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Technology-driven business evolution

Lerina Aversano, Thierry Bodhuin, Gerardo Canfora *, Maria Tortorella

RCOST—Research Centre On Software Technology, Department of Engineering, University of Sannio, Via Traiano, Palazzo ex-Poste–82100, Benevento, Italy

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Abstract

Innovating the business processes and supporting software systems of an enterprise requires their preliminary analysis and assessment. In particular, data concerning the performance and costs of activities and processes must be gathered in order to identify candidates for innovation. A critical point is finding a suitable presentation means for the gathered data in order to effectively support decision makers.

This paper presents two case studies performed by applying a strategy, named Joint Evolution of business Processes and software Systems (JEPS), for innovating business processes and their supporting systems. JEPS integrates measurement, decision-making, and critiquing techniques for analyzing business processes, identifying activities and software systems to be innovated, and mapping critiques onto specific innovation actions. JEPS is supported by a software environment, named WebEv+, for managing the assessment and evaluation tasks, and the modeling and critiquing of the business processes. The paper discusses two case studies regarding two different organizations in the Local Government domain. The analysis of the organization highlighted improvement goals and technological enhancement needs, and permitted the identification of the business processes and software systems to be evolved.

Keywords: Business Process Innovation; Legacy systems; Software evolution and reengineerings

1. Introduction

Rapid changes in business requirements are forcing enterprises to innovate their business processes and supporting software systems (Hammer and Champy, 1993; Jacobson et al., 1995). Currently, several strategies and methods exist to drive business processes and software reengineering (Bennett, 1995; Bernd and Clifford, 1992; Berztiss, 2001; Sneed, 1995; Steven et al., 2002). All these methods comprise an initial stage for creating a baseline of the enterprise by analyzing and assessing its business processes and software systems. The baseline is then used for identifying critical processes and activities and for devising suitable changes.

This paper presents the results obtained by applying an evolution strategy in two case studies regarding two real contexts of Italian Local Government. The strategy, named JEPS, Joint Evolution of business Processes and software Systems, is presented in a greater detail in (Aversano et al., 2004d). JEPS supports the joint evolution of the business processes and software systems of an enterprise, considering the needs arising from the organization. More specifically, JEPS analyses roles and opinions of all the stakeholders playing an active role in the organization: managers, employees, users, providers and so on. All the information they provide is evaluated and used in decision-making activities, in order to identify effective evolution requirements.

Other methodologies, which analyze the ideas and contributions of all the actors of an organization, have

* Corresponding author. Tel.: +39 0824 305521; fax: +39 0824 50552.
E-mail addresses: aversano@unisannio.it (L. Aversano), bodhuin@unisannio.it (T. Bodhuin), canfora@unisannio.it (G. Canfora), stortorella@unisannio.it (M. Tortorella).

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been discussed in literature. The Quality Function Deployment (QFD) methodology (Cohen, 1995) uses a set of matrixes for codifying and progressively transforming the imprecise user requirements into product requirements and technical characteristics, subsystems requirements, right up to the definition of the development process planning.

JEPS, like QFD, takes into account all the participants involved in the enterprise activities. However, it differs from QFD in its key objective, which addresses the evolution of the Organization, Business Processes and Software Systems rather than the development of new products. To fulfill this purpose, it defines a set of components useful for guiding the joint evolution of three contexts: Organization, Business Processes and Software Systems. This ensures that a business process evolves in order to reach an organization improvement goal, and a software system evolves in accordance with it in order to continue to actively support it after its evolution, and to participate in the achievement of the same goal.

Approaches have been proposed for supporting the assessment of the organizational aspects of enterprises. The Balanced ScoreCard, BSC (Kaplan and Norton, 1996) is a management approach, which provides senior executives with a comprehensive measure of how the organization is progressing towards achieving its strategic goals. BSC starts with the analysis of the mission and vision of an enterprise, and then defines the financial objectives to be achieved for identifying the customer measures needed to produce the desired financial performance. It was initially developed in the business domain, but it was later adapted to the software domain. In (Buglione and Abran, 2000), BSC is compared to the Goal–Question–Metric (GQM) paradigm (Basili and Weiss, 1984; Basili et al., 1994), an analytical goal-oriented approach which is measurement based and button-up driven. Its main characteristic is the use of quantitative evidence for identifying where an improvement is needed. BSC and GQM offer the opportunity to implement a quantitative analysis, and this has led to misinterpreting them as either interchangeable or mutually exclusive. Both have a three-tier structure and aim at determining measures from business goals, but the key point differentiating the two is the strategy, which in the BSC support alignment of business and operative goals.

JEPS exploits the underlying ideas of the QFD and BSC methodologies, and uses the GQM paradigm for defining the evaluation supports. It comprises a toolkit, which supports the assessment in all the contexts and facilitates devising the identification of innovation actions. In particular, the assessment exploits a measurement framework and the identification of innovative actions is based on critiquing techniques, used for identifying opportunities for change (Markovic, 1988; Silverman, 1992). The use of critiquing as a tool for design is not new, as several authors have applied it to the design of software systems (Silverman and Mezher, 1992). In this article, critiquing techniques are applied to process innovation and software systems reengineering (Aversano et al., 2004e). A software environment named WebEv+, *Web for the Evaluation*+, is the automated support for the strategy (Aversano et al., 2004a).

The paper is organized as follows. Section 2 briefly describes the evolution strategy. The subsequent section presents the two case studies and discusses the results obtained with reference to the organization, business process and software system within the two investigated contexts. Section 4 discusses conclusions, lessons learned and open challenges.

2. An overview of JEPS

JEPS consists of three main components:

- a *methodological approach*, which drives the activities to be performed in order to identify the approaches to be applied for evolving business processes and supporting software systems of an organization;
- a *supporting toolkit*, which is composed of a measurement framework, for supporting the collection of quality data by applying the assessment tasks included in the methodological approach, and a set of critiquing tables, for supporting the identification of the approaches to be applied in the evolution process;
- an *automated support*, WebEv+, *Web for Evaluation*+, which is an environment implemented by the authors for supporting the management of the measurement framework, the execution of the assessment activities, and the use of critiquing tables.

Fig. 1 illustrates JEPS. It highlights that the three components consider aspects which are distributed in three contexts, namely Organization, Business Process and Software System. Therefore, a component of the methodological approach is defined for each context. The three methodological components are: Business Innovation, Process Innovation and System Evolution. Each of them defines a set of activities to be performed in the relative context. Moreover, the three methodological components interact in order to achieve the innovation goals defined within the organization and guide the evolution of business processes and software systems. Therefore, the decisions taken in a context influence those to be taken in the others.

The three components of the strategy interact with each other. In particular, the methodological approach aids the tailoring and application of the supporting toolkit, which guides the customization to the specific