Examining Software Maintenance Processes in Small Organizations: Findings from a Case Study

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Abstract. Software maintenance constitutes a critical function that enables organizations to continually leverage their information technology (IT) capabilities. Despite the growing importance of small organizations, a majority of the software maintenance guidelines are inherently geared toward large organizations. Literature review and case-based empirical studies show that in small organizations software maintenance processes are carried out without following a systemic process. Rather, they rely on ad-hoc and heuristics methods by organizations and individuals. This paper investigates software maintenance practices in a small information systems organization to come up with the nature and categories of heuristics used that successfully guided the software maintenance process. Specifically, this paper documents a set of best practices that small organizations can adopt to facilitate their software maintenance processes in the absence of maintenance-specific guidelines based on preliminary empirical investigation.

Keywords: Small organizations, software maintenance, case study, cognitive heuristics, ad-hoc process.

1 Introduction

Software maintenance is extremely important for organizations of all sizes; 60–80 percent of organizational resources are spent on maintenance as opposed to 20-40 percent on software development (Takang and Grubb 1996). Software maintenance is defined in IEEE Standard 1219 as "the modification of a software product after delivery to correct faults, to improve performance or other attributes, or to adapt the product to a modified environment" (IEEE 1993). There are four types of software maintenance: (Lientz and Swanson 1980): 1) Adaptive: Changes made to adapt to software environment; 2) Perfective: Changes made based on user

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requirements; 3) Corrective: Changes made to fix errors/bugs; 4) Preventive: Changes made to prevent problems in the future. A vast majority of these changes (75%) are either adaptive or perfective. Corrective changes (fixing defects) comprise 20% of software maintenance of activities and preventive maintenance typically constitutes less than 5% of the total mix (Pigoski 1997).

Small organizations play a vital role on the world stage. Economic growth of many countries including U.S., Brazil, China and European countries rely heavily on small businesses (Software Industry Statistics 1991-2005). According to Process Maturity Profile, organizations that have 25 or fewer employees allocated to software development are considered small (Software CMM 2005).A critical challenge for small organizations in successfully implementing software maintenance functions is the lack of resources (Pigoski 1997). This results in insufficient processes, tools and documentation. Additionally, there is lack of adaptable process improvement models that can be specifically adopted by a small organization (April et al. 2005). Existing process improvement models (e.g. CMMI) are typically extremely resource intensive and are problematic for a small organization to adopt because of their prohibitive resource costs and lack of ease of implementation (Staples et al. 2007). Therefore most small organizations are inadequately prepared to meet the demands of comprehensive process frameworks. Despite the challenges faced by small organizations in carrying out software maintenance functions, there has been very little research investigating how such organizations perform their software maintenance operations (Brodman and Johnson 1994). Therefore, there is an imperative need to investigate the nature of software maintenance operations in small organizations. This article reports the preliminary finding of an exploratory investigation into the nature of software maintenance operations in small organizations using a qualitative case study based approach.

The rest of the paper is organized as follows. We first provide details of our case study based approach. Then we report our preliminary finding. Finally we conclude with a discussion of our findings.

2 The Case Study

We adopted an interpretive case study approach (Walsham 1995) to conduct the empirical study for this research. The choice of the methodological approach was predicated primarily by the context of our particular research focus. In this study, we were interested in obtaining an in depth understanding of a phenomenon (software maintenance processes within a small organization) that has not been explicitly investigated in information systems research. In addition our intention was to obtain a rich description and develop preliminary theoretical insights about the phenomenon in question. Case study research has been recommended as an appropriate methodology in situations where the “intention is to investigate a contemporary phenomenon within its real life context” (Yin, 1994, pg 13), the research and theoretical development understanding of the particular phenomenon are at a formative stage (Benbasat et al. 1987) and the “focus is on the in-depth understanding of a phenomenon and its context” (Darke et al. 1998). The site for