Challenges in Knowledge-Intensive Processes. Mining from Semi-Structured Information and Providing Run-time Automated Adaptation

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For a long time, structured business processes (e.g., the ones of public administrations, of financial institutions, etc.) have been the main subject of workflow related research. However, in recent years, the maturity of process management methodologies has led to the application of process-oriented approaches in new challenging and knowledge-intensive scenarios, such as healthcare, emergency management, coordination of large projects, etc. In these working environments, most business functions involve collaborative features and unstructured processes that do not have the same level of predictability as the routine structured work.

In this talk, we discuss some recent research techniques we developed during the last years that may complement or extend the existing state of the art of Knowledge-intensive Processes (KiPs): the discovery of artful processes and the automated adaptation of dynamic processes at runtime. Let us start by considering a project manager: every day, s/he needs to react to unexpected events, more than the ordinary work of collaboration, such as starting the draft of a document together with a partner, setting up a critical business meeting with her/his group, etc. Very often, managers follow some processes, which are implicitly known by the managers themselves only. Extracting and formalizing them would allow, *(i)* for the manager, a better comprehension of her/his methodologies, along with the opportunity of being assisted by an automated software tool, and *(ii)* for the company/organization s/he works for, to collect and compare the best business practices. As a matter of fact, despite the advent of structured case management tools, many enterprise processes are still "run" over email messages. Thus, reverse engineering workflows of such processes and integrating them with artifacts and other structured processes can paint a true picture of the enterprises process landscape. "Artful processes" are conversely carried out by those people whose work is mental rather than physical (managers, professors, researchers, engineers, etc.), the so called "knowledge workers". In contrast to business processes, which are formalized and standardized, often artful processes are not even written down, let alone defined formally, and can vary from person to person even when those involved are pursuing the same objective. Knowledge workers create such processes "on the fly" to cope with many of the situations that arise in their daily work. Though frequently repeated, they are not exactly reproducible even by their originators since they are not written down and can not be easily shared either. Their outcomes and information are exchanged very often by means of email conversations. The objective of the approach described in the first part of the talk, named MailOfMine, is thus to automatically build a set of workflow models that represent the artful processes laying behind the knowledge workers activities, on top of a collection of email messages.

In the second part of the talk we focus on dynamic processes, a kind of processes that represent activities in highly dynamic situations, where context changes or undesirable outcomes of some activities may occur unpredictably at any time by preventing the achievement of the business goals. Usually, there is not a clear, anticipated correlation between a change in the context and corresponding process changes, by making not possible to predict all possible exceptions at design-time. While several approaches have been proposed and implemented for dealing with expected exceptions via exception handlers typically pre-specified by process designers at design-time,

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our research has been focused on dealing with unanticipated exceptions. Such exceptions can be only detected during the execution of a process instance, when a mismatch between the computerized version of the process and the corresponding real-world business process occurs. To cope with those exceptions, we propose a Process Management System realization, namely SmartPM, which is able to adapt automatically dynamic processes at run-time when unanticipated exceptions occur, without the need to define any recovery policy at design-time. To this end, we use a specialized version of the concept of adaptation from the field of agent-oriented programming; our approach is mainly based on well-established techniques and frameworks from Artificial Intelligence, such as situation calculus, IndiGolog and classical planning.

References

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