

# Cognitive Process Designer - An Open-Source Tool to Capture Processes according to the Linked Data Principles Demo Paper

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**Abstract.** Processes need to be captured in a structured way in order to analyze them by using computer-assisted methods. This circumstance becomes more important as the process becomes complex. Although there are standardized formats, they do not capture semantics of input/output parameters, involved persons or references to external data sources. Existing solutions provide tools to capture processes locally and specify new properties to extend the semantics of process languages. However, a collaborative platform to capture, discuss and share information is more advantageous, because processes are usually used and maintained collaboratively. In addition, users cannot define own semantics for their use-case scenarios and the proposed semantics and processes are not published according to the Linked Data principles. To address these problems we 1) provide an open-source tool to capture BPMN processes graphically in a Semantic MediaWiki; 2) allow users to define own semantics and 3) publish the information according to the Linked Data principles.

**Keywords:** Process Modeling, Semantic MediaWiki, Business Process Model and Notation, Semantic BPMN, Semantic Annotations

## 1 Introduction

Process modeling languages are mostly graphical representations, which capture workflows. However, processes must be available in a structured way in order to analyze and optimize them. Semantic information like input/output parameters, involved persons, conditions or references to external data sources can improve analyzes of processes. Although, there are standardized formats that represents the graphical representation of process modeling languages and allow to share them, they do not capture semantic information.

Existing solutions allow to capture semantics partly, however, they do not publish the information according to the Linked Data principles<sup>1</sup> and do not run

<sup>1</sup> <https://www.w3.org/DesignIssues/LinkedData.html>

in a collaborative platform [1]. However, the analysis of process models and its elements can profit from including semantic information [2, 3].

Processes are usually used and maintained collaboratively. Therefore, a collaborative platform, which captures processes and its semantic information, is preferable. The constantly availability and easy accessibility of the World Wide Web provides the basis for a collaborative platform, in which multiple persons can accumulate, share, discuss and edit processes, as well as information about them.

To this end, we present a graphical editor to capture Business Process Model and Notation (BPMN) processes and semantic information about them in a Semantic MediaWiki [4] (SMW)<sup>2</sup>, which serves as a collaborative platform. In particular, our tool allows to 1) create, import and export BPMN processes – ensuring proposed standard formats for a facilitated communication with other tools, 2) editing already existing BPMN processes in Semantic MediaWiki – allowing to add, edit and delete BPMN process, 3) annotating BPMN processes – enriching BPMN elements with semantic information.

## 2 Motivation

We want to use Semantic Web Technologies and already existing contributions to model, store and access information about processes for enabling people to use the information for analyzing processes.

We used Business Process Model and Notation (BPMN) as modeling language. The main reason is that BPMN is proposed as a standard by the Object Management Group (OMG) in 2008. Currently, the latest available version of BPMN is 2.0.2, published in ISO/IEC 19510<sup>3</sup>. In addition, BPMN is not restricted to a specific domain.

There are many ontologies for BPMN 2.0 available [5–7] that allow to capture the semantics in processes and include meta-information. Among others, there is a BPMN Ontology from the Data & Knowledge Management (DKM) research unit<sup>4</sup>, which has a very detailed formalization of the BPMN 2.0 specifications in OWL 2 DL [8]. We follow an approach of reusing existing standards and approaches and therefore, want to allow to reuse such existing ontologies.

Once the information is modeled and structured according to existing ontologies, the process and the related information is available for different purposes. The graphical presentation of the process allows people, especially non-technical people, to understand the workflow of the process.

Besides this, analysts can use the available structure data and retrieve information from the process. Thereby, especially the semantics allow to retrieve information, which could not be queried before, and therefore help to analyze a process in very detail. The information can among others be used to perform statistical analyses on processes like correlation tests to indicate crucial parts

<sup>2</sup> <https://www.semantic-mediawiki.org>

<sup>3</sup> [http://www.iso.org/iso/catalogue\\_detail.htm?csnumber=62652](http://www.iso.org/iso/catalogue_detail.htm?csnumber=62652)

<sup>4</sup> <https://dkm.fbk.eu>

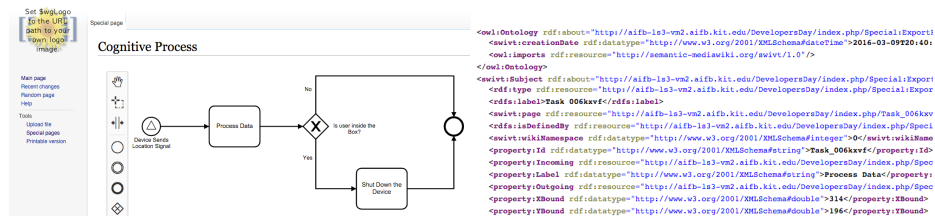
of the process, train models for predicting the outcome or perform similarity analysis for compare different processes.

### 3 Cognitive Process Designer

We use a Semantic MediaWiki to store process models and meta-information and providing them as Linked Data. For modeling and annotating BPMN processes, we developed an extension to SMW, called Cognitive Process Designer<sup>5</sup>, that allows to model BPMN processes graphically in Semantic MediaWiki. Each element of the BPMN process (node and edge) has its own wiki page, and therefore unique URI, that stores information about the element. SMW publishes the information according to the Linked Data principles. Therefore, the information is published by using standard format like RDF, which can be accessed, queried and interlinked. Figure 1 shows an exemplary process, modeled with Cognitive Process Designer, and an extraction of the semantically available information.

Cognitive Process Designer provides an interface to Semantic Forms, which allows to capture and store meta-information about the BPMN process and its elements by using forms. The graphical user-interface and the provided forms make it also for non-technical users possible to enter process models and related information.

Cognitive Process Designer interacts with each modification of the diagram with the MediaWiki API in order to change the information on the wiki page of the corresponding element. For the communication with the MediaWiki API, we use an asynchronous communication so that users do not have to wait for the response, which makes the tool more user-friendly. Besides creating and loading



**Fig. 1.** The left figure shows a BPMN process, modeled by using Cognitive Process Designer. The right figure shows the formal representation of the BPMN process and all its information stored in the SMW.

existing BPMN processes in Semantic MediaWiki and modifying them, Cognitive Process Designer allows to import BPMN 2.0 XML<sup>6</sup>, which is a standardized format to represent BPMN processes. Moreover, Cognitive Process Designer allows to export BPMN processes in BPMN 2.0 XML and in SVG, which is an

<sup>5</sup> [https://www.mediawiki.org/wiki/Extension:Cognitive\\_Process\\_Designer](https://www.mediawiki.org/wiki/Extension:Cognitive_Process_Designer)

<sup>6</sup> <http://www.omg.org/spec/BPMN/2.0/>

image format. Therefore, Cognitive Process Designer can handle proposed standard formats in order to share BPMN processes with different modeling tools.

The available information can be queried by using SPARQL. Thereby, structural information like the presence of deadlocks or loops can be queried, meta-information related information like the runtime of the process and number of involved persons, as well as the ratio of description for each task to see how well a task or process is described.

## 4 Demonstration Setup

The demonstration of Cognitive Process Designer involves the modeling of a BPMN process, taken from the domain Internet of Things. During the demonstration, we will show how the tool is suitable to 1) capture BPMN processes 2) store semantic information about the BPMN elements 3) handle proposed standard formats in order to import/export process models and 4) query the entered information.

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