

## Chapter 65

# On Predicting the Results of Applying Workflow Management in a Healthcare Context

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### ABSTRACT

*Even though workflow management systems are currently not being applied on a wide scale in healthcare settings, their benefits with respect to operational efficiency and reducing patient risk seem enticing. The authors show how an approach that is rooted in simulation can be useful to predict the benefits of using a workflow management system. The approach is discussed and its application is demonstrated in the setting of the pre-operative process as being executed in the Bronovo hospital. The approach is considered useful for other healthcare organizations in search for a better foundation for the application of workflow technology.*

### INTRODUCTION

Workflow management technology is widely applied in the financial services and in governmental settings. The fundamental idea is to separate the flow logic from application code that is used for executing a certain process (Van der Aalst & Van Hee, 2002). The advantages of using a workflow

management system (WfMS) to manage a business process can be summarized as follows (Reijers, Rigter & Van der Aalst, 2003):

- **Less coordination effort.** The WfMS liberates human actors from the routine work they need for coordination; it is the WfMS that oversees which of the potentially many actors needs to be involved at a certain stage.

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- **Higher quality.** The WfMS will offer actors the work packages, including the required information, in accordance to a predefined way of working to deliver the preferred quality of service, while it also allows for exception handling.
- **Higher efficiency.** The WfMS will not offer more work to actors than what is required to produce an acceptable result. Specifically, available information can be made available throughout a process and tasks will only be executed as often as necessary.
- **Higher maintainability.** Ejecting the business control flow from traditional applications and moving it towards a WfMS simplifies the adjustment of both the logistics and the content of work.

Healthcare processes too require the cooperation of many different organizational units and medical disciplines. One can also see that the timely availability of information and the coordination of work are important elements in diagnosis, treatment, and care activities. Despite these matches with what workflow has to offer, it has been noted that WfMSs are not yet broadly used in healthcare environments (Reichert & Lenz, 2007).

It is an open question what the underlying causes are of WfMSs being hardly used in healthcare. One may speculate that much of ongoing IT initiatives in healthcare relate to the introduction of electronic patient records, which favors a *data* perspective rather than a *process* perspective. Secondly, one can observe a disparity with respect to traditional workflow domains, since a healthcare setting transcends pure information processing – people rather than documents are in the loop. Applying workflow may therefore be more difficult. Thirdly, it has been argued that healthcare settings require a level of flexibility that WfMSs systems cannot deal with (Quaglini

et al., 2001; Ash, Berg, & Coiera, 2004). It has to be added here that current workflow technologies have improved considerably in this respect over the past years.

This paper explains how the advantages of using a WfMS in a medical context can be estimated up-front. The described approach demonstrates that it is possible to assess the benefits of using this type of technology to improve both the *efficiency* and *quality* of a medical process. The approach is based on the use of discrete event simulation and builds on a quantitative analysis of an as-is situation, as well as on the modeling of the to-be situation after a WfMS has been introduced. By doing so, this paper aims to contribute to the more widespread application of WfMSs in medical contexts, since it clarifies how the benefits can be made more transparent.

The structure of the paper is now as follows. In the following section, we will provide some background information, explaining the primary ingredients of our approach. After, we will describe the context in which our approach has been applied, i.e., the pre-operative assessment process within the Bronovo hospital in The Netherlands. The following sections respectively deal with the followed approach and the results thereof. The paper concludes with a summary and an outlook.

## BACKGROUND

The approach that is followed to assess the effectiveness of a WfMS in a particular medical setting primarily involves *simulation*. While such an approach has proven to be quite feasible to assess quantitative aspects of systems, even in the healthcare domain (Jun et al., 1999), we also wish to extend it with a qualitative assessment. The latter is done by incorporating the *Human Error Criticality Analyses (HECA) methodology* in our approach. These elements will be discussed in this section.

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