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An Experience of Software Process Improvement Applied to Education: The Personal Work Planning Technique

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EXECUTIVE SUMMARY

This case describes the use of the Personal Work Planning (PWP) technique as a time management tool for student practicals on the Software Engineering II course at Carlos III University. It analyzes the results obtained and presents the methodology used to implement activities associated with the Personal Work Planning technique in an academic institution. In addition, an empirical study was carried out to determine the level of student satisfaction after using this technique. This case study concludes that many students realized the usefulness of PWP for their assignments. This technique is of invaluable help to lecturers who wish to improve the course curriculum and the practicals.

BACKGROUND

Carlos III University of Madrid, founded in 1989, is a public university with an enrollment of 13,342 students and a staff of 1,231 (910 lecturers and 321 administrative staff). It offers a total of 32 degree courses and has three faculties: Social Sciences and Law; Humanities, Documentation and Communication; and the Engineering School. The Engineering School offers studies in Industrial Engineering, Computer Sciences and Telecommunications among others. The university teaching staff is divided into 16 departments, which organize research and lectures in their respective areas. Carlos III University opened with modern, flexible and multidisciplinary curricula and, from the beginning, made measuring and controlling its basic processes an integral part of their policy. Every year, a University Quality Committee implements Improvement Programs and carries out a Teaching Quality Evaluation Program for all degree courses. Every semester, students complete questionnaires to evaluate both courses and lecturers for the Computer Science degree. The evaluation for the Computer Science degree has been positive.

At present, the questionnaires consist of 13 questions: one assesses their interest in the subject matter, eight assess the lecturer, and the remaining four assess the practicals and time dedicated to the course.

This experiment was based on an evaluation of the Computer Science course. The aim was to determine the effort students dedicated to developing their practicals. With the real data, it will be possible to design better courses where there is a correlation between the total number of hours and the time dedicated to practicals, thus a more realistic approach to achieving the objectives.

SETTING THE STAGE

The main objective of Software Process Improvement (SPI) is to increase the quality of products and services, which a software company provides, by improving the quality of their production processes.

One of the first research centers of software process improvement was the Software Engineering Institute (SEI) at Carnegie Mellon University, in particular under Watts Humphrey. The SEI developed the Capability Maturity Model (CMM) (Paulk et al., 1993) based on the definition of Humphrey's software process improvement (SPI) principles (Humphrey, 1989). SPI has already been edited in ISO 15504 standard (ISO, 1997) as an international model reference for software process improvement.

However, experience related to SPI has shown that the lack of success in an improvement program is due to the bureaucratic nature of the improvement designs and the need for an amount of human and material resources that many organizations cannot provide.

Important research has conclusively shown that one of the project's success factors is the capability of the personal software process used by software engineers. Watts Humphrey defined the main purpose of the Personal Software Process (PSP) as continuous improvement of the individual activities related to a software project developed by a software engineer.

The Software Engineering curriculum must, therefore, help software professionals to do their job well; that is, to design and develop high-quality software products at agreed cost and on schedule. This will increase the quality of the products and services provided by the software companies.

In the PSP description, Humphrey (1997), introduces software process principles to teach students disciplined personal practice to produce high-quality work. In order to develop quality software systems, students must learn to plan and control their work. Previous case studies (Lisack, 2000) concluded that many students failed to recognize the benefits of such a process and felt that it only took time away from programming.

The authors of this experiment firmly believe that PSP should be taught with each course but different aspects would correspond to different courses. For example, individual task management would be taught during a software project management course, and software error prevention and detection during a software development course. For this reason, the techniques proposed in PSP for planning individual work have been extracted and modified. This is how the definition of Personal Work Planning Technique (PWP) came about. PWP was taught during a software project management course in Information Systems, a specialization of Computer Science.

PWP techniques help to improve the individual process used by software engineers since previously registered personal process performance experience can be retrieved to organize and estimate the size, duration and effort of the new task to be accomplished. Consequently, software engineers can reduce the time spent on re-work resulting from poor task organization, which means that software products can be delivered on time, thus satisfying all quality levels previously determined.

Personal Work Planning Technique

In this case, *plan* refers to the document that describes the way a specific project is to be developed: how, when and what time and effort are needed. The main contents of the plan were: tasks to be accomplished, starting and finishing dates and the time needed to execute them. Time could be spent on different work categories. A work category is a set of tasks of the same type; for instance, attending classes, studying, doing exercises. All work categories are types of tasks.