Chapter 6.1

Optimizing the Configuration of Development Teams Using EVA:
The Case of Ongoing Project Adjustments Facing Personnel Restrictions

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ABSTRACT

Resource constrained software development projects are likely to exceed the planned duration as well as the originally planned budget. As variances arise, the revision of team-task-assignments and a resource reallocation might be advisable to avoid a project escalation. In doing so, the development management has to consider the impact on team expertise and possible productivity losses if team members are shifted to other work packages than originally planned. This paper proposes the use of a modified Earned Value Analysis based on new resource-based performance measures, which provides information on the performance effects of adjustment alternatives. Furthermore, it will be demonstrated how these figures can support the decision which human resources should be shifted if a delay exists in one work package that belongs to the critical chain. In this regard, the idea of the knapsack problem is transformed into the challenging task of shifting resources to find the work package that should release the resources to minimize an overall performance decrease. A case study clarifies the implementation.

INTRODUCTION

Accurate forecasts of costs, the duration and quality of software development projects are hardly to achieve (e.g., Barry, Mukhopadhyay, & Slaughter, 2002; Fairly, 2004). The reasons for these overruns arise out of the complexity, conformity, changeability and invisibility of such projects (Brooks, 2010). Whereas the macro level aspects have been widely discussed, consequences for individual decision making are rarely analysed (Abdel-Hamid, Sengupta, & Ronan, 1993). Due to several reasons, the problem of inaccurate forecasts is especially true for the development team performance (Plaza, 2008), which generally has important influence on the overall success. Especially owing to the still existing problems, a lot of research has been done in the field of team design and effectiveness (e.g., Campion, Medsker, & Higgs, 1993; Cohen, Ledford, & Spreitzer, 1996; Li, Li, & Wang, 2009). Hackman and Oldham (1975) elaborated the basics of the Job Characteristics Model, which is according to Fried and Ferris (1987) a rather useful explanation on the individual level. It focuses on task identity and significance, autonomy, feedback and the variety of skills and corresponds to the Team Characteristics Model developed by Strubler and York (2007). Combining both models, the perception of meaningfulness of the work might enable a higher team performance and is itself based on the variety of individual and team skills, task significance and task identity (Stewart, 2006). Empirical studies point out a positive correlation between task characteristics and team performance (Li, Li, & Wang, 2009).

Based on this relationship, literature is primarily analysing optimal task design or team configuration to improve team performance (e.g., Chiu & Chen, 2005). In doing so, cost or time restrictions are oftentimes neglected. Thus implicitly, an unrealistic planning situation is presumed in which management can decide without further constraints and has sufficient lead-time to adjust teams or tasks. Considering software development, this might be an appropriate assumption at the starting point of the project. After the project started, delays oftentimes require to shift work sub-packages to other development teams or to adjust team configurations. Due to preliminary decisions and the requirement of ongoing development, an optimal fit between task characteristics and team members compared to the initial planning before the project's start is frequently not achievable. In fact, the project management has to take productivity losses into account that occur when team members are shifted to other than the originally planned work packages.

Since cost, schedule or quality variances are likely to occur, key performance indicators have to be tracked by a project control system (Kerzner, 2009; Meredith & Mantel, 2009; Plaza, 2008). Numerous well-known performance measurement systems already exist, for example: Measurement and Analysis Infrastructure Diagnostic (MAID) evaluation criteria (SEMA Group, 2009), Six Sigma (e.g., Pyzdek & Keller, 2009), Integrated Enterprise Excellence System (Breyfogle, 2008), Practical Software Measurement (McGarry et al., 2001), Goal-Driven Software Measurement (Park, Goethert, & Florac, 1996) or Balanced Scorecard (Kaplan & Norton, 1996). However, all of them provide a formal framework with design recommendations rather than precise metrics, whereas, for example, Kitchenham (2010), Kan (2002) or Fenton and Pfleeger (2000) focus on software metrics rather than on the management process. Farooquie & Farooquie (2009) provide empirical evidence on performance measurement. Kasunic (2008) provides an overview of performance measures, their definition and influencing factors as result of expert workshops organised in the Software Engineering Process Management (SEPM) program (Table 1).

Influencing factors show possible impact on the project outcome (Kasunic, 2008; Figure 1):

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