Evaluating Effectiveness of Global Software Development Using the eXtreme Programming Development Framework (XPDF)

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Abstract

This paper presents an ongoing study into the productivity of the eXtreme Programming software development approach when carried out globally. XP is evaluated using a framework that has been developed using multiple data collection techniques. This study is in the early stages, at this point a pilot study is underway with a view to a more rigorous study once the analysis is complete and framework assessed. The paper also covers the future work that could be completed using this framework.

1. Introduction

Due to the changing nature of Software Engineering a greater number of people than ever are working in non-traditional development environments. This is pushing the existing Software development methods to new limits. These methods have been proven over a number of years to work to at least a satisfactory level in more orthodox settings, the question that my research poses is do they also work to the same satisfactory level when used in a geographically disparate manner.

This paper presents a theory that I proposed, the reasoning behind this investigation and an initial set of results and future experiments. This work is in its early stages and the results give an intermediary view of the investigation.

2. Why I think XP can work in a Global development environment

The eXtreme Programming (XP) approach has been proven by previous studies to be a successful development methodology in an orthodox development environment [1][2]. In addition these studies show that although XP isn't for everyone the majority of developers who have developed software using both traditional software development methods and XP believe that this is a more satisfying and productive way of writing software.

There are now many tools available to encourage communication and numerous other tools available to allow two people to view and amend the same code at the same time from different locations, commonly grouped under the 'groupware' heading [3][4]. However the use of tools alone will not be sufficient. This work focuses on using XP as the process model with an eXtreme Programming Development Framework (XPDF) to evaluate this approach.

One of the four XP principles is communication and the importance of this to effective software development. Encouraging the level of communication suggested by XP in development teams working remotely has proved to be one of the most difficult areas to replicate. With the tools that are readily available and the XP approach, this work is evaluating whether it is possible to have a similar level of communication whilst working in remote locations to more orthodox software development teams.

3. What is XPDF?

XPDF is an evaluation framework, which incorporates small, easily implemented, aspects from three, previously tried and tested investigation techniques. These include Software Process Improvement [5] evaluation processes, such as aspects from the Capability Maturity Model [6][7][8], which focuses heavily on the repeatability and reliability of the development method in question, in this case XP.

Qualitative Research techniques focus on the subjective opinions of those participating in the study; in

this context how people feel about working in remote locations in place of a more traditional development environment or using different development methodologies. Data will be collected using questionnaires and interviews [9][10].

Finally Software Metrics were collected, software metrics are the bare statistics of the team, number of lines of code produced in the time given, the number of errors in the final deliverable, any change from previously delivered work to name a few [11][12][13].

During the data collection phase data collected using each technique was treated in isolation, as indicated by Figure 1. However during the evaluation phase of the investigation several of the results will be analysed using two or more methodologies simultaneously.
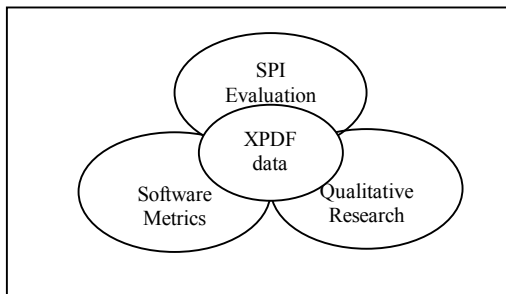

Figure 1: The Evaluation Framework used.

Several XP practices can be carried out in the same way independently of the location of the developers. This study concentrates on the evaluation of the practices that must be adapted, these include pair programming, collective code ownership, customer onsite and always available, and high levels of communication and pair swapping [14][15]. XPDF aims to evaluate the productivity of teams using XP in remote situations in comparison to those in more traditional settings.

4. Preliminary results

Preliminary results show that XP is a very effective development methodology when used in an orthodox setting [1][2]. There are no official results for the effectiveness of XP when used on remotely conducted projects as this research is in its early stages. However early indicators of the analysis of data are that with the correct tools in place to aid communication XP can be just as effective when carried out in this manner as in more orthodox settings.

5. Experiments in Progress

5.1. Experiment 1

This experiment involves a number of volunteers. Each experiment requires two participants. After the pilot investigation it would be beneficial to have more participants involved throughout each iteration. People participating in this experiment are given an overview to eXtreme Programming, in the form of a handout for them to read. An in-depth knowledge is not required, as specific tasks are presented guiding the participants through XP in a stepwise manner.

A relatively simple exercise, involving the programming of a 'Lego brick' is presented for completion following XP principles. The main challenges of this task are the implementation of XP practices on this scale and with participants in different locations. The two participants are located in adjoining rooms. The person conducting the experiment is able to view the activities of both participants and give instructions to both participants or to each individual. Communication is by means of a telephone, NetMeeting and a code-sharing tool. All tasks are be presented by the customer as realistically as possible in the form of tasks and story cards decided at a planning meeting, again conducted remotely, with changing requirements and priorities.

5.2. Experiment 2

Software Hut is a module taken by all second year students taking a Computer Science / Studies degree course. During this module the students are asked to write a piece of software to fulfil a specific brief. All the students are given the same brief and all have to follow the same development process. To carry out the investigation effectively the group is split into two sub groups, both are presented with the same task. One group follows the XP principles in an orthodox manner, the other follows XP remotely. Both groups are evaluated using XPDF.

It could be argued that these students have insufficient experience in both developing software using any development process, or carrying out eXtreme Programming software development in particular.

However at no point in the specification of this research is it mentioned that the subjects under investigation are either experienced software developers or in mainstream industry. The criteria are that the participants are developing software on some scale following the eXtreme Processing methodology in a remote fashion. When this implementation is carried out the lack of experience will have to be taken into consideration when analysing the results. Similar studies evaluating XP in undergraduate modules have been carried out and the effect on the final conclusions shows to be negligible [16][17].

6. Future experiments – Why Use XPDF?

Small development teams carrying out all or some of their development using XP in a remote manner would be required to participate in the experiment. Companies would be required to supply similar information to that required in the experiments currently running. This would include the completion of qualitative and quantitative questionnaires, participation in an interview. As well as the above each company would be required to provide a summary of productivity during the course of the study.

In return for their participation the company would gain feedback on the emotions of the development team regarding the process and productivity, suggestions on how the current process could be improved based on the information gathered from their company and the findings of others. All information supplied would be confidential.

As well as this companies would be included in any research papers resulting from the studies.

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