

Improving an Industrial Reference Process by Information Flow Analysis: A Case Study

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Abstract. Reference processes are supposed to be the basis for collaboration and mature cooperation in software development. Large business organizations need large and diverse reference processes. However, process conformance is a constant concern. There are many explanations why a project may deviate from its reference process. This is especially true in larger software companies with a lot of different projects and variants modeled in a single reference process. During an industrial cooperation we have identified a phenomenon that adds to the problem: Unclear and incorrect information flows. Process modeling notations and practices in many large organizations nurture information flow anomalies. We improved the information flows in the reference software process by means of information flow analysis and flow patterns. A comprehensible reference process with reasonable information flows is easier to understand and therefore gains acceptance in the project team.

1 Introduction

Mature software organizations define and maintain software development processes based on CMMI [1] or SPICE (ISO 15 504). Modeling a reference process for software projects is a mandatory task in maturing environments. However, reference process models generate new problems. Correctness and conformance have been concerns for many years.

In this contribution, we report on collaboration with a financial institution. We were asked to check and improve their large reference process model. During that work, we identified an interesting class of problems that we traced back to information flow anomalies. We applied information flow analysis to tackle the problems.

The implementation of a large software development reference processes is difficult in itself. Challenges include:

- **Complex, unclear, incomprehensible reference processes:** To cover every intended use many processes tend to be complex. More documents and possible branches are modeled rather than keeping it simple and understandable. Unfortunate name assignments as well as sloppy descriptions make processes and

activities unclear. Furthermore the information flows are obscure. Complexity and the lack of clarity as well as badly designed information flows lead to incomprehensibility of the processes.

- **Unrealistic requirements:** Many processes require a lot of documentation work. Almost every activity demands a document as a result. Most of the time this is due to the fact that most process modeling techniques lack the ability to represent the flow of information in other representation media than documents. The reference process analyzed in our case study requires each and every project to produce between 60 and 165 documents.
- **Inflexible reference processes:** Since processes are designed to fit many needs they are often neither suitable for large nor for small projects. That is the reason why tailoring is needed before each project.
- **Faulty reference processes:** Reference processes are faulty in two ways: syntactically and semantically. Syntactical mistakes are caused by not following modeling standards and guidelines, unthoughtful modeling or insufficient support of the notation by the modeling tool. Semantic mistakes like multiple preparations of identical contents or parallel alteration of the same information are caused by e. g. distributed modeling and missing interface coordination. Hence, information flows are not only obscure but also faulty.

At least some of these problems can be found in most reference software development processes. As a consequence, many reference processes are not accepted by project teams. We analyzed such a software development process in a case study at an information technology service provider in the financial sector. We tried to narrow the gap between reference and actual processes by means of information flow analysis. Optimizing the information flows of a process leads to a more comprehensible and sound process which again affects its acceptance positively. The basic concepts of information flow analysis will be described in the following section.

2 Information Flow Analysis Concepts (FLOW Project)

In this section the basic concepts of information flow analysis are presented, as far as they are needed to understand the case study described in section 3. A detailed introduction can be found in [2, 3]. Our FLOW project was initiated at the Leibniz Universität Hannover in 2004. Besides the information flow analysis, FLOW is concerned with active strengthening and coordination of flows. We develop specific techniques and tools that improve information flows [3, 4]. However, these aspects are beyond this paper.

2.1 Goals of Information Flow Modeling

Information that flows in a process or project is modeled to accomplish several goals:

- Reflection and manual analysis by experts helps to remove flow anomalies and to shape information flows more adequate.
- Some anomalies can be described as information flow patterns. Pattern search can then be semi-automated.