

Chapter 10

Complementing Business Process Verification by Validity Analysis: A Theoretical and Empirical Evaluation

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ABSTRACT

This paper investigates the need for complementing automated verification of business process models with a validity analysis performed by human analysts. As business processes become increasingly automated through process aware information systems, the quality of process design becomes crucial. Although verification of process models has gained much attention, their validation, relating to the reachability of the process goal, has hardly been addressed. The paper investigates the need for model validation both theoretically and empirically. The authors present a theoretical analysis, showing that process model verification and validation are complementary in nature, and an empirical evaluation of the effectiveness of validity criteria in validating a process model. The theoretical analysis, which relates to different aspects of process model quality, shows that process model verification and validation are complementary in nature. The empirical findings corroborate the effectiveness of validity criteria and indicate that a systematic criteria-supported validity analysis improves the identification of validity problems in process models.

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INTRODUCTION

As business processes become increasingly automated through process aware information systems, the quality of process design becomes crucial. In the life-cycle of a business process, designed process models can be transformed into executable process models (Zur-Muhlen & Rosemann, 2004). As is the case with artifacts in various domains (e.g., software, product, service), problems are easier and cheaper to fix at the early development phases than afterwards (Bray, 2002). Furthermore, unattended design flaws will result in an execution model which preserves the same flaws.

In the area of software engineering, quality assurance entails validation and verification. Validation, often referred to as “building the right system”, relates to whether the system meets the customer’s requirements, while verification, often referred to as “building the system right”, addresses the technical correctness of the system’s operation (Sommerville, 2007).

In analogy between software functional requirements and the goal of a business process, validation of a business process can relate to its ability to achieve its goal. However, most process modeling languages do not entail a goal construct. Rather, they mainly focus on control-flow structures. As a consequence, the main focus of quality assurance in process modeling has been on verification of structural properties of process models.

The verified properties stand for the model’s ability to be executed without reaching situations where the execution cannot complete (e.g., deadlocks, livelocks). Algorithms have been developed for verifying the existence of these properties in process models, usually related to specific modeling languages. Currently there is a variety of verification techniques which can automatically be applied to a designed process model. However, while these can be applied to a process model based solely on its structure, validation of the model requires the understanding of the business domain (van der Aalst, 2002; Sadiq et al., 2004).

Typically, a process model can be validated by domain experts through simulation (Aguilar-Saven, 2004). However, this requires the process to already be implemented in some simulation tool and does not support the early phase of design. At that phase, validation can only be accomplished as a human based task. Since, as mentioned, most process modeling languages do not entail a goal construct, no structured validation procedure is practiced, thus the task remains to the intuition and common sense of the human analyst. In many cases validation per se is ignored, and verification of control-flow properties is considered as sufficient for determining whether the quality of a process model is satisfactory.

Goal-oriented approaches to process design (e.g., the Generic Process Model – GPM) (Soffer & Wand, 2004, 2005) entail criteria for goal reachability (also termed process validity) in a process model. However, these criteria are theoretical and abstract, and do not constitute a structured methodology to be followed. Furthermore, they are still not widely accepted in practice. The application of these criteria relates to the business logic of the process rather than to its structure. Currently, it is only based on human reasoning, not supported by automated algorithms.

This paper investigates the need for improving the current support to business process validation at design time. In particular, it investigates whether the commonly practiced verification needs to be complemented by validation based on goal reachability. As mentioned, validity criteria address goals, but can be applied by humans rather than in an automated manner. In contrast, verification methods can be performed automatically but without explicitly addressing goals. Hence, we propose to use the validity criteria while the process is being designed, and complement them with an automated verification of control flow properties.

We show that this combination is needed as follows. First, we theoretically analyze and compare the validity criteria and the verification-related properties, and show that they are complementary

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