, and how do they manifest themselves in the process?**

Here are some details on the methodology of your survey:

- **Theory of expectations based on available surveys**
- **Questionnaire with 35 questions**
  - Closed and open questions
  - Implemented via the Enterprise Feedback Suite
  - Available at [www.re-survey.org](http://www.re-survey.org) (soon)
- **Invitation of participants from existing research co-operations**
First NaPiRE results from Germany

Study population

- German companies only
- Response rate: 55% (105 invitations, 78 participants, 58 completed questionnaires)

| General characteristics                                      | Main business area                           |
|--------------------------------------------------------------|----------------------------------------------|
| Most respondents in large enterprise (median: 251-500 employees) | Custom software development 36 %             |
| Most respondents work in globally distributed settings (97 %) | IT consulting 36 %                           |
| 80 % of respondents with more than 3 years of experience    | Project management consulting 35 %           |
| 19 % customer role, 47 % role of contractor, 38 % product development | Software process consulting 31 %             |
|                                                              | Standard software development 28 %           |
|                                                              | Embedded software development 7 %            |
First NaPiRE results from Germany

RQ 1: Expectations on good RE

What do you see as a barrier for an RE reference model?

| I disagree | Neutral | I agree |
|------------|---------|---------|
| Missing willingness for change | | |
| Higher process complexity | | |
| Higher communication demand | | |
| Missing possibility for standardisation | | |
| Lower efficiency | | |

Top rated answers in follow-up questions

- RE improvement considered as most beneficial and most challenging
- Important for RE reference model: Support for agility and guidance for tailoring
- Biggest motivation for RE reference model: QA of artefacts
First NaPiRE results from Germany
RQ 2: Status quo in RE

How do you elicit your requirements?

- Workshops: 80%
- Change Requests: 60%
- Agile approaches: 50%
- Prototyping: 40%
- Other: 20%

Top rated answers in follow-up questions

- Motivation for reference model: Company-specific demands (64%)
- Tailoring: By project lead based on experiences (62%)
- Control: Constructive quality assurance (53%)
First NaPiRE results from Germany

RQ 3: Status quo in RE improvement

Motivation for an RE improvement

- Detecting weaknesses: 80%
- Expected by customers: 60%
- Demanded by regulations: 0%

Improvement methods (assessment & evaluation)

- Qualitative analyses: 80%
- Metrics: 40%

No prescriptive RE improvement

“I am not convinced of the benefits of external standards.”
First NaPiRE results from Germany

RQ 4: Contemporary problems in projects

- Interpretation: Need for agility?
- Interpretation: Need for artefact definition and QA?

Overall frequency
Cause for project failure
Summary and future work

Summary of results

• Design of family of RE surveys
  – Collaborative design of instrument
  – Establishment of infrastructure
• First results from Germany (completed)
• First replication in Netherlands (ongoing)

Next steps planned for ISERN 2013

• Synthesis of studies, publication, and disclosure of data to PROMISE repository
• Organisation of thematic workshop
  – Adjust instrument
  – Define process for replications
  – Provide infrastructure
You are cordially invited to join us!

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