Chapter 114
Predictive Analytics for Business Processes in Service Management

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ABSTRACT

Underlying business processes in service management are people intensive and collaborative by nature. We are observing an emerging trend in the service management applications, moving away from rigid process orchestration to leveraging collaboration. Such solutions allow staffers to define their own customized, ad-hoc step flow consisting of the sequence of the activities necessary to handle a service component. These ad-hoc steps introduce uncertainty to the successful completion of a service request. When there is uncertainty, predictive guidance about future outcomes could provide value to the workers handling a time-sensitive service delivery component. Predicting the future outcomes using machine-learning techniques requires effective representation of the process execution traces. This is challenging when process model includes parallel execution flows or repeated executions of some activities. In this chapter, we describe algorithms for training machine learning models when the execution paths include parallel flows and when some activities are repeatedly executed.

INTRODUCTION

Service management aims at improving customer satisfaction and providing value to the customers by reducing high service cost. Managing the customer expectations right after the order is fulfilled, providing continuous support, and accommodating demand under uncertainty impact the profit. The implementation of service management components and applications requires the integration of a number of activities

across different organizations. In general, optimization of service management components depends on effective management of underlying business processes. Thus, business process management disciplines improve the ability of the organizations to manage their service components.

Services often are implemented as activities of a business process. Customer service requests instantiate semi-automated business process flows. The activities of the business process associated with a service request may include different aspect of service management such as checking legislative or customer compliance requirements, contacting suppliers, tracking inventory, building, assembling products, communication with the customer and the suppliers, etc. Increasing customer satisfaction and reducing the service management cost depend on how effectively underlying business processes are managed. Business process management (BPM) promotes processes as essential organizational assets to deliver value added services to the customers. BPM includes concepts, methods and techniques to support the design, administration, configuration, enactment and analysis of business processes. In this respect, BPM is considered critical to ensure quality of service while maintaining regulatory compliance. As part of improving service quality, predictive analytics play important role during the life cycle of a business process management. Accurate prediction of how the business process evolves helps managing customer relations and increase customer satisfaction. After the process starts, reducing the uncertainty about the future increases the ability to be more proactive about possible outcomes. The resources are managed more effectively and customer expectations are set more accurately. Predictive analytics constitute an important part of service analytics. In this chapter, we utilize the BPM concepts and extend them to apply machine-learning techniques to extract insight about process behavior from execution traces. Traditional BPM disciplines focus on controlling and improving business activities. Our approach to better management of business activities is to use machine-learning techniques to predict process outcomes. The techniques presented in this chapter are expected to reduce service management cost and increase customer satisfaction as the underlying business processes are improved. It reduces service cost as it becomes possible to foresee and avoid potential costly failures. It also increases customer satisfaction when customers are informed in time about the status of a service request or excessive delays are avoided by introducing new resources to the process.

In structured business processes, the activities to be performed are controlled by software based on processes specific execution rules. Therefore, during the life-cycle of a business process the sequence of activities are deterministic. Thus, uncertainty in managing service components is relatively low. Semi-structured processes, on the other hand, depart from the traditional kind of structured and sequential predefined processes. In such processes the set of activities that need to be performed, their order and whether additional steps are required, are determined by human judgment in addition to available document contents. This is often the case when communications between service providers and other actors external to the business process management platform is done out of band, through telephone calls, emails, or face to face conversations. The external actors of a business process may include suppliers, legal departments, consultants, police officers, other companies, etc. Such out of band and unstructured communications may introduce uncertainty into the flow of business processes, thus impact the quality of service management in fulfilling customer expectations.

Flexible Process-Aware Information Systems (PAIS) (Aalst, 2007, 2011; Aalst et al., 2003; Cook & Wolf, 1998; Rokach & Maimon, 2010) have emerged to support such processes and are exemplified in adaptive process management systems and case handling systems where a case consists of a sequence of the activities necessary to handle a service component. Knowledge workers and other users of PAIS have been compared to artists who ignore the rules when necessary. They redefine the process, alter any

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