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Business Process Modeling Approaches and Tools at the Institute for Project Management and Information Modeling (IPIM)

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Abstract: Information Modeling has been a core research area in the IS discipline. Furthermore, the design and implementation of information modeling tools is an established and frequently used method to examine artifacts and phenomena. Especially in design-science-research (DSR) the implementation of prototypic modeling tools is often a key success factor for the proof-of-concept and evaluation of artefacts. The Institute for Project Management and Information Modeling (IPIM) focuses on DSR and implementation of modeling prototypes, e.g. the SenSoMod-Modeler or an adaptive BPMN modeling tool. SenSoMod is a domain-aware modeling language, which enables to model the data origin and aggregation of context as input for mobile context-sensitive business processes. The BPMN modeling tool enables the modeling of adaptive process models including all variants of a process. The tool also enables the extraction of a concrete variant from the adaptive model using parameters. At the exhibition both concepts and tools will be presented.

Keywords: Business Process Modeling, Modeling Adaption, Domain-Specific Modeling

1 Introduction and Motivation

Information Modeling has been a core research area in the IS discipline. Furthermore, the design and implementation of information modeling tools is an established and frequently used method to examine artifacts and phenomena. Especially in design-science-research (DSR) the implementation of prototypic modeling tools is often a key success factor for the proof-of-concept and evaluation of artefacts. The Institute for Project Management and Information Modeling (IPIM) focuses on DSR and implementation of modeling prototypes. The Institute was founded in 2014 as a central, cross-faculty institute and defines its areas of activity on the basis of three pillars. The first pillar addresses current issues of efficient project management. It focuses in particular on topics such as hybrid and agile project management in small and medium-sized enterprises (SMEs) [TS16]. The second pillar is information modelling. Topics such as modeling of business processes [DS17], data and operational software systems [PSM15], Business Process as a Service (BPaaS) [BS14] or the development of domain-specific modeling languages [DSH18] are on focus. The intersection of these two topics results in the third pillar of the institute, which deals with reference and process models for project management. Within the framework of this third pillar, work is currently being carried out on an adaptive reference

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model for hybrid project management [Ch18]. In particular, this improves cooperation between SMEs and large companies in projects that combine agile and classical project management methods. Furthermore, the institute addresses questions concerning the application of artificial intelligence in all three pillars. All three subject areas are represented at the IPM in research, teaching and further education. Several research projects, funded by the Free State of Bavaria[2], the Federal Ministry of Education and Research[3] (BMBF) and the EU[4], are currently conducted. The IPIM is an active member in a number of renowned professional associations and standardization organizations, such as the Object Management Group (OMG), the Gesellschaft für Projektmanagement (GPM) or the Gesellschaft für Informatik (GI). Besides of the undergraduate courses in project management and information modelling in several bachelor and master programs, the institute offers further education in the form of its own MBA program Systems and Project Management as well as several certificate courses.

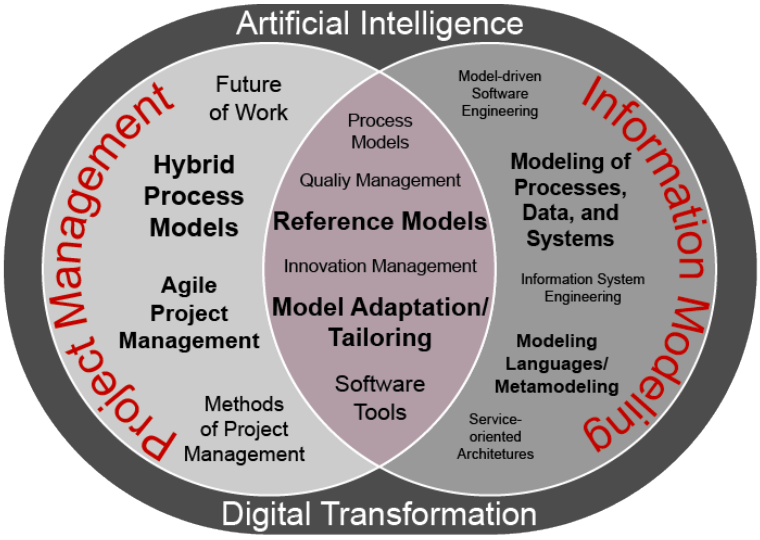


Fig. 1: Topics of the IPIM

[2] Internet Kompetenzzentrum Ostbayern – Kompetenzzentrum Mobile Business und Social Media http://www-mbsm.uni-regensburg.de/index.php

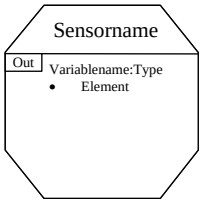
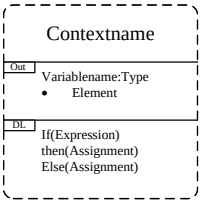
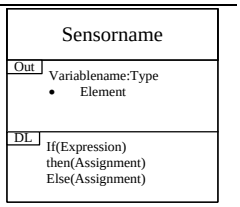
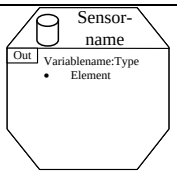
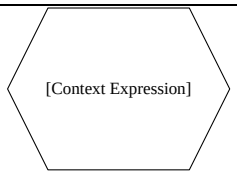
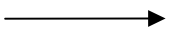
[3] Self Service Konfiguration von Projektmanagementmethode und -werkzeug (PRAGUE) Funding Number: 01IS17093C

[4] European Regional Development Fund (ERDF) – „Investition in Wachstum und Beschäftigung“ Bavaria 2014 – 2020. Funding Number: EU-1703-0001

2 Modeling Approaches and Tools

2.1 SenSoMod

SenSoMod is a domain-specific modeling language (DSML) for modeling the data collection and aggregation for context. The reason to develop a new DSML instead of extending an existing modeling language (e.g. BPMN) was that this would be an extensive enlargement which would lead to large and overloaded models. It was developed after the visualization principles by DEELMAN and LOSS [DL04], which includes guidelines for using similar shapes, line types and thickness, among others. The notation of SenSoMod can be seen in Tab. 1. A sensor can be any source of data, e.g. usual physical sensors which measure physical quantities, or a database or an application. Therefore, physical und virtual atomic sensors have to be distinguished to indicate the origin of the data. Furthermore, an atomic sensor indicates that the data cannot be aggregated from other sensors. When data can be derived or aggregated from different sources, the element *computed sensor* should be used. All sensors have an *Out* field to state and describe their outgoing objects and data types for example a float type for the humidity. In addition, the computed sensor has an *DL* field to describe the decision logic for outgoing elements. This is necessary to express when a certain state from the *Out* field of a sensor will be returned. The context element is based on at least one sensor and has to match with the name of the mentioned context in the context description.

Notation	**Notation**	**Notation**
		
Physical atomic sensor	Context	Computed sensor
		
Virtual atomic sensor	Context description	Flow

Tab. 1: Notation of SenSoMod

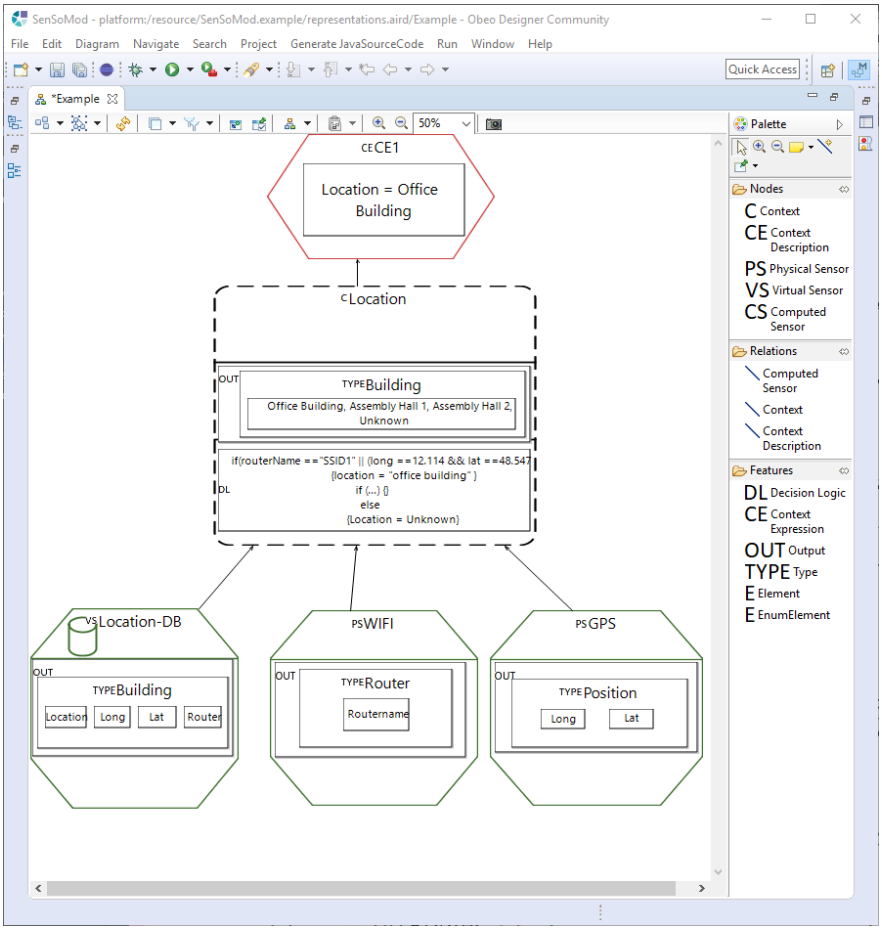


Fig. 2: SenSoMod-Modeler

The context description element is dedicated to describe a context term in a business process and is also part of the BPMN extension Context4BPMN. A more elaborated explanation of SenSoMod can be found in [DSH18]. The Language Workbench Obeo Designer [Ob18] was used to create a comprehensive modelling tool for SenSoMod, which can be seen in Fig. 2. This Tool is called the SenSoMod-Modeler. It enables to model with the SenSoMod notations according to the rules of the language. Fig. 2also shows a small example of how SenSoMod can be used to model the context ‘location’ from the sensors ‘WIFI’, ‘GPS’ and ‘Location-DB’. The latter can be seen as green atomic sensors at the bottom of the screenshot. The *Out*-area shows that for example the GPS sensor returns an object ‘Position’ with the values Long and Lat. In the middle of the screenshot the context ‘location’ can be seen. It also returns an object ‘Building’. Depending on the decision logic in the DL-area it returns the relevant building. The SenSoMod-Modeler can also generate

java code from the model which includes the defined types of the *Out* as well as the logic of the *DL* areas.

2.2 BPMN-Modeler

Information modeling has been established as a standard description tool in business informatics and is frequently used to model processes and company data [Se10]. In practice, concrete problems arise in the management of model variants. These problems can be found in many industries and application areas, such as logistics, project management [TS16] and vehicle leasing for the bank of an automobile manufacturer [Se17]. A concrete example would be related to maintaining consistency across different process variants, which only differ in small details. LA ROSA et al. provide an overview of various existing approaches to model process variants through adaptive, configurable models [La17]. In general, configurable models can be adapted by adding or removing submodels. However, the existing approaches of the construction of adaptive information model are only practicable if they are supported by software tools, which is why software support is indispensable [Th06]. In a study, SEEL et al. examined various open source modeling tools for their suitability as research prototypes for the construction of adaptive information models [Se16]. The study find that previous modeling tools are only of limited use for this purpose since they do not contain all necessary functionalities. The Camunda Modeler was identified as a solid basis for a more comprehensive modeling tool to construct adaptive information models. HILPOLTSTEINER et al. presented the conception and development of a research prototype based on the Camunda modeler. The tool supports users maintaining the single adaptive model with all different variants and let them extract a concrete process variant in a situation based on variables. Using a single model can reduce the administration amount and reduces the risk of inconsistencies across multiple files. As an example, for the complexity of variant management, the situation of a larger car leasing bank, which maintains process variants for different countries of the world was chosen. In this example process variants for different countries only differ in small details, because of regional characteristics of the market or applicable law [HSD18]. In concrete terms, an adaptive information model was created from various individual process variants. This was extended with the help of configuration terms to identify the variants later. A configuration term represents decision rules and consists of a combination of variables and logical operators, which together lead to a true or false statement. This procedure is called element selection by terms [Be02]. Furthermore, the modeling tool was used by HILPOLTSTEINER et al. to identify and document process variants in the field of goods picking [HBS18]. Several Variants of picking processes were identified in different companies and combined in an adaptive model (cf. Fig. 3). Some of the companies used different of these picking process variants for special product categories. With the help of the Technology Centre at the University of Applied Sciences Landshut and cooperation partners in the technology transfer project, work is continuing on constructing adaptive information models for further improvements and evaluation.

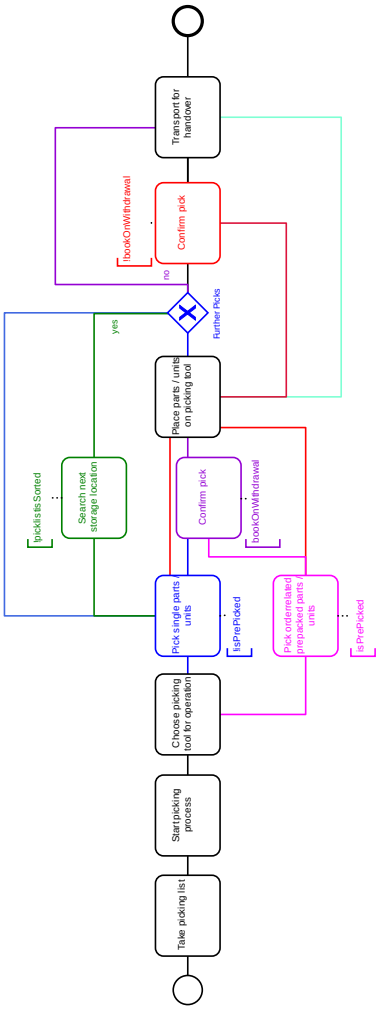


Fig. 3: Adaptive Information model for the picking process found in small and medium sized enterprises. Source: Hilpoltsteiner et al. [HBS18]

3 Further Research

In general, business process modeling is the basis for a variety of applications in different areas. Thus, business process modeling itself is subject to ongoing research in order to adapt to changing requirements and new applications. The Institute for Project Management and Information Modeling (IPIM) addresses this by developing – where necessary – new modeling languages, appropriate tools in order to conduct the modeling

process, new applications which are enabled by new models, new modeling techniques or new modeling tools. With SenSoMod, IPIM developed a new domain-specific modeling language (DSML) which serve as a context modeling language. It enables to model contextual influences on business process and (mobile) applications. Good software design and user-friendly mobile applications require well-designed business processes. These in turn can be created and optimized using thorough models. While static models serve as basis for the creation and optimization of business processes, more sophisticated applications require the use of (self-)adaptive business process models. Adaptive models offer the opportunity, to optimize a generic process model in dependence of a set of parameters. To demonstrate the feasibility and the opportunity of such adaptive business process models, IPIM developed a research prototype which is based on the Camunda modeler tool. In order to determine further research needs in the combined area of process and project management, IPIM developed a maturity model for digitalization in project management [TS18]. According to this, adaptive process models are required for various applications, like self-learning and knowledge management using artificial intelligence. The unique nature of project requires a sound knowledge base, which is represented by process models. For this, the BPMN modeler can be used and serve as development platform for future prototypes and applications.

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