Chapter 7
Context-Based Handling of Mobile Process Activities

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ABSTRACT

Process technology constitutes a crucial component of information systems. In this context, high flexibility is required as business functions must be quickly adaptable to cope with dynamic business changes. As recent developments allow for the use of mobile devices in knowledge-intensive areas, it is often demanded to enhance process-aware information systems with mobile activity support. In general, the technical integration of this activity type with existing process management technology is challenging. For example, protocols governing the communication between mobile devices and process management systems must be adapted. If a mobile context shall be additionally considered, the integration gets even more complex. However, the use of a mobile context offers advantages. For example, the mobile activity execution time may be decreased if mobile activities are only assigned to those users whose location is beneficial. This chapter proposes an approach to enable the robust handling of single process activities on mobile devices based on a mobile process model.

INTRODUCTION

Daily business routines more and more require mobile access to Information Systems. However, the integration of mobile devices into existing infrastructures is laborious and error-prone. In particular, the infrastructure must cope with ad hoc events, various types of exceptions (e.g., connectivity problems), physical limitations of mobile devices (e.g., limited battery capacity), misbehavior of users (e.g., instant shutdowns), and the evaluation of data collected by mobile sensors (Schobel et al., 2013). In general, proper exception handling constitutes a prerequisite for any mobile activity support. In this context, adaptive and flexible process management technology offers promising perspectives based on a wide range of techniques (Reichert & Weber, 2012; Reichert & Weber, 2013). In particular, it allows for the

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proper handling of run time exceptions. However, execution of process activities on mobile devices in the same way as on stationary computers is not appropriate when the specific challenges of mobile environments are not taken into account.

A service-oriented environment should allow for mobile activity support during business process execution. This paper presents an approach developed in the MARPLE (Managing Robust Mobile Processes in a Complex World) project. This approach enables the robust execution of single process activities on mobile devices and is based on two services, a service that assigns mobile users to mobile activities and an exception handling service for mobile activities. These services ensure that mobile activities are (a) only assigned to those mobile users that are particularly appropriate based on a mobile context and (b) do not harm the overall process execution when activity exceptions occur. In this context, a service-oriented architecture was realized that integrates the services with existing process management technology. To be more precise, the architecture allows for the instantiation, activation, and exception handling of mobile activities.

This paper presents the support of *mobile activities* and the handling of exceptions during run time without need for manually involving mobile users. Note that this is crucial with respect to higher user acceptance of mobile business processes. Generally, the provisioning of self-healing techniques is crucial for executing mobile activities in the large scale as well as for achieving higher user acceptance.

We firstly discuss fundamental issues arising in the context of mobile environments. Their understanding is crucial for developing the two fundamental services as well as for designing the overall system architecture. In this context, the challenges (e.g., device failures) are considered which must be tackled to ensure robust execution of mobile activities. In detail, challenges are addressed that are related to the mobile environment itself (e.g., a mobile device loses its connectivity), related to the business process execution (e.g., missing data caused by activity exceptions), and related to the behavior of the mobile users (e.g., instant shutdowns).

BACKGROUND

Many domains crave for the integration of mobile devices into business process execution (Lenz & Reichert, 2007; Pryss et al., 2016(a)). Figure 1 shows a simplified healthcare example illustrating this. It depicts a ward round process for which mobile assistance is required (Pryss et al., 2015). For instance, *Prepare Ward Round* constitutes an activity whose mobile support would ease daily work of healthcare professionals.

The use of mobile devices during process execution raises several challenges with respect to mobile activity support. For example, if the mobile device running the activity *Determine Vital Signs* (see Figure 1) encounters physical problems, overall process execution might be harmed; or if activities succeeding a mobile activity in the flow of control have to access data that is usually provided by this mobile activity, standard exception handling strategies (e.g., to skip the mobile activity) are not appropriate when the mobile activity fails. As shown in Figure 1, activity *Finish Ward Round* is data-dependent on mobile activity *Determine Vital Signs*. In turn, this might cause problems when activity exceptions occur, i.e., if *Determine Vital Signs* fails, the process cannot terminate properly, since activity *Finish Ward Round* cannot be properly executed due to the missing value of data element *D1*.