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Development of a Domain-Specific Language for Run-Time Process Modelling – Making Use of Smart Glasses in BPM

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Abstract: Wearable devices pose novel challenges to the BPM field. The advanced functionality in combination with the increased mobility has rendered devices such as smart glasses particularly suited for mobile process support. However, whereas this support is predominantly limited to information provision and workflow management, the glasses' capability to be utilized for actual process modelling has yet to be investigated. As a first step, this paper proposes an outlook on the development of a process modelling language that is specifically tailored towards the application domain smart glasses and can be applied for both modelling and representing business processes using a glasses-based modelling environment. A demonstration case is provided to highlight the utilization of process modelling on smart glasses.

Keywords: business process management, process modelling, smart glasses, mobile

1 Introduction

The integration of mobile information systems (IS) is considered a crucial long-term challenge for Business Process Management (BPM) [Ho11]. Nowadays, BPM has become increasingly important for enterprises due to growing complexity of organizational operations and technology [PWC11]. To support BPM in practice, process-aware information systems (PAIS) have emerged, which ought to "support operational business processes by combining advances in information technology with insight from management science" [Aa09]. Recently, the notion of PAIS has been expanded towards mobile [Ma17] and wearable [Ni16] technology, which is used to steer the workflow of operational processes such as technical services and to support processes with required information during their execution [Ma17]. However, current approaches in terms of mobile PAIS rather focus on the process control and execution phases of the BPM lifecycle [Aa04] by guiding users through already existing workflows and processes. As a result, there is a notable gap concerning the utilization of mobile technology and wearable devices in the process design phase, although wearables such as smart glasses are bringing valuable features and functionality to the table that can be exploited to enrich process models with additional data and to keep business process modelling up-to-date with technical innovations [Me17]. The consequences of this gap are two-fold: First, business process modelling as a core component of BPM fails to keep pace with technological advances. Nowadays, the modelling of

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processes still relies on traditional BPM suites running on desktop computers, which does not cope with the required mobility and flexibility of today's business processes. Second, process modelling remains a task for domain experts. Naturally, this issue results in severe consequences with respect to model quality and reusability, since the person responsible for process modelling often differs from the person that actually executes the business process [PAL99]. For any modelling endeavours, the choice of an adequate modelling language is essential. Henceforth, the utilization of smart glasses for business process modelling requires the development of a specific modelling language that is tailored towards the application domain smart glasses [Me17]. Although propositions regarding modelling languages for mobile devices have already been made, research in this matter primarily focuses on smartphones or tablet computers, e.g. [KRR12]. Accordingly, the contribution at hand adheres to the research question stated as follows: How can business process modelling on smart glasses be utilized via an appropriate modelling language that is developed according to the specific needs of the application domain? To this end, the paper conceptualizes the development of a domain-specific process modelling language (DSPML) that is suited for a smart glasses modelling environment. The modelling language is based on the event-driven process chain (EPC) that has been chosen as baseline language, since it is well established in both research and practice [Fe13]. Furthermore, the EPC is characterized by a rather limited set of modelling constructs, which fits the intended domain. The primary outcome of this research is an outlook on the development and potential utilization of a domain-specific process modelling language, which can be applied to document and represent business processes in run-time on smart glasses.

The paper is structured as follows. Section 2 introduces fundamentals on smart glasses. In section 3, the research design of the underlying research project is carried out. Lastly, section 4 provides a brief outlook on the utilization of a customized EPC language specification towards a smart glasses modelling environment.

2 Smart Glasses as mobile PAIS

Smart glasses are an emergent mobile technology that has been introduced in its current form by Google in 2012 through the presentation of the Google Glass. As lightweight wearable devices [RR16], they provide the user with a high degree of mobility. Smart glasses can be divided into monocular and binocular designs. The monocular build has one screen, while binocular glasses have two screens, one for each eye. With see-through displays, a user can look through the screen, being able to see elements directly behind the displayed information. Through the adoption of smart glasses, additional information provision can aid users in various different use cases or usage scenarios. In the context of this paper, we consider service support systems as mobile PAIS, since both systems share common characteristics. A service support system is a technical IS that supports the execution of activities, which are aligned in a process-oriented manner. An exemplary service support system discussed in literature utilizing smart glasses can be found in [Ni16] In contrast to common PAIS, mobility is a crucial aspect of service support systems, since

emphasize is put on the on-site support of its users, especially in the context of technical customer service. Here, focus lays within the flawless provision of information and data necessary for service execution [Ma17]. In parallel, smart glasses provide valuable functionality, such as video or audio capabilities, which need to be integrated into the underlying service process for further usage and analysis, expanding the notion of PAIS towards a rather user-centric system definition.

3 Research Design

For the development of a domain-specific process modelling language suited for a smart glasses modelling environment, a conceptual approach is applied as an underlying research methodology. The structure of the methodology is based on previous work of [Fr13] and the language development framework introduced in [Ja17]. The integrated procedure model is depicted in Figure 1. Slight alterations have been made in order to fit the research goal, which focuses on the conceptual level and does not include, for example, modelling tool integration.

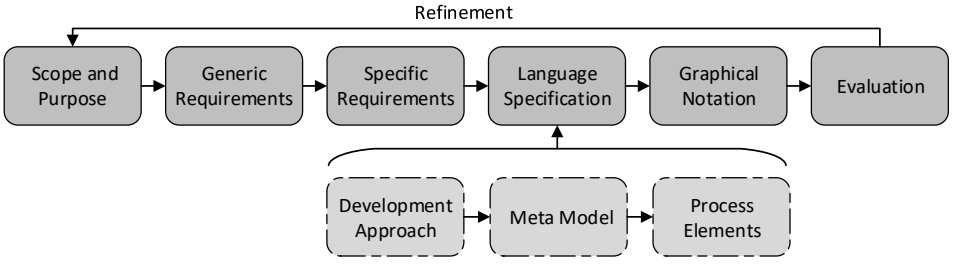

Fig. 1: Research methodology

The starting point of the language development is the determination of scope and purpose, which will be the main focus of this paper by providing an outlook on the potential utilization of a domain-specific EPC modification for run-time modelling with smart glasses. Following scope and purpose, a structured literature review is required to identify general requirements concerning the development of modelling languages as well as specific requirements that shed additional light on features, characteristics and obstacles of the application domain smart glasses that have an impact on the modelling language. The language specification is planned to be streamlined in accordance with the domain-specific process modelling language framework of [Ja17] and includes the choice of development approach, a meta-model based language specification on the basis of the identified requirements and the determination of process elements to be considered in a smart glasses modelling environment. Subsequently, each of the determined elements needs to be appropriately specified in terms of their graphical representations in order to cope with the specific requirements of information provision on smart glasses. Concluding the language development, an evaluation phase is required to assess the feasibility and performance of

the language, which can be facilitated by a prototypical implementation of a smart glasses modelling system using the developed modelling language. In order to elaborate on the scope and purpose of the current state of research with respect to the language development, an exemplary utilization of a domain-specific EPC modification on smart glasses is presented in section 4.

4 A Domain-Specific Language for Run-Time Process Modelling

An outlook of a prototypical utilization of a domain-specific modelling language in a smart glasses application domain in the field of technical customer service (TCS) is depicted in Figure 2. The TCS domain has been chosen, since it represents a promising area for smart glasses-based process support and corresponding process documentation due to the high complexity of manual service processes and the need for hands-free information provision.

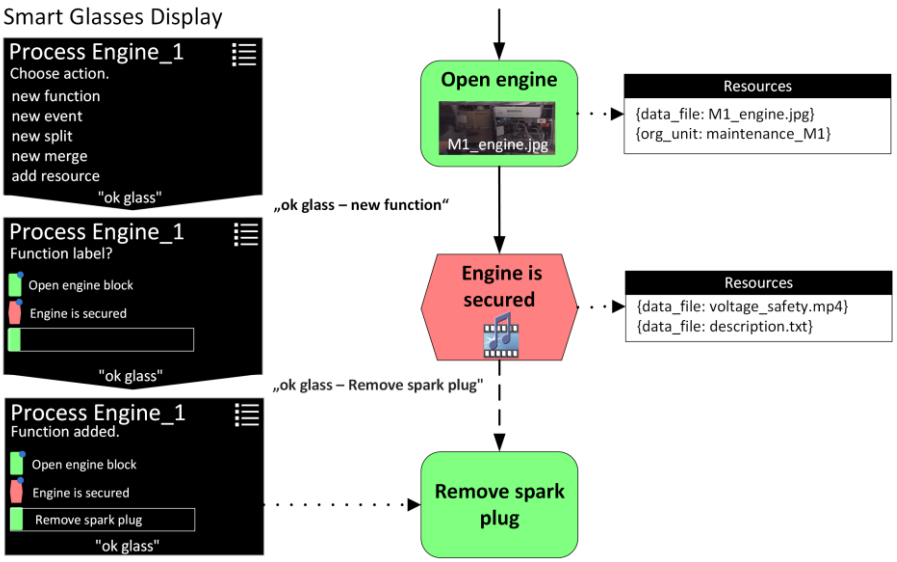

Fig. 2: Modelling of an EPC process model using smart glasses

In Figure 2, a technical service process is being documented by using a smart glasses modelling environment and a customized EPC specification. In the following, an outline of potential language modifications in terms of syntax, element semantics and graphical notation will be provided in order to facilitate a utilization of the EPC on smart glasses. On the one hand, the amount of modelling elements has been limited by removing trivial events and resource elements to reduce complexity and to cope with display space issues. Instead, resources are visually denoted on their associated element (as indicated by a blue mark in Figure 2). In contrast to traditional EPC specifications, the modification allows for resources to be assigned to events. The advanced functionality of smart glasses features

has been integrated into the language modification as well: The *Data File* modelling element has been added in order to represent images or video files that have been recorded during modelling. On the other hand, the modified graphical notation puts emphasis on the textual descriptions of the element labels to correspond to the specific demands of information provision on smart glasses. Furthermore, elements have been adjusted in size and appearance for usability and display space reasons. In addition, the elements are characterized by different colours and a high contrast of background to symbols and text to increase readability. The demonstration case in Figure 2 represents the smart glasses display that is visible to the user during modelling on the left side. The top screen shows a navigation menu with available options for process modelling. Via voice commands, the user is able to select an appropriate action. In the presented case, the user desires to add a new function after the previously modelled event "*Engine is secured*." Subsequently, the system requests an element label that the user models via voice-to-text and includes the new element "*Remove spark plugs*" in the process model. Figure 2 demonstrates that two previous elements are attached with resources, as indicated by the blue mark. In the given case, these resources are data files which have been attached to both functions and events, such as the video file "*voltage_safety.mp4*" which belongs to the event "*Engine is secured*." Here, the modeller has used smart glasses functionality to record a video in order to document his proper securing of the engine. Following the modelling process, the resulting process model may be stored in a process database and subsequently be used to support other technicians that are assigned to similar service processes by its representation on a mobile PAIS or to train new employees in a specific service task.

In conclusion, little effort has yet been made to investigate a potential integration of novel features offered by wearable devices and process modelling. This paper proposes a first step to utilize process modelling on smart glasses. To this end, the contribution at hand introduces a development methodology for domain-specific process modelling languages and provides an outlook on a potential integration of a modified EPC specification into a smart glasses environment. The applied EPC modification is further detailed by indicating changes that have to be made on the language level in order to cope with the requirements of information provision on smart glasses. Process modelling with wearable devices opens up new research streams in the field of run-time modelling and addresses challenges of the field: Modelling quality and reusability can be increased, because smart glasses enable even non-domain experts to document processes in parallel to their execution. Process models can be further enriched with additional data, which facilitates the information support when being integrated into a PAIS. However, limitations have to be considered in subsequent research: First, run-time modelling on smart glasses is not generically feasible for all types of business processes, which requires a more detailed elaboration on processes that benefit from the outlined solution. Second, only a limited set of modelling pattern can be implemented in a smart glasses modelling environment to not increase complexity. Third, the presented contents remain on a rather conceptual level. However, an application in a real-world scenario may reveal additional requirements that have not been considered yet. Hence, a software prototype that implements the outlined EPC modification within a smart glasses modelling environment proves to be a fruitful step for future research.

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