Chapter XII
SPI Long-Term Benefits:
Case Studies of Five Small Firms

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ABSTRACT

The contribution of small enterprises to the software industry is marked, but the level of understanding of the ways in which they can survive, grow, and improve is limited. In particular, there has been a lack of information on the long-term outcomes of process improvement initiatives in small firms. Building on the basis of a study of assessment-based improvement in 23 small and medium size organizations, we have undertaken a follow-up meeting with each company approximately five years following the original assessment. The results show that changes made in an organisation, driven by a framework of model-based improvement, can have long-term impacts even in small organisations; it appears, however, that there is no necessary link between success in implementing improvement and survival of the organisation. The results provide insight into the extent to which improvement actions can reinforce overall success for the small business.

INTRODUCTION

Faced with an enormous choice of methods, tools, and techniques, software development managers need evidence that their investment in new practices will produce benefits (Fenton, Pfeeger, & Glass, 1994; Wood, Daly, Miller, & Roper, 1999). Unfortunately, many approaches are adopted ‘based on anecdotes, gut feelings, expert opinion and flawed research, not on careful, rigorous software engineering experimentation’ (Fenton et al., 1994, p. 87). Therefore, researchers are urged to undertake evaluative research involving realistic projects with sufficient rigour to ensure that any
benefits identified are clearly derived from the concept in question (Fenton et al., 1994). Although past studies have indicated factors which inhibit adoption of software process improvement (SPI), empirical research on SPI in small firms is largely lacking. Recently, research into capability maturity model integration (CMMI) adoption by small units in large companies has been undertaken (Garcia, Graettinger, & Kost, 2005), but there are fundamental differences between small software firms (i.e., where the owner is an operator) and small enterprises (which may be a small unit in a much larger business). Consequently, there is insufficient knowledge about which innovations are effective and which factors influence their adoption. It is vital to understand the processes currently used and to evaluate the effectiveness of process improvement programs, or investments in SPI are wasted (Mustonen-Ollila & Lyytinen, 2003). This research provides evidence of the long-term outcomes of software process innovation in five small software development firms.

A retrospective review of participants in a SPICE-based process improvement program considered the long-term impact of the program on five small firms. After establishing the need to evaluate the long-term effects in small firms, this chapter presents a detailed account of the experiences of five small firms. Recently, retrospective reviews of the SPI outcomes were held with five of the firms that participated in the Rapid Assessment for Process Improvement for software Development (RAPID) program. After describing the methodology, this report considers the long-term impact of the RAPID program on five small firms five years since it was conducted. For each firm, changes in the business are summarised, then the major outcomes of the program, as reported at the follow-up meetings are reviewed to determine progress subsequent to the follow-up meetings. The firms are then compared and contrasted, and conclusions are presented.

**PROCESS IMPROVEMENT IN SMALL ENTERPRISES**

Recent research has raised doubts about whether traditional SPI models (assessment based) are appropriate for small software development organisations. This study is a response to demands for more research to evaluate the long-term effectiveness of assessment-based SPI programs within small development firms (Brodman & Johnson, 1997; Kautz, 1998).

Significant benefits have been shown to derive from process improvement programs, both in software and systems engineering (Gibson, Goldenson, & Kost, 2006) and in conventional manufacturing (Repenning & Sterman, 2001). Long-term studies in manufacturing organisations have identified problems and issues in maintaining improvement initiatives over long periods; a variety of issues have been identified, including the ‘Improvement Paradox’: significant improvements in productivity may lead to production outstripping market demand, with consequent adverse impacts on the firm’s survival. The previous studies we have identified relate almost entirely to large organisations and predominantly outside the software domain. There have been few reports on the long-term benefits that may have been derived from improvement initiatives in the domain of systems and software engineering (Fenton et al., 1994). In particular, few if any long-term studies on the impact of improvement initiatives in small enterprises have been reported.

Recently, plans were announced for the conduct of follow-up studies on participants in the SPIRE Project (SPIRE, 1998) in Europe. The approach we have taken in our retrospective analysis is quite different from that proposed in the Irish study (Sanders & Richardson, 2005b), and in the longer term a comparison of the findings from the two studies will be of value. This work answers the call to evaluate the implementation
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