Introduction to workflow technology: Representation of healthcare processes in a workflow editor and their execution in a workflow engine

Abstract

This workshop will provide an introduction to workflow technology, also known as Business Process Management (BPM). In the first part, the workshop will provide historical overview, evolution and introduction into Workflow Management Systems and introduce the benefits of formal representation of processes. The second part will provide overview of the current process representation standards and in detail describe the XPDL standard (XML process definition language) from Workflow Management Coalition. Finally, in the third part, the participants will be able to see (and follow) a hands-on demonstration of use of an open source workflow editor, engine, workflow mining tool and view and modify examples of healthcare process definitions. Relationship of decision support engines to workflow engines will also be discussed.

Introduction

Workflow technology (WT) represents an emerging class of software products which enable advanced modeling, execution and analysis of processes. In spite of the presence of commercial Business Process Management (BPM) products, workflow remains an active area of computer science research.

Workflow technology in Healthcare

Workflow technology has been shown to deliver efficiency and management improvements to many industries. Graphical nature of process definitions enables non-IT experts (e.g., champion physicians) to better understand or even directly modify processes programmed within their information systems. WT can support easy customization of information system to different facilities and local workflow patterns. Healthcare is one industry that has shown relatively little penetration (less than 5%) of WT [1]. This has been attributed to a number of factors, but most prominent has been the complexity of healthcare domain and greater variability of care processes. Challenging healthcare-specific implementation factors include: large number of actors, interlocking roles and actions, the autonomy of physicians, support for process exceptions, multiple individuals serving as a process administrator, and the need for seamless integration of workflow task tracking into clinical settings.

In its 2008 Priority Matrix for Healthcare Providers, Gartner assigned WT a high impacting factor [1]. Gartner stated that workflow will become particularly important in supporting care management protocols and complex, interdisciplinary processes. The report recommends healthcare institutions to begin developing expertise regarding the tools and methodologies that support workflow, and should begin deploying pilot projects to gain experience in using this critical technology.

WT has also been endorsed as a promising technology by clinical decision support systems (DSS) community. In a DSS textbook chapter titled “Guidelines and Workflow Models” [2], Peleg suggests that workflow technology (extended with external modules accommodating medicine-specific DSS functions) can be an equal alternative to existing standards in clinical DSSs (such as GLIF, ProForma, or SAGE). This research will address the widely stated

goal in informatics of accelerating the conversion of new discoveries and new disease-management guidelines into common practice using interventions within EHR systems. The results of this work have the potential to significantly shape future evolution of WT. Since the penetration of WT into healthcare in only 5%, an open question is whether current WT can support well the complexity and variability found in healthcare processes. Although health care is the target domain for this work, the findings will be generalizable to other complex, multi-actor domains.
This workshop will provide introduction to WT and practical examples of its use.

Outline of topics:

Part 1: Introduction to workflow technology (business process management)

- Need for specifying workflow within IT systems [3]
- History of workflow technology (prior 1960s-1980s)
- Overview of development after 1990
- Components of workflow technology (process definition, execution engine, analytical components)
- Benefits of implementing a workflow server within a generic IT system
- Major workflow vendors and open-source workflow technology tools
- Workflow Technology in healthcare [4-5]
- Future development and research challenges

Part 2: Workflow technology standards, standard developing organizations and related theories

- Workflow management coalition's (WfMC) standards
    - Definition of WT terms (Terminology and Glossary)
    - XML process definition language (XPDL) [6]
- Other standardization efforts
    - Business Process Execution Language (BPEL)
    - Business Process Modeling Notation (BPMN)
    - Research-originated WT standards
- Petri Nets theory and its relationship to workflows

Part 3: Practical tools demonstrations and case studies of use of workflow technologies

- Demo of an open-source, XPDL-based workflow editor and engine (Enhydra) (includes hands-on activity)
    - Representing a surgical procedure, discharge and RCT trial enrolment process
        - Two rheumatology decision support processes (TB screening, Pneumococcal vaccine)
- Demo of an open-source process mining tool (ProM)
        - Mining a progression of a chronic kidney disease from EHR data [7]
- Brief overview of other workflow technology software [8]
- Overview of non-healthcare industries using WT
- Case studies of use in healthcare/informatics research [9-11] [12]
- What are the differences between a decision support engine and a workflow engine

Who should attend

Those with some prior interest in workflow technology, but little or no prior practical exposure to it. In terms of professional roles, informatics scientists or healthcare administrators interested in using WT, computer scientist, system developers, and programmers. No Prerequisite knowledge is required.

Instructors

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Teaching strategy:

The workshop is structured for a two hour session. The workshop is best delivered in a computer lab settings where participants can follow the instructor and carry out tasks as they are demonstrated during the part 3 of the workshop. All software required for the workshop is open source and available with no license costs. Alternatively, if the settings is not in a computer lab, the task can be demonstrated by the instructor only and participants may optionally follow them on their laptops

References

1. Gartner IR: Hype Cycle for Healthcare Provider Technologies and Standards, 2008. In.; 2008.
2. Peleg M: Chapter 13: Guidelines and Workflow Models. In: Clinical Decision Support: The Road Ahead. Edited by Greenes RA, 1st edn; 2007: 581.
3. van der Aalst WMP, van Hee K: Workflow management : models, methods, and systems. Cambridge, Mass: MIT Press; 2002.
4. Emanuele J, Koetter L: Workflow Opportunities and Challenges in Healthcare. In: 2007 BPM & Workflow Handbook. 2007.
5. Haux R, Seggewies C, Baldauf-Sobez W, Kullmann P, Reichert H, Luedecke L, Seibold H: Soarian - workflow management applied for health care. Methods Inf Med 2003, 42(1):25-36.
6. Huser V, Rasmussen L, Starren JB: Representing clinical processes in XML process definition language (XPDL). AMIA Spring Symp 2009.
7. Huser V, Starren JB: EHR Data Pre-processing Facilitating Process Mining: an Application to Chronic Kidney Disease. AMIA Annu Symp Proc 2009, accepted, 2009.
8. Huser V, Peissig PL, Christensen CA, Starren JB: Evaluation of commercial workflow engine for modeling clinical processes in quality improvement and decision support. Proc of 15th Annual HMO Research Network Conference 2009.
9. Huser V: Analyzing biomedical datasets using executable graphical models: RetroGuide system VDM Verlag; 2009.
10. Huser V, Rocha RA, Narus SP: Evaluation of a flowchart-based EHR query system: a case study of RetroGuide. J Biomed Inform 2009, ePub ahead of print doi:10.1016/j.jbi.2009.06.001
11. Huser V, Rocha RA, Huser M: Conducting Time Series Analyses on Large Data Sets: a Case Study With Lymphoma. Medinfo 2007.
12. Huser V, Rasmussen L, Starren JB: RetroGuide, a knowledge representation and execution system for clinical research informatics alerts based on workflow technology. CTSA conference, Washington, DC, fall 2009 2009.