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# Modeling Test Cases in BPMN for Behavior-Driven Development (Extended Abstract)

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**Abstract:** Validating analytical business processes and testing executable ones are difficult task in process development projects. Within the project Terravis, which builds a process hub for enabling fully digitalized mortgage processes between Swiss land registries, banks, notaries and other parties, these tasks became problematic. For improving stakeholder communication and extending the test scope, behavior-driven development was adapted to BPMN and business processes. This technique was introduced and very well received within the project, leading to better process documentation and better tests.

**Keywords:** BPMN, Process Elicitation, Business Process Modeling, Scenarios, Model-Driven Testing, Behavior-Driven Development

## 1 Introduction

Business Process Modeling is a challenge in practice: Many stakeholders need to be interviewed and their opposing views integrated into one target solution. The project Terravis [BLM14] faced this problem heavily when it started to build a process integration platform for all land registry-based business throughout Switzerland. Prior to this project, there was no overall process description on how mortgage-related business processes, e.g. increasing an existing mortgage because a bank customer wants to increase his/her loan for repairing the roof, are executed. Cantonal laws differ so that there was and still is no Swiss-wide homogeneous solution, banks and involved notaries conducted business differently and non-standardized. The financial crisis increased the pressure on the banks to operate more cost-efficiently in 2009. One possibility was to digitalize the business that was completely paper-based before.

Digitizing business processes meant to first understand the different variations of the same business process especially taking into account the cantonal legislature and different notary systems. The second step was to standardize the processes and used documents as much as possible before they were implemented in the Terravis Process Hub. Such an endeavour meant designing and especially validating the new business processes with all stakeholders that up to this point were not confronted with any BPM-related project nor had prior knowledge of BPMN.

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The Process Hub consists of a central BPMS running executable business processes and a Web application that can be used to start and control running processes. Alternatively, all stakeholders can integrate via SOAP services.

This extended abstract will summarize the original paper [LvL16] describing the Behavior-Driven Development (BDD) Approach to find a practical way to validate new business processes and build executable test cases for Terravis efficiently.

## 2 Motivation

Terravis was in production for 3 years before first problems required a new approach to process modeling and testing. The platform grew and processes got more complex [Lü15]. Feature Requests came in via email and were not documented in appropriate quality in the existing process models. Also the impact of these changes were more and more unclear because very often stakeholders did not express enough constraints and clear business rules for the change scope. The communication between process stakeholders and the development team got interrupted, which is a common problem [SR16].

One essential change in Terravis' environment led to a new approach to process validation and testing because it significantly increased the number of test cases:

Banks started to integrate their core systems to enable process integration with Terravis. However, two standard-banking-solution providers supported only an older version of the service interfaces. This in turn led to two new huge-impact features.

The first feature was multi-version support. When a new service version became available, external systems might use either the new or the old version. However, not all the necessary components could be tested with the Web application before because it supports only the newest service version. So, system tests conducted through the Web application cannot catch defects in the version transformation component.

The other requested feature was multi-channel capability. The banks realized they could not rely only on their systems' capabilities. In order to access new features that are only available via the new service versions, they had to use the Web application. This meant that processes can be started via either the Web application or the integrated system and are "sticky", i.e. all messages for that process instance are routed to the initiating system. However, the multichannel feature also could not be tested with the Web application alone.

The new approach needed to enable the testing of the new architectural features, provide test automation and increase process documentation quality as well the ability of the project to validate business process descriptions.

## 3 Approach

We decided to use a modified Behavior-Driven Development (BDD) approach. BDD [No06] is an evolution of Test-Driven Development (TDD) [Be03] that also integrates elements

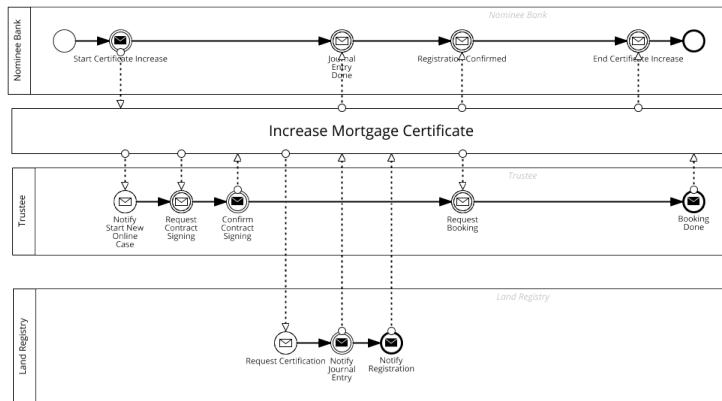


Fig. 1: Simple BPMN Test Case [LvL16]

from Domain-Driven Design (DDD) [Ev03]. While the roots are for sure in the field of software development, the approach is well-suited for business process design and modelling. Instead of the traditional Given-When-Then-structure for describing system behavior, the modified approach uses BPMN [SR09] scenarios.

A *scenario* is a completely sequential and deterministic business process model. Collapsed pools represent the process or the system to be described/tested and all process participants are modeled as pools exchanging messages with the test subject. A sample test case is shown in figure 1.

Test Data and Assertions from a business point of view, which are also useful for discussing and validating the business process with stakeholders, are added as documentation to the BPMN elements.

The free text is not completely free, but must conform to templates. These templates are defined according to the needs of the scenarios by the process developers. The same is done for the assertions. Finally, the pools and messages are mapped to WSDL the WSDL constructs Services, Porttypes, and Operations.

These mappings are used by a generator for generating an executable BPELUnit test suite [Lü07]. BPELUnit is the framework already used for unit testing all processes and using it for other SOAP-based tests was a natural choice. However, the conceptual approach is independent of BPELUnit and even WSDL & SOAP.

The project has adopted the new approach and modeled test cases for the 10 most frequently used process variants. Because the test cases are independent of any technical details, the test cases can be used with other technical mappings for different service versions. They are successfully integrated into the nightly build and test the current process implementations together with the current service and infrastructure implementations (e.g. ESB, digital archive, document generation, ...).

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## 4 Conclusions & Outlook

The BPMN-based BDD approach uses scenarios modeled in BPMN with text-based descriptions of exchanged messages and assertions. It was very well received in the project Terravis and really allows BPMN to serve as a “lingua franca”: BPMN is not only used for formulating an analytical model that is further refined into an executable model but it is also used for describing easy to understand scenarios that are also executable test cases.

Besides the technical motivation of developing well-understood test cases, the scenarios serve a validation and documentation purpose: The process documentation is made understandable for non-BPMN people and can be used in workshops to discuss process steps and variants. The project now establishes more and more test cases for existing processes.

All new processes are documented with scenarios for getting an analytical validation from all stakeholders before they are transformed into executable test cases by the development team. All test cases are executed daily as part of the nightly build.

We have received feedback to this approach by both industry and academia. Further formalization and conceptual support for other integration technologies like REST services are the next possible research steps.

The work summarized in this extended abstract has been published in [LvL16].

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