Chapter 11
Software Process Improvement in Small Organizations:
A Knowledge-Management Perspective

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ABSTRACT

Recently, many micro and small-sized enterprises (MSEs) have implemented a model-based Software Process Improvement (SPI) initiative. An initiative like this is a knowledge-intensive activity that uses and creates knowledge related to multiple areas (SPI knowledge) that should be managed. However, MSEs do not usually manage their SPI knowledge, which results in its erosion and eventual loss. This chapter discusses the importance of Knowledge Management (KM) for those MSEs that are implementing an SPI initiative. It also presents the knowledge created or required to accomplish the implementation of this type of initiative. Finally, it discusses the characteristics that a software tool should have to effectively support this KM process.

INTRODUCTION

The micro and small-sized enterprises (MSEs) play an important role in the development of software products and services. MSEs are organizations with fewer than 50 employees and, in some countries, represent 94% of the software development organizations (Fayad, Laitinen, & Ward, 2000). Competition in the software market encourages many MSEs to start a model-based Software Process Improvement (SPI) initiative. The goal of these initiatives is to increase the productivity and quality of these organizations'

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software processes and products, reduce their associated time and costs, and increase customer satisfaction (Paulk, Curtis, Chrissis, & Weber, 1993). MSEs have limitations, particularities, and special conditions that SPI managers need to consider to design effective SPI initiatives (e.g., MSEs have a reduced number of employees; they have limited funds and they are very vulnerable to market conditions) (Demirors & Demirors, 1998; Horvat, Rozman, & Gyorkos, 2000). Because of these limitations and characteristics, MSEs use special SPI strategies and methodologies. For instance, MSEs usually implement tailored versions of some well-known Process Reference Models (PRMs) (e.g., CMMI, ISO/IEC 15504, or ISO/IEC 12207), or implement PRMs designed especially for their characteristics (e.g., MoProSoft (Oktaba & Vázquez, 2008), Competisoft (Oktaba et al., 2008), or MR-MPS.BR (Montoni et al., 2006)). In spite of these innovations, there is a high failure rate of SPI initiatives, estimated at 70% (Niazi, 2006).

The model-based SPI in MSEs is complex, resource-demanding, and a long-term activity (Mishra & Mishra, 2008; Niazi, Wilson, & Zowghi, 2006). During this activity, to meet the specifications of the PRM, MSEs make several major changes in their current processes (e.g., reallocation of activities flow), structure (e.g., change of roles and responsibilities), policies (e.g., changes in work performance expectations), culture (e.g., introduction of habits, beliefs, or values), employees (e.g., changes in status, benefits or influence), tools (e.g., introduction of new support tools), and software development methodologies (e.g., introduction of new methodologies) (Mathiassen, Ngwenyama, & Aaen, 2005; Moitra, 2005). Because of the magnitude and diversity of these changes, an SPI initiative is a knowledge-intensive activity that uses and creates knowledge related to multiple areas (e.g., software engineering, project management, organizational change, human motivation, etc.). To make these changes, the employees involved (directly or indirectly) in the SPI initiative (called *SPI stakeholders*) acquire new knowledge, work collaboratively, make decisions, learn from others, share their knowledge, and learn from the results and experiences obtained during the performance of their SPI activities. However, very often MSEs do not manage (identify, create, maintain, update, evaluate, access, transfer, apply and preserve) the knowledge created or acquired in all of the above activities (called *SPI knowledge*). This situation may cause MSEs many difficulties (e.g., repeating the same mistakes, making ineffective decisions, overdependence on the very experienced people, increasing the time and cost of the initiative, and eroding the SPI knowledge or its eventual loss (Wickert & Herschel, 2001)). Sometimes the SPI initiatives may fail (Komi-Sirviö, Mäntyniemi, & Seppänen, 2002). In this sense, SPI knowledge management, tailored to the characteristics of MSEs, may help to solve some of the above problems and increase the success of their SPI initiatives.

The purpose of this chapter is threefold: first, to raise awareness of the importance of SPI KM in MSEs and discuss the general problems that MSEs face when they want to manage their SPI knowledge; second, to present an SPI knowledge taxonomy to help MSEs to determine the type of knowledge they require to manage their SPI initiatives; and third, to provide an overview of the features that a technological tool should have to support the management of SPI knowledge and the limitations to its adoption.

BACKGROUND

Nowadays, knowledge is a very important factor for organizations' competitiveness. Davenport and Prusak (1998) consider knowledge as "a fluid mix of framed experience, contextual information, values and expert insight that provides a framework for evaluating and incorporating new experiences and information." Polanyi (1966) classified knowledge into two dimensions: tacit and