A Requirement Elicitation Methodology for Global Software Development Teams

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INTRODUCTION

Failures during the elicitation process have been usually attributed to the difficulty of the development team in working on a cooperative basis (Togneri, Falbo, & de Menezes, 2002), but today there are other points that have to be considered. In order to save costs, modern software organizations tend to have their software development team geographically distributed, so distance between members becomes one of the most important issues added to the traditional problems of the requirement elicitation process (Brooks, 1987; Loucopoulos & Karakostas, 1995).

So far, literature has widely analysed real life Global Software Development (GSD) projects and pointed out the main problems that affect such environments, especially related to communication. As a complementary view, we have focused our research on analysing how cognitive characteristics can affect people interaction in GSD projects, especially during the requirement elicitation process, where communication becomes crucial.

In this article, we present the main characteristics of requirements elicitation in GSD projects and introduce a cognitive-based requirement elicitation methodology for such environments.

BACKGROUND

Advantages and challenges of GSD have been widely analyzed in literature. As part of the advantages, the most cited are:

- Taking advantage of time difference to extend productive hours (Herbsleb & Moitra, 2001);
- Minimizing development costs (Lloyd, Rosson, & Arthur, 2002);
- Locating developers closer to the customers (Damian & Moitra, 2006); and
- Taking advantage of diversity of stakeholders' knowledge and experiences (Ebert & De Neve, 2001).

On the other hand, the challenges that GSD must face are (Damian & Zowghi, 2002):

- the loss of communicative richness, affected by the lack of face-to-face interaction;
- the time difference between sites, that introduce delays in the project;
- cultural diversity, as a source of misunderstandings; and
- knowledge management, because of the need of maintaining information from many distributed sources.

Looking for solutions to improve communication in GSD, concepts from CSCW (Computer-Supported Cooperative Work) become important because this research area concerns the development of software for enabling communication between cooperating people (*groupware*), that can be simple systems (like e-mail or plain-text chat), more complex ones (like videoconferencing), or the combination of more than one of them. To be more specific, when talking about groupware we follow a convention: We refer to every simple communication technology (e-mail, chat, videoconference) as groupware tools, and to the systems that combine them as groupware packages (Gralla, 1996). Doing so, the most common groupware tools used during multisite developments are e-mails, newsgroups, mailing lists, forums, electronic notice boards, shared whiteboards, document sharing, chat,

instant messaging, and videoconferencing (Damian & Zowghi, 2002; Gralla, 1996).

Another research area related to the distributed requirements elicitation process is Cognitive Informatics (CI), a transdisciplinary research area that encompasses informatics, computer science, software engineering, mathematics, cognition science, neurobiology, psychology and philosophy, and knowledge engineering (Chiew & Wang, 2003). In CI, there is a bidirectional relationship between cognitive sciences and informatics (Wang, 2002):

1) using computing techniques to investigate cognitive science problems like memory, learning, and thinking; and
2) using cognitive theories to investigate informatics, computing, and software engineering problems.

In our research, we have followed the second point of view, using concepts from cognitive psychology to improve the requirement elicitation process. Doing so, our research focused on learning styles models (LSMs), a cognitive psychology theory based on Jung's theory of psychological types published in 1921 (Miller & Yin, 2004), that classify people according to the ways they perceive and process information. These models have been discussed in the context of analyzing relationships between instructors and students, but we propose applying them to a virtual team that deals with a distributed requirement elicitation process, considering an analogy between stakeholders and roles in LSM, because during the elicitation process everybody "learns" from others (Martin, Martinez, Martinez, Aranda, & Cechich, 2003), and stakeholders play the role of students or instructors alternatively, depending on the moment or the task they are carrying out.

After analyzing five LSM in Martin et al. (2003), we found out that every item in the other models was included in the model proposed by Felder-Silverman (Felder & Silverman, 1988), so that we may build a complete reference framework choosing this as a foundation. The Felder and Silverman (F-S) model classifies people into four categories, each of them further decomposed into two subcategories (*Sensing – Intuitive*; *Visual – Verbal; Active – Reflective; Sequential – Global*). To know their cognitive profile, people must fill in a multiple-choice test (available at http://www.engr.ncsu.edu/learningstyles/ ilsweb.html), that returns a rank for each category. Depending on the circumstances people may fit into one category or the other, being, for instance, "sometimes" active and "sometimes" reflective, so preference for each category is measured as *strong*, *moderate*, or *mild*.

Most of related works use learning and psychological style models with educational purposes, while few works use them to solve problems in software engineering. One work which uses cognitive styles as a mechanism for software inspection team construction is described in Miller and Yin (2004). They use the MBTI method, an instrument similar to the F-S model. Their intent is different from ours because they use the cognitive styles to set which people seem to be more suitable to work together, while we try to give the best solution (concerning technology) for an already chosen group of people.

Figure 1. RE-GSD methodology