RESEARCH REVIEW

Investigating Goal-Oriented Requirements Engineering for Business Processes

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ABSTRACT

Business processes are designed to execute strategies that aim at achieving organisational goals. During the last decade, several methods have been proposed that prescribe the use of goal-oriented requirements engineering techniques for supporting different business process management activities, in particular business process modelling. The integration of goal modelling and business process modelling aims at increasing the alignment between business strategies and the processes with their supporting IT systems. This new research area, which the authors call Goal-Oriented Requirements Engineering for Business Processes (GORE-for-BP), is developing rapidly, but without a clear conceptualization of the focus and scope of the proposed GORE-for-BP methods. Furthermore, an overview is lacking of which methods exist and what their level of maturity is. This paper therefore presents a research review of the GORE-for-BP area, with the aim of identifying relevant methods and assessing their focus, scope, and maturity. This study used Systematic Literature Review and Method Meta-Modelling as research methods to identify and evaluate the state of the GORE-for-BP research area and to propose a research agenda for directing future research in the area. Nineteen methods were identified, which is an indication of an active research area. Although some similarities were found with respect to how goal models are transformed into business process models (or vice-versa), there is also considerable divergence in modelling languages used and the extent of coverage of typical requirements engineering and business process management lifecycle phases. Furthermore, the exploitation of requirements engineering techniques in the full business process management lifecycle is currently under researched. Also, the maturity of the methods found in terms of the formalisation of the transformation activity, the elaboration of method guidelines, and the extent to which methods are validated, can be further improved.

Keywords: Business Process Management, Business Process Modelling, Goal Modelling, Goal-Oriented Requirements Engineering, Method Meta-Modelling, Systematic Literature Review

INTRODUCTION

Gartner Research estimates that by 2015 30% of business software applications will be developed in Business Process Management System (BPMS) environments (Woods & Genovese, 2006). A BPMS environment is an integrated collection of modelling, execution and management tools for supporting Business Process Management (BPM), i.e., the practice of (re) designing business processes, (re)configuring software applications that enact these processes and monitor their execution, and analysing process execution data to discover opportunities for process improvement (van der Aalst, ter Hofstede, & Weske, 2003; Smith & Fingar, 2004; Shaw et al., 2007).

The knowledge about business processes that is required to configure BPMS applications is represented in business process models. These models describe business processes in terms of how to sequence the different process steps (i.e., the orchestration of process activities and the choreography of different collaborating processes), organize the flow of information (e.g., document flows), and assign the responsibility and allocate the required resources for executing process activities to organizational departments or functions, individual process workers or automated devices (e.g., software services in the enterprise's service-oriented IT infrastructure). Hence, business process models present both the operational design of business processes and the functional requirements for the BPMS applications that are intended to support these processes (Vondrák, 2007).

In the field of Requirements Engineering (RE), which studies the elicitation, documentation and analysis of information system requirements, there is growing awareness that also the organizational context of information systems needs to be taken into account in order to obtain a complete and reliable picture of the system requirements (Rolland, 2005). Goal-Oriented Requirements Engineering (GORE) (Mylopoulos, Chung, & Yu, 1999; van Lamsweerde, 2001; Kavakli, 2002) is an approach for capturing the context in which information systems fulfil their role. The GORE approach externalizes this context by means of goal models that show the strategic goals that an organization is pursuing and the decomposition of these goals into operational objectives for which designated organizational actors are responsible. Operational objectives can be achieved through the proper use of organizational resources (including information systems) that are allocated or made available to the responsible actors. As information systems help achieving organizational goals, goal models can be seen as describing high-level requirements for information systems which can be gradually refined into lower-level functional and non-functional system requirements. The high-level 'business' requirements provide the rationale for the more detailed system requirements (van Lamsweerde, 2001; Rolland, 2005).

Most process modelling languages that are used for designing business processes and specifying the functional requirements of BPMS applications do not contain modelling constructs for goals and goal refinement relationships nor do they offer mechanisms to link processes and process activities to the objectives they intend to achieve (Kazhamiakin, Pistore, & Roveri, 2004a; Soffer & Rolland, 2005; Lapouchnian, Yu, & Mylopoulos, 2007; Soffer & Kaner, 2011). Although RE is recognized as a key success factor for systems development, it has received little attention in business process modelling research (Frankova, Massacci, & Séguran, 2007a). Some researchers have recognized, however, the need to clarify the wider organizational context of business processes. Strategies are formulated to configure an organization's capabilities in such a way that the goals of the organization can be achieved. Business processes that use and operate these organizational resources should therefore be designed in accordance with the formulated strategies (Bleistein, Cox, & Verner, 2004b; Kazhamiakin et al., 2004a; Lapouchnian et al., 2007).

The increasing recognition of the advantages that a GORE approach can bring to business process design and BPMS application development (see e.g., Regev, Soffer, and Bider

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