Workflow Management Systems—A Powerful Means to Integrate Radiologic Processes and Application Systems

Joachim Schmidt, Kirsten Meetz, and Thomas Wendler

This presentation describes a research project investigating the suitability of model-based Workflow Management Systems (WfMS) to support radiological process. The following aspects are covered: process modeling, process enactment, and architecture of workflow-enabled application systems.

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MANY RADIOLOGY DEPARTMENTS are on the point of going totally digital, while a few have already taken the plunge. Expectations are high that the new technology is to solve functional and economical problems. But experience has shown that the power of digital infrastructures in radiology only unfolds to its full extent if combined with new ways of providing services. One approach to tackle this problem is business process reengineering (BPR) with the goal to redefine organizational structures and processes to achieve the objectives of a business. The typical result of this systematic procedure is an organizational model defining roles of staff members and process models assigning roles to activities to be performed in order to achieve the goals of an enterprise. The automation of these processes is called workflow and the systems implementing workflows are called Workflow Management Systems (WfMS). The purpose of the project described here is to investigate whether commercially available WfMSs can be employed in radiology to support a process-oriented way of providing services.

METHODS

As an initial step of the project, radiologic processes were analyzed in a couple of European and North American hospitals with the goal to learn about their key characteristics. The results of the analyses were a formal description of the organizational structures and a formal model of the processes carried out. The

processes were described as sets of activities performed sequentially or in parallel. Roles of users were assigned to activities, thus expressing "who does what." Finally, the functional components of the Radiologic application systems were associated with the corresponding activities. The next step dealt with the mapping of radiologic processes on WfMS with the intention to find out if these systems can enact the desired processes.

RESULTS

Radiologic processes can be classified due to the regularity in a spectrum from "ad hoc" to "well structured." Approximately 80% of the observed processes can be categorized as "well structured" or "well structured with ad hoc exception" and these two categories can be implemented by WfMS available today. Figure 1 shows an example how a typical radiologic process looks like if translated into a workflow that can be enacted by a WfMS. The WfMS creates instances of the workflows triggered by incoming service requests and compiles worklists containing executable activities (eg, "ready for filing," "ready for reading"). To handle these lists within radiologic application systems, a worklist handler was defined, which displays the worklist and invokes those application system components that support the execution of a given activity (eg, "register patient module" to perform activity "register patient"). Figure 2 outlines a system architecture with an autonomous WfMS.

Fig 1. Typical radiologic examination workflow.

From the Philips Research Laboratories, Division Technical Systems, Hamburg, Germany.

Address reprint requests to Joachim Schmidt, Philips Research Laboratories, Division Technical Systems, Roentgenstrasse 24-26, D-22335 Hamburg, Germany.

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Fig 2. System architecture with autonomous WfMS.

CONCLUSIONS

Commercially available WfMS can improve the performance in radiology because they provide flexible and easy-to-change implementation of ra-

diologic processes as workflows, the customization of workflows by a model-based approach, and a paradigm for the process-oriented integration of radiologic application systems. Generic, process-independent worklist handlers make radiologic application systems "workflow enabled," thus supporting users like receptionists, schedulers, technologists, and radiologists in process-oriented working.

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