Design and Development of a Process Modelling Environment for Business Process Utilization within Smart Glasses

Jannis Vogel[1], Sven Jannaber[1], Benedikt Zobel[1] and Oliver Thomas[1]

Abstract: Business process modelling languages do not yet allow a representation of mobile or wearable device functionality, such as gestures, audio and video recording or voice commands, within a process model. However, in the last decade novel technologies like Smart Glasses or Smart Watches have been further integrated into the execution and support of business processes, thus leading to new requirements for an appropriate business process modelling and their integration into information systems. Hence, the paper focuses on a novel research direction with the overall objective to assess a potential integration of mobile and wearable device functionality in business process models, which subsequently can be transformed, utilized and automatically executed on mobile and wearable devices. Based on a Smart Glasses-based exemplary business process, we demonstrate the usage of domain-specific modelling languages for a model-driven Smart Glasses-based information system.

Keywords: Domain-specific Modelling Language, Smart Glasses, Wearables, Model-driven IS

1 Introduction and Motivation

Process models have proven to be beneficial for businesses, especially if such models consider specific domain concepts and are used to enable the implementation of information systems [To07]. In addition, [Ho11] mentioned that ubiquitous computing and mobile devices will result in new research to allow flexible business processes and an easier integration. However, technological advances such as mobile or wearable devices are not yet considered by standard business process modelling languages such as the EPC and BPMN, although e.g. Smart Glasses have been frequently associated with mobile process support [Me17, NMT17]. To this end, more and more domain-specific extensions have arisen for business process modelling in the last decade [BPS14], which allow for the representation of a special domain within modelled processes and improve the model quality as a communication instrument between process experts and business users [Yo16]. Although many different BPMN extension for various domains exists [BE14], only a few address the technological integration of devices like the uBPMN by [Yo16].

Therefore, superordinate focus of the conducted research is a design-driven research

[1] Osnabrück University, Information Management and Information Systems, Katharinenstraße 3, 49074 Osnabrück, Germany, [jannis.vogel, sven.jannaber, benedikt.zobel, oliver.thomas]@uni-osnabrueck.de

project, which aims for a direct integration of mobile and wearable device functionality into business for process automation purposes. The research presented in this short-paper focuses explicitly on Smart Glasses as a new wearable device, due to its popularity in the context of mobile process support, e.g. in the field of technical customer service. Hence, the presented research addresses the following research question: *How can mobile and wearable device functionality be integrated within business process models that can be utilized and automated on Smart Glasses?*

To address the research question, we initiate a design-driven research project with the aim to integrate Smart Glasses functionality into a new domain-specific modelling language (DSML), whose models can be interpreted for the utilization and automation on Smart Glasses. The new procedure, explained in detail in section 3, should minimize implementation concerns like privacy, limited battery capacity and small screens that turn up with the use of Smart Glasses. This is realized by using a model-driven concept. A correct representation of the Smart Glasses functionality is achieved through a domain-specific language extension that is based on the BPMN. The paper is structured as follows. The next chapter outlines the research method, followed by the objectives of the solution and explanations behind the conceptual idea of model-driven information system demonstrated by a BPMN extension for Smart Glasses functionalities. Finally, the last section discusses the implications of the new research direction and gives an outlook.

2 Research Method

The research method towards a utilization and automation of Smart Glasses functionality is shown in Figure 1. The research project follows a problem-oriented Design Science Research Method in accordance to [Pe08]. The excerpts from the first two phases are presented in this paper (red border). In the first section, the problem is identified and motivated. A DSML for Smart Glasses representing functionalities should lead to a utilization and automation of the created process models within model-driven IS. In section three, we clarify the objectives of the solution. Not included in this paper, but in the outlook of the design-oriented research, is the design and development phase. It contains a definition of requirements for the DSML and the model-driven concept for a total model to IS transformation. The DSML for Smart Glasses will be developed. Moreover, we will implement a prototypical implementation of the generated model-driven IS. In the demonstration phase, the prototype is applied to real business processes from various domains. An evaluation will create new insights and evaluates the generated prototype against the real world. Lastly the results of a new model-driven concept will be communicated in the IS literature and through practical talks and exhibitions. Especially the rigorous definition of new concepts for a technological domain-specific modelling language is crucial for further usage. Therefore, further investigations have to be included regarding the development of technological domain-specific modelling languages for mobile devices and wearables. For the most popular

modelling languages such as EPC and BPMN, general approaches exist for development. For instance, [BS14] created the method for domain-oriented development of BPMN extensions. Other frameworks are more general, like the Framework for the Development of Domain-Specific Process Modelling Languages by [Ja17].

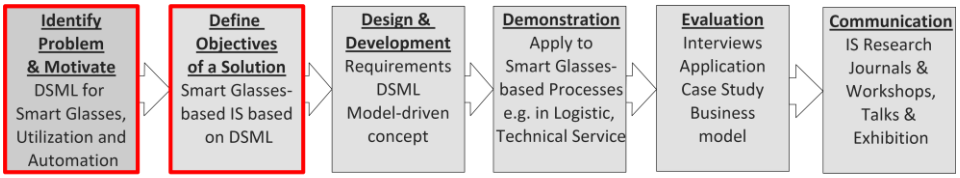

Fig. 1: Design Science Research Method [Pe08]

3 Integration of Smart Glasses Functionality within Business Process Models

The primary objective is an effective integration of business process models through a model-driven approach, which allows an automatic generation of a Smart Glasses-based IS. The model-driven concept is depicted in Figure 2. We build on an example process in the logistics domain based on a primary use case (15) identified by [Ni17]. We use the process receipt of goods, which is very common in the logistic domain. A possible BPMN extension for the Smart Glasses-based process domain or any other DSML is used for a model-driven approach (1). The user can trigger the process with a speech command, e.g. “process receipt”. After that, an identification of the palette is executed through a scan task. The user can then decide manually if the products are intact. If the products are damaged, the user should record the damage with the Smart Glasses camera and receives a damage classification as an information provision task in a list form. The other path results in an advanced communication task, which informs the receiving department that the delivery is satisfactory. Besides the graphical representation, further properties could exist for a precise Smart Glasses-based IS, such as the declaration of possible interactions functionalities such as speech, touch or gestures. The process model is then used as basis for the software development. Code generation and interpretation are two approaches (2) for the model-driven software development (MDSD). The main differentiation between both is the code binding. An interpreter allows the binding during runtime, while a generator binds the data during compilation. Therefore, further advantages could appear with the use of an interpreter. An interpreter is supposedly favourable, because changes at the model directly affect the behaviour of the software. Consequently, a developer and a business expert can change the model together iteratively until they created the desired information system [St07]. Especially in the Smart Glasses domain, the variable creation of Smart Glasses information systems is necessary, since Smart Glasses are used in a mobile environment where processes can change rapidly.

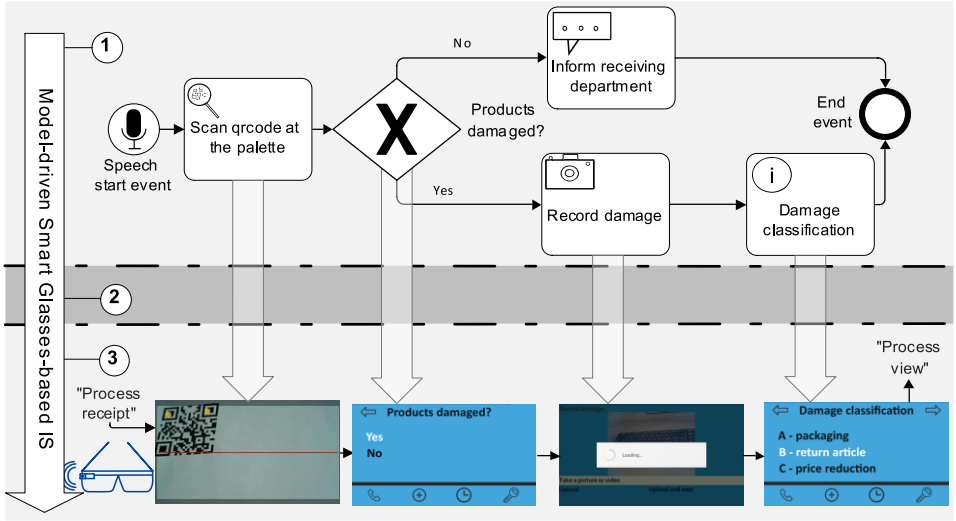

Fig. 2: Transformation of business process model to Smart Glasses-based IS

A model-driven concept realized with an interpreter aims at a 100% model to information system transformation. Therefore, no further steps are necessary for the directly generated Smart Glasses-based IS (3). Consequently, a mobile worker gains step-by-step guidance comparable to [Me17] and also generates process relevant data through the solution with speech commands, photos and interactions through the usage of the device during job tasks. The presented solution is similar regarding the usage of process models for mobile process support as in [Me17]. However, the concept in this paper extends the access to Smart Glasses functionalities through technical process models and focuses on the generation of Smart Glasses-based IS with a model-driven approach, which exceed visualisation purposes.

4 Conclusion and Outlook

The presented concept is a solution for the challenges that turn up with the implementation of Smart Glasses in businesses. A possible BPMN extension, which implements the missing Smart Glasses-based process concepts, allows the technical representation of Smart Glasses functionalities in a process model. Through the combination with a model-driven approach, many advantages regarding model quality, implementation speed and enhancement in the importance of process models can be gained. The presented challenges and potentials with the aid of a model-driven IS can be transferred to new existing and upcoming mobile devices and wearables. Further investigations have to be done besides the pure technological integration of the devices within process models, how internet of things components can be integrated into the presented research and how an overall context-aware information system can be realized.

Finally, a further question is how new cloud services for translation, computer vision or artificial intelligence can be integrated through a modular approach.

Bibliography

[BE14] Braun, R., Esswein, W.: Classification of Domain-Specific BPMN Extensions. In (Frank, U., Loucopoulos, P., Pastor, Ó., and Petrounias, I. eds.): The Practice of Enterprise Modeling. PoEM 2014. Springer, Berlin, pp. 42–57, 2014.

[BPS14] Bjeković, M., Proper, H.A., Sottet, J.-S.: Enterprise Modelling Languages. In (Shishkov, B. eds.): Business Modeling and Software Design: Third International Symposium. Springer International Publishing, Cham, pp. 1–23, 2014.

[BS14] Braun, R., Schlieter, H.: Requirements-Based Development of BPMN Extensions: The Case of Clinical Pathways. In: 2014 IEEE 1st International Workshop on the Interrelations between Requirements Engineering and Business Process Management (REBPM). IEEE, pp. 39–44, 2014.

[Ho11] Houy, C. et al.: Business Process Management in the Large. Business & Information Systems Engineering 3, pp. 385–388, 2011.

[Ja17] Jannaber, S. et.al.: Designing a Framework for the Development of Domain-Specific Process Modelling Languages. In (Maedche, A., vom Brocke, J., and Hevner, A. eds.): Designing the Digital Transformation: 12th International Conference, DESRIST 2017. Springer International Publishing, Cham, pp. 39–54, 2017.

[Me17] Metzger, D. et.al.: Vom Techniker zum Modellierer – Konzeption und Entwicklung eines Smart Glasses Systems zur Laufzeitmodellierung von Dienstleistungsprozessen. In (Thomas, O., Nüttgens, M., Fellmann, M. eds.): Smart Service Engineering. Springer Fachmedien Wiesbaden, pp. 193–213, 2017.

[Ni17] Niemöller, C., et al.: Sind Smart Glasses die Zukunft der Digitalisierung von Arbeitsprozessen? Explorative Fallstudien zukünftiger Einsatzszenarien in der Logistik. In (Leimeister, J.M. and Brenner, W. eds.): 13. International Conference on Wirtschaftsinformatik (WI). St. Gallen, pp. 410-424, 2017.

[NMT17] Niemöller, C., Metzger, D., Thomas, O.: Design and Evaluation of a Smart-Glasses-based Service Support System. In (Leimeister, J. M., Brenner, W. eds.): 13th International Conference on Wirtschaftsinformatik (WI). St. Gallen, pp. 106–120, 2017.

[Pe08] Peffers, K. et.al.: A Design Science Research Methodology for Information Systems Research. Journal of Management Information Systems 24, pp. 45–77, 2008.

[St07] Stahl, T. et.al.: Modellgetriebene Softwareentwickung - Techniken, Engineering, Management. dpunkt Verlag, Heidelberg, 2007.

[To07] Trompeter, J. et.al.: Modellgetriebene Softwareentwicklung - MDA und MDSD in der Praxis. entwickler.press, Frankfurt am Main, 2007.

[Yo16] Yousfi, A. et.al.: UBPMN: A BPMN extension for modeling ubiquitous business processes. Information and Software Technology 74, pp. 55–68, 2016.