Assessing Software Replacement Success: An Industrial Case Study Applying Four Approaches

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Abstract. This paper describes an industrial case study assessing software replacement success and other effects. The target of assessments has been a large commercial legacy system for customer register management. The success of its replacement by its performed rewrite has been assessed via four approaches concerning: user satisfaction, strengths and problems of the system, problem surveillance and expert judgments. The approaches and metrics have been selected in cooperation with industrial experts in order that they would meet the needs of their organization. The assessments have been conducted by comparing the situations before and after the rewrite. They have included quality aspects. The applied approaches have supplemented each other well and results provided by them have been mainly consistent. The study has offered a wide view of the system replacement effects and lessons for the replacement assessment process improvement in industrial settings.

1 Introduction

Software maintenance and the related software evolution processes constitute the most laborious and expensive phase of software lifecycle. The proportion of maintenance costs of the total software lifecycle costs has traditionally been 50-75% in case of successful systems with long lifetime [9,12]. These so-called *legacy systems* [8] need to be evolved to reflect the typically changing technical and user requirements. Software evolution activities may include modernizing or replacing a legacy system. System evolution strategy choices related to these kind of large-scale changes often have extensive technical and economical long-term effects. Consequently, there is a need to improve the *assessment processes* concerning the success of these software evolution processes. There is also a need to empirically study especially the evolution of practically important legacy systems.

There are many general methods for evaluating economic success and benefits of general IT-projects as listed e.g. in [3,17]. Prediction of success and benefits is obviously important but also very challenging due to the nature of benefits and problems in having access to reliable input metrics. Especially early reliable estimation of the

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oncoming monetary success in industrial settings is typically difficult in practice even despite good intentions and investing large effort to metrics programs.

Another complicating issue is that the total monetary modernization and replacement success including the benefits has not been extensively studied in the past. There are, however, many earlier studies on evaluating software maintenance and evolution, including [1-2,6,11-12,14-15,18-19]. Most of the methods reported in those studies have been evaluated [7]. Additionally, we have earlier developed two methods for evaluating system evolution: ISEBA [5] for selection of proper IS evolution benefit assessment measures, and MODEST [16] for supporting early estimation of system modernization pressures.

The assessment approaches should meet the needs and possibilities of the industrial organizations applying them. Due to the reasons presented above, it appears to be convenient, in case of assessing industrial software replacement success, to first use and improve approaches which support versatile but not too ambitious assessment of the issues contributing to the replacement success and benefits. This includes viewing the replacement success from relevant perspectives by assessing the effects. In this study we refer by success to the achieved total benefits of the performed system replacement as measured in versatile but relatively uncomplicated ways. The success includes the combined effect of the resultant positive and negative issues. This paper presents the results of a case study applying four different approaches to the assessment of the replacement success of a large-scale industrial legacy system. Section 2 describes the context and goals of the conducted case study. Section 3 describes the approaches used in assessing the success of the performed system replacement, and the received results. Section 4 summarizes the main results.

2 The Case Study

The case study was funded by National Technology Agency of Finland (TEKES) and by the industrial partners of the assessment project. The total length of the project was about 14 months. The assessment project group as such used about 200 work days of its resources to the study. Both the system supplier and user organization participated to the study. Central industrial participants included four experts: a manager, two chiefs, and a maintainer. In addition about 100 persons from those organizations provided information regarding various aspects of the system and its use.

The target of the case study was a customer register management system (CRM). It is a legacy system developed since the beginning of 1980s by a software company specializing for providing solutions for supplier-chain management. It is in constant industrial operational use within its user organizations operating on financial business field. The user organization involved to this case study has over 90,000 customers, whose information is stored, handled, and managed via CRM. The system uses a major relational database management system. The data included into the managed customer register concerns: customer identification, contacts, discounts, and delivered documents. The system rewrite was performed by the system supplier in order to further develop the quality of the system. It is the first large-scale change of the system. The identified change pressures concerned: deteriorating accuracy of data content, increased information needs of customers, new needs from sales and marketing regarding the flexibility and versatility of the system, deteriorating system