The Role of Feedback in Software Process Assessment

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INTRODUCTION

Processes play a pivotal role in business success of enterprises because effective processes increase their adaptability, efficiency and competitiveness in a global market (Lam, 2014). Lepmets et al. (2012) argued that effective software organizations should align their processes to overall business goals and goals on the operational level, which assumes continuous process assessment and improvement. However, in many cases processes are not well defined, which lead to poor and unsystematic implementation. According to Persse (2006), an organization that uses weak or misdirected processes will have weak products and services, and unpredictable outcomes of business activities. For solving problems with poorly defined and implemented processes, a number of approaches have been proposed and shaped in software process improvement (SPI) frameworks. SPI is a set of activities aimed at achieving better process performance, leading to increased quality of software products and services. However, analysis of reported SPI studies revealed a great variability in success of SPI initiatives (Rainer & Hall, 2003; Montoni & da Rocha, 2014). In addition, Bannerman (2008) argued that implementation of SPI initiatives does not always lead to business benefits.

Process assessment helps software organizations to improve themselves through identification of critical problems and appropriate improvement opportunities. Process assessment is the first phase in SPI cycle, which means that assessment outcomes serve as input for process improvement action plans. Effective assessment requires commitment and involvement of management at all levels in an organization, as well as involvement of staff who implement processes (Mathiassen et al., 2005; Herranz et al., 2013). According to Baddoo et al. (2000), a variety of experiences and attitudes of different groups of people within an organization positively contribute to realization of process assessment and improvement activities. O'Connor & Basri (2012) stated that people involvement in assessment and improvement activities is necessary because employees are the best source of information for these activities and should implement improvements in practice.

Feedback is one of the most valuable tools for achieving continuous organizational development and improvement (Roebuck, 1996). Feedback is essential in assessing and improving organization performance since it is in the core of problem solving activities and it influences decision making while searching for solutions for identified problems (Greve, 2010). Understanding feedback and its effects requires looking at intrinsic sources of information relevant for increasing knowledge and improving performance of individuals and organizations (Greller & Herold, 1975). Considering people as the main sources of feedback information in an organization positively influences the success of improvement initiatives. However, it is necessary to consider and weight potential sources of information, which is usually the task of people within an organization.

Software process assessment includes feedback as a core activity aimed at feeding data back to relevant individuals or groups within an organization. Feedback is usually a part of a typical sequence of activities, which includes collecting, analyzing and interpreting data. Dyba et al. (2004) proposed a measurement and feedback process in the context of software process assessment with the following steps: planning to use data, collecting data, analyzing data, feeding back data, and follow up. Feedback is also used as a method for learning in software organizations based on previous experiences. Heikkilä (2009) suggested that SPI initiatives should be more concerned with organizational learning and change management, which helps in improving processes gradually and based on lessons learned during SPI implementation. In addition, information included in feedback can be used as a basis for decision making. According to Halloran (1999), software process assessment and improvement facilitate organizational learning if all relevant information and knowledge is communicated to organisation's members.

BACKGROUND

The concept of feedback has been researched and used in many different fields, including education, management, marketing, professional training, human resource development, medicine and engineering. Feedback is a complex concept originated in systems thinking and cybernetics. Due to the specificity of different fields, the term feedback has been used and interpreted in many ways, which causes that there is no universally accepted definition of feedback in theory and practice. Ramaprasad (1983) provided the most general definition of feedback: *Feedback is information about the gap between the actual level and the reference level of a system parameter which is used to alter the gap in some way*. Examinations of this definition in recent literature revealed that it cues directions for learning and performance improvement in organizations (Hattie & Tim-

perley, 2007). The most common usage of the term feedback in the research on humans relates to presentation of information to individuals regarding different aspects of performance, such as behavior or outcomes (Atkins et al., 2002). Assessment of functional mechanisms of feedback provides more useful and practical information for managers and practitioners than assessment of feedback characteristics (Alvero et al., 2001).

Feedback is strategically important and valuable tool for assessing and improving organizations in highly dynamic, uncertain and competitive business environment. Based on the literature review on various types of feedback in organizations, De-Nisi & Kluger (2000) found that studies reported inconsistent results concerning the effectiveness of feedback. For achieving the best positive effects on performance, and preventing possible negative effects, feedback should be carefully planned and designed. Feedback is generally used for evaluating the level of performance and for indicating improvements. In this sense, feedback is used for identifying a gap between what is observed in the practice and what is expected in improved practice. According to Grafton et al. (2010), the main uses of feedback in organizational context are for: (1) promoting organizational learning, (2) analyzing the impact of past decisions, (3) prompt examination of adopted strategies and targets, and (4) identifying needs for corrective actions. Feedback involves people that provide information and people that interpret provided information. Based on the interpretation of feedback information people make decisions in their organizations. Feedback forms loops between actual performance and established goals. According to Hattie & Timperley (2007), the main purpose of feedback is to reduce divergence between current understandings and performances and proposed objectives.

Types of Feedback

Several approaches for defining and observing feedback can be found in literature. Based on

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