

An Investigation into Business Requirements Evolution in Service-Based Enterprise Systems

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Abstract. Service-Based Enterprise Systems represents an emerging paradigm in software development. Over the years, its usage has increased exponentially in fields such as manufacturing, banking, telecommunication and healthcare due to its ability to promote reusability, loosely-coupled and scalability for software development. However to accommodate the evolution of business requirements in SBES, there needs to be in place a standard strategic approach. Moreover, handling business requirements evolution in natural language is very challenging when deluge scale of requirements are expected. Therefore, we propose an approach to automate the activity of evaluating the need to evolve phase which firstly conducted in service evolution life cycle. The proposed approach follows Change-oriented Service Life Cycle methodology as guideline to portray different phases in service evolution. As proof of concept we will select a few SBES projects to evaluate the feasibility of the proposed approach.

Keywords: service-oriented architecture, business requirements evolution, service-based enterprise systems.

1 Introduction

Making its first emergence last few years, Service-Based Enterprise Systems (SBES hereafter) had received a very wide attention from software developers around the globe. Gaining the popularity due to its high potential capability to promote and maximize reusability, scalability, interoperability and performance in software development [7].

Being recognized as an evolution of conventional enterprise system [2]; the development process of a SBES is more less the same, which started with Requirements Engineering (RE) Process. To the best our knowledge, there is inadequate of research being conducted to standardize the application Requirement Engineering (RE) process in SBES environment particularly in industrial settings. Muneera et al [3] highlighted there are five most challenging issues of RE in SBES and one of them is Requirement Change Management and Evolution. The challenge would be, to analyze the impacts

of change on the system. Moreover, it is difficult to modify the functionality existing service especially when the service is being consumed by various users in different context. On top of that, having the requirements presented in natural language would a challenging task for the analyst to extract information and decide the need to evolve for a service [14]. Failure of monitoring these issues will lead to late service delivery and affect the cost, resources and time [8].

Usually, in an enterprise environment, the beginning of service evolution will start with Chief Information Officer (CIO). CIO initiates IT goals that need to be fulfilled by the enterprise. The Enterprise Architect is the person who will translate the goal into meaningful Business Requirements. These Business Requirements, which usually presented in natural language, will be forwarded to the Service Analyst who will be conducting further analysis. The first part of this analysis is to evaluate the need evolve. This activity is the first phase in Change-oriented Service Life Cycle methodology as proposed by Papazoglou [4], which serves as guideline to handle deep changes in service evolution. Generally, deep changes is defined as large scale, transformational changes cascading beyond consumers of service possibly affected the entire end-to-end service chain. It normally deals with re-alignment of business process and policy induced [4]. Studies showed, there are numerous techniques, framework or model [4], [7], [9] and [10] being proposed to manage the evolution of business requirements in SBES perspective. The literature study also identified issues and challenges [2], [3], [6] and [8], typically encountered in business requirements evolution under SBES context.

We propose an automated approach to assist service analyst, conducting the evaluation of need to evolve activity in service evolution life cycle.

2 Research Aim

The core aim of this research is to promote an automated environment of handling business requirements evolution in Service-Based Enterprise Systems.

3 Research Objectives

To achieve the specified aim, a few objectives are derived: (1) to investigate the current issues of business requirements in Service-Based Enterprise System context; (2) to review the current solutions related to business requirements evolution in Service-Based Enterprise Systems (3) design and develop a strategic approach to handle business requirements evolution in Service-Based Enterprise Systems; (4) validate the approach with appropriate case study.

4 Research Questions

The main research question is formulated as follow:

How to assess the effectiveness of automating the process in handling business requirements evolution under Service-Based Enterprise System context?

The main research question is further divided as follow:

- (1) What are the current issues and problems in business requirements evolution under Service-Based Enterprise context?
- (2) What are the current available solutions to support business requirements evolution in Service-Based Enterprise Systems context?
- (3) How to overcome the problems and issues of business requirements evolution in Service-Based Enterprise Systems?
- (4) How to evaluate effectiveness the proposed solution?

5 Research Methodology

To materialize this project, Design Science Methodology for Information Systems and Software Engineering [16] is selected to guide in the process of investigating the problems, design the treatment and validate the treatment. The explanation of each activity is explained in detail below.

5.1 Problem Investigation

Stakeholders.

Based on the current findings, there is only one stakeholder involving for the study that is service analyst. As stated earlier, service analyst will be conducting series of tasks under evaluate need to evolve activity.

Stakeholders Goals.

Upon receiving deluge scale of requirements, the service analyst wished to have faster analysis of requirements evolution with high precision of analyzing the evolution impact when conducting the need to evolve activity.

Conceptual Problem Framework.

Figure 1 below, depicts the activity conducted by the service analyst upon receiving business requirements from Enterprise Architect. We use UML 2.0 Use Case Diagram to portray this conceptual problem.

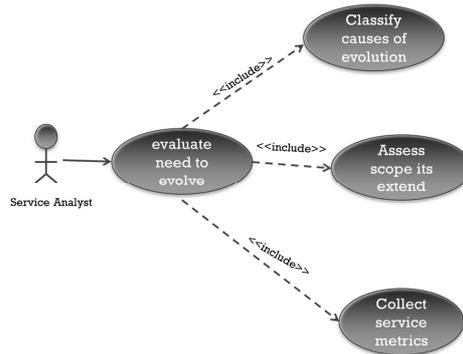


Fig. 1. Need to Evolve Phase

Evaluating need to evolve activity usually involves three sub-activities as depicted in Figure 1. Classify causes of evolution is conducted to categorize types of evolution. Taxonomy constructed by Zaiwen Feng [9], claimed there are three types of motivations that lead to service evolution. Those motivations are recognized as perfective, corrective and performance. Once the classification process is done, the service analyst will assess scope it is extend due to the evolution. At this phase, service analyst will assess how many existing requirements get affected with the evolution initiatives. This activity is also known as inter-requirement change impact analysis [13]. The final task is to collect service metrics. The metrics include delivery performance, transaction volumes, quality thresholds and etc. This information is useful for comparative purposes and determination of expected productivity, cost and service level improvements.

To conduct the aforementioned activities, require huge amount of time. Dealing with natural language requirement is an ever-challenging task faced by the service analyst, as most of the requirements are presented in natural language format [linguistic]. Apart from that, to accurately measure the inter-requirement is also difficult and tedious work.

This research enhances the implementation of conducting need to evolve activity by automating the implementation.

5.2 Treatment Design

Classify Causes of Evolution.

To automate the classification process, researcher will employ the taxonomy constructed by [9] combined with the classification algorithm using natural language processing technique implemented by [15]. This automated classification tool will lessen the time needed for service analyst when attempting the classification activity. The output of this activity would be a well categorized requirements aggregated in in three distinct categories known as perfective, corrective and performance.

Assess the Scope.

Once the classification activity is finished, the service analyst will have to assess any affected requirement due to the evolution initiative. To automate the process, natural language processing technique utilized in [13] will be adopted. The affected requirements will be ranked and prioritized accordingly. This output will assist service analyst to assess how many requirement will be affected by the evolution in statistical figure.

Collect Service Metrics.

This activity requires the service analyst to collect existing service metrics to assist in understanding the nature of services-in-scope and related services and provide a baseline for comparative and determination of expected productivity, cost and service level improvements [6]. We employ work done by [12] and [7] to create a specific repository to store all relevance information about service performance. This information is useful, when predicting future changes of requirements by learning from evolution history [12].

Planned Treatment.

The researcher will conduct an experiment to test the efficiency of proposed solution. A real SBES project will be selected with complete software engineering artifacts like requirements document in particular.

5.3 Treatment Validation

As for validation, the researcher will compare and contrast how close the result produced by the tools to those produced by service analyst. The evaluation is devised using precision and accurateness. In this validation, experts from the requirements engineering domain were used in this study.

6 Current Progress

Currently, the researcher has completed the literature study. Based on the findings from literature survey, a set of questions is constructed for the qualitative study. The qualitative study is conducted as an explanatory purpose to gain better understanding pertaining issues and challenges faced by the industrial practitioner. Conducting the interview session will also enrich researcher's findings. Some of the undiscovered problems reported by the literature might be discovered during the interview sessions. Once the interview session is completed, the result will be assessed and analyze.

The next step to proceed would be the design of the treatment for the identified problem. This would take quite some times.

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