Quantitative Measurements of the Influence of Participant Roles during Peer Review Meetings

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Abstract. Peer review meetings (PRMs) are formal meetings during which peers systematically analyze artifacts to improve their quality and report on non-conformities. This paper presents an approach based on protocol analysis for quantifying the influence of participant roles during PRMs. Three views are used to characterize the seven defined participant roles. The project view defines three roles: supervisor, procedure expert and developer. The meeting view defines two roles: author and reviewer, and the task view defines the roles reflecting direct and indirect interest in the artifact under review. The analysis, based on log-linear modeling, shows that review activities have different patterns, depending on their focus: form or content. The influence of each role is analyzed with respect to this focus. Interpretation of the quantitative data leads to the suggestion that PRMs could be improved by creating three different types of reviews, each of which collects together specific roles: form review, cognitive synchronization review and content review.

Keywords: Peer review meetings, formal technical reviews, process measurement, participant roles, cognitive activities, data analysis, log-linear modeling.

1. Introduction

It is helpful if the team activities defined in a software process facilitate the flow of information, which is based on communications, and knowledge, which is based on understanding, among the project team members. Informal and formal communications are two forms of internal team communication that facilitate project progress.

Informal communications, by the definition of “informal”, are rarely explicit or prescribed practices of software process, and constitute an implicit activity of any team interaction and a mechanism for maintaining the flow of information and ideas. Typical informal communications are peer-to-peer conversation, electronic mail and informal brainstorming meetings. Little is known about the influence of informal communications in such software development settings, and more studies are needed for a better understanding of their impact on the efficiencies of software development projects.

Formal communication consists of practices often prescribed in software processes in the form of different types of meetings, such as walkthroughs, inspections and review meetings, which we classify under the generic name of peer review meetings or
PRMs. The activities expected to take place during a PRM have been outlined in various references (Institute of Electrical and Electronics Engineers, 1993).

PRMs are held throughout the development process to verify the content of an artifact resulting from the current phase of the development process, and to validate the specifications for succeeding tasks. By our definition, a project team can hold many PRMs during a week, and each PRM can last anywhere from less than an hour to almost a day.

Using our definition, the number of participants can range from two to the full team. The ideal size of a reviewing team is, however, a subject of debate. Weller (1994) showed that a team composed of four reviewers is twice as efficient as a three-reviewer team. By contrast, Buck (1981) demonstrated that there is no difference in the efficiency of two, three- and four-reviewer teams. Porter and Johnson (1997) concluded that reviewing team size does not influence the anomaly detection rate, and that anomaly detection techniques are the main factor influencing PRM efficiency. Two remaining factors (Porter et al., 1995) must be understood if the efficiency of PRMs is to improve: the cost-benefit ratio, and the factors responsible for the increase in benefits or the reduction in costs have to be identified.

Participants in a PRM may know that roles are influential. It is often observed that some participants are better than others at leading a team meeting. It is also suspected that participants’ places in the hierarchy are somehow related to the amount of talking they do. These are both general qualitative observations about what is really going on. To obtain quantitative data on meeting activities finer measurements are needed. Of course, there is an inherent difficulty in setting up an experiment: the participants will be aware of the roles they are playing. Another approach is to observe the PRMs that are held during a real software development project. In such a case, fewer parameters are under control but the data are from real-life meetings. At the same time, the data from such a case study must be treated with caution, since such a study is a specific set-up. Nevertheless, it could serve to illustrate the benefit of using quantitative data and provide some support for the qualitative interpretation of roles. More and specific case studies are needed, however, before generalized models can be proposed. The analysis presented in this paper is a first step towards quantitative analysis of the PRM.

This paper presents an approach to the study of the PRM based on protocol analysis in which the collaborative activities involved in reviewing a technical document are measured. The basis for this approach is to obtain quantitative data, which enables modeling of the roles and factors that influence the PRM. The working hypothesis is that the influence of roles in a PRM can be quantitatively measured and modeled. Generalization of the model is beyond the scope of this paper because the data are based on this particular case study.

2. Case-Study Setting

This case study is taken from a real software development project to develop a business process simulator based on Petri Nets. The project required four full-time