A model-based proposal for integrating the measures lifecycle within the process lifecycle

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Abstract. Software development process (SDP) is a complex and long endeavor, the quality and management of this process affect the quality of its results. Measuring the SDP is essential to gain insight on its performance and to discover improvements. This work proposes to use Model-Driven Engineering (MDE) paradigm to integrate the measures lifecycle within the process lifecycle in order to explicitly and operationally model measures during the process modeling. Also defines transformation rules to derive executable code to run these measures into enterprise tools in order to support the measures lifecycle.

Keywords: Software development process. Modeling. Measurement. MDE.

1 Introduction

Software development is a long, complex and expensive process, this process does not only produce the final product, but also many intermediate artifacts. Furthermore, the quality of these products directly relates to the quality of the SDP [1]. Defining and executing the SDP as a sequence of work activities promotes its management, which in turn is necessary to achieve the estimated quality, cost and time. In this context, process measurement is one of the main activities of the process management which involves: defining, measuring, controlling and improving the process [2].Due to the complexity of SDP, the use of Process Modeling Languages (PML) [3] [4] [5] has become increasingly important to describe the process, also to ensure the common understanding of its inputs, activities, and outputs, among all participants.

After reviewing these PML ,we found that there are a lack of defining and modeling the process measures in an operational form [6]. In this context, our proposal aims to integrate the measurement into the process lifecycle [7] by considering the measurement issue during the process definition, modeling, deployment, execution, monitoring and improvement. This integration is necessary to evaluate the pro-

cess execution for its monitoring, control and continues improvement. Next section presents an over view of related works, Section 3 introduces the starting hypothesis and then our proposed solution is described in Section 4.Finally, Section 5 presents the conclusions.

2 Related works

As a preliminary step, we have conducted a systematic mapping study of the literature [8] to gain knowledge about the state of the art in this area. However, this section provides a brief description of model-based proposals for defining and measuring processes.

Authors of [9] present a meta-model based proposal for software process modeling which does not define the measures as a process element but mention the necessity to measure the process in order to monitor its execution. In [10], authors propose a framework to measure any software entity (e.g. process model) based on the meta-model that represents them, but it does not address the process execution aspects (e.g. time measurements). In [11], authors define a meta-model to model measures, but it does not define the measures explicitly in the process model, does not consider the manually collected measures, neither the process artifact measurement. In [12], authors propose a meta-model and tool for the definition and analysis of process indicators. The measure definition could be enriched to support the operational definition of the manual and automatically collected measures. In [4] authors present a meta-model to define the SDP which defines the measure as a process element. The proposal derives the process execution model from the definition model, but the resulting model does not include the measure elements defined in the definition model.

Moreover, there are other proposals to define processes that are widely used in industry (e.g., BPMN [5]). Although BPMN does not define the measures as a process element, there are tools that provide some support for the measurement. In [13], we demonstrate the lack of measurement support in these systems. One of the main reasons for this situation is the absence of measurement as an element in the process definition language. These academic and industrial efforts fail to integrate the measurement into the process lifecycle in the way that allows the operational definition of the measures to support its collection, analysis and exploiting the results.

3 Starting hypothesis

Defining and integrating the measures into the process model in an unambiguous and comprehensive form (i.e. provide the necessary information to describe, collect, store, analyze and use the results) enhance the process documentation and the understanding between the process participant, also allow the process modeler to recommend a set of measures to be carried out during the process execution, furthermore, ensure the correct implementation, collection and analysis of these measures, additionally, including the process measures within the process model support the quick evaluation of the process modification proposals, another advantage of this integration is performing design time analysis of the measures and support the process simulation.

This thesis is continuation of previous doctoral theses conducted by members of the IWT2 research group. These previous thesis address different aspects of process management (e.g. MONETA[14], PLM4BS [4])[1]. However, the process measurement aspect has not yet been studied. This work investigate the possibility of using MDE to develop a theoretical framework supported by tools to integrate the process measurement lifecycle into the process lifecycle.

4 Proposed solution

This section introduces the main objectives of the proposal and the identified activities to achieve them:

1. Select and define the measure operationally. It aims to provide a guide for the process analyzer and modeler to select and define the appropriate process measures. The planned activities to achieve this goal are: 1) Investigate on the measurement selection and definition methods, 2) Investigate on the definition criteria.
2. Develop a process definition meta-model. Aim to support the operational definition of the measures; by defining the necessary attributes, relations and constraints, the planned activities are: 1) Study the meta-models available in the literature and investigate how to enrich it to support the measurement definition. 2) Study the necessary changes on the process elements (e.g. activities) to allow its measurement.
3. Develop a process execution meta-model. The execution meta-model is necessary to allow the process execution. The identified activities are: 1) Study the available execution meta-models and investigate how to enrich them to support the measure elements and the measurable process elements (e.g. activities). 2) Develop a transformation rules to derive the execution model from the definition model, considering the measurement.
4. Derive the database model. Develop transformation rules to derive the measurement database from the process definition model.
5. Exploitation and reporting. Developing a tool to support the reporting and visualization of the measurement data and its analysis results.

5 Conclusions

This proposal aims to develop a MDE based solution to support the measurable execution of the SDP, by integrating the measurement lifecycle into the process lifecycle. The solution allows the process designer to define the measures during the process modeling, include the measurement in the execution model, and support the generation of the database necessary to store the measurement data, also visualizing the measurement data to discover the improvement opportunities.

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[1] For more information: http://iwt2.org/en/group-activities/research/results/

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