THE EXPERT APPROACH – A CASE STUDY

Ilian Mihaylov, Penko Ivanov, Eliza Stefanova, Avram Eskenazi, Sylvia Ilieva

Abstract: An experiment under the EC IST 34488 eXPERT project in Rila Solutions (a Bulgarian software company) is described. The approach is a systematic combination of Extreme Programming (XP) and Personal Software Process (PSP). The Rila Solutions context of applying eXPERT approach is presented. The advantages of applying the eXPERT approach, as well as the lessons learned, are outlined.

Key words: software development process, eXtreme Programming (XP), Personal Software Process (PSP), eXPERT approach.

INTRODUCTION - SOFTWARE REALITIES IN SME

In the last couple of years the development of software projects became quite different from the projects carried out just a few years ago. The IT marked became much more competitive and a lot of companies tried to find out ways for producing better and better software at lower company costs. The risk and uncertainty caused by business and technological changes are greater today than in the past.

Nowadays the software development characterizes with rapid development and less delivery time to the customer (or a shorter time-to-market period) at lower cost. At the same time the new technologies and standards put the SME in a position that fewer specialists are aware in the latest high-tech achievements while the client requires higher and higher quality of the products – low defect levels, high performance and persistence, etc. In this situation the new company projects are put in rather risky situation for achieving the required outcomes. The result is that the projects have to be managed in a turbulent business and technology environment - the often changes on the market and in the technologies area, which influence the software development [4].

Such a situation is enough complicated in itself. But in real software development in the SME it becomes more complex because of several additional peculiarities already inherited in such companies. Practically the most of the e-project development SMEs are at Capability Maturity Model (CMM) Level 1. The reason for that may be:

- They are young SMEs with ambitious and energetic developers, but still inexperienced and not enough trained.
- Such organizations frequently have difficulty making commitments that the staff can meet with an orderly engineering process, resulting in a series of crises.
- During a crisis they usually revert just to coding and testing.
- Success depends entirely on the competence and heroics of the people in the organization.
- Occasionally, capable and forceful software managers can withstand the pressures to take shortcuts in the software process; but when they leave the project, their stabilizing influence leaves with them, and the established practices become unstable again.

In spite of this ad hoc, even chaotic, process, Level 1 organizations frequently develop products that work, but quite often exceeding the budget and schedule. Thus, Level 1, characterizes more the individuals than the organizations capability [7].

In the described new software development environment with its specific characteristics new methods and approaches should be adopted, providing possibilities for responding to the changes, yet achieving the business and quality goals, and learning from the experience from the already accomplished projects. SME should aim to achieving higher level of company knowledge and competence, approving the overall organization capabilities and level of expertise.

The paper is organised as follows: Section 2 presents the eXPERT approach. Section 3 - the Rila Solutions context of applying eXPERT approach, Section 4 - the lessons learnt and Section 5 concludes the paper.
THE EXPERT APPROACH

The main objective of EC IST 34488 eXPERT project is to define and provide the SMEs, developing e-business applications, with a powerful light approach by facilitating all related activities with crucial importance for a project success: pure development, management of time, changes, quality, customer relationships, and professional growth of the employees.

The eXPERT approach is a lightweight approach for software development combining the principles of eXtreme Programming (XP) [1] and the Personal Software Process (PSP) [6]. It addresses various aspects of e-project development, like imprecise and slipping project scope, effective communication, integration of the customer into the project development process, project estimation and planning, following sound personal and team discipline principles. These features make it particularly appropriate for a wide range of e-projects. The adoption of this approach creates new professional and personal values that are necessary for SME to enter the digital economy - flexibility, quality, efficiency, communication skills, as well as working with uncertainty, intangible assets, rapidly changing requirements, and the crippling cost of failure.

The eXPERT project consortium established a network of Centers of Expertise (CE) in Spain, Germany and Bulgaria, and user companies associated to each CE. Seven pilot projects are run at the User companies who experimenting the application of the defined approach to e-project development. The case study this paper describes is one of those pilot projects – the Bulgarian company Rila Solutions.

The latest studies on the well-known software development methodologies and their applicability to e-projects reveal that they do not fit very well the priorities, the abilities and the corporate culture of SMEs developing e-business or e-commerce applications.

Traditional methodologies assume that if the programmers tried hard enough, they could anticipate the complete set of requirements early and reduce cost by eliminating change, which can be reasonable in stable environments, but it is not the case at all in e-projects. In the fast changing environment of e-projects change cannot be eliminated. Rather than eliminate rework, the new strategy is to try to reduce its cost, while retaining quality.

Of all the lightweight methodologies, XP tends to be best accepted by the e-project developers due to the simplicity of its rules and practices, its flexibility to changes in a project run, refactoring orientation and collaboration ideology. XP emphasizes team style of work, involving the customer in all the processes of software development, which is one of the reasons for having a successful product delivery in time and with a happy customer. XP identifies five fundamental principles: Communication, Simplicity, Feedback, Courage and Quality Work [5].

XP practices are intended for use with small (less than 10 people), co-located teams such as most of those in e-project development, especially in SMEs.

Although the XP practices seem to be very simple they require strong individual and team discipline in order to achieve good results. There are a number of reports about XP experiments showing that they have failed due to developers’ reluctance or incapability to apply the practices in a disciplined and professional manner. The incapability aspects are mainly related to making wrong estimations of individual work and failing to create a correct plan of the tasks that have to be performed. It seems that complementing XP with the PSP is a good way for resolving the problem. Even more, the PSP could also contribute to coping with the problem of reluctance. That is why the eXPERT approach is based on combination of two well-known software development approaches XP and PSP.

The PSP helps people to understand and improve their personal performance. It educates them to estimate and plan their work and to do this before committing to start doing the job. PSP, similarly to XP, focuses on building quality products and tracking quality from the initial development phase, instead of checking it right before delivery. A
complementary feature of PSP to XP is that PSP provides scripts that support each engineering activity and facilitate its correct completion. Another PSP feature that pairs the XP objectives is that it assists the software engineers in improving their performance. Last but not least, PSP is organized in levels, and companies could adopt a level, which best suits their current state and maturity level, and to gradually improve them.

The eXPERT approach tries to balance or compromise between the "too heavy" methodologies that one remembers and the "too light" methodologies that are barely a step away from anarchy. As mentioned in [2], SME’s real need is a "barely sufficient" methodology, one that will inject the right amount of rigor for the situation without overburdening the team with unnecessary bureaucracy and eXPERT approach is created as such.

The eXPERT architecture (Fig.1) is process oriented.

Fig. 1 - eXPERT structure

The approach is described by means of five processes: Customer Requirements Management, Project management, Designing, Coding and Testing. The processes are described in terms of Activities, Tasks that have to be done to complete an activity, and Responsible role for performing a task. Roles are described in eXPERT organizational structure. In particular, eXPERT defines the following roles: Customer, Coach, Tracker, Developer and QA-person. They are very close to the roles as defined in XP, with some additional responsibilities coming from the application of the PSP practices. More than one role can be assigned to a single team member into a project. In such a case it is important that this team member has the necessary knowledge and skills as well as the time for playing all the roles assigned to him.

The eXPERT approach, if compared to XP, seems to be more structured, easier to be understood and applied by SME’s because of the process oriented architecture. At the same time it is not as light as XP - especially for developers - because of the need to measure activities and tasks to be done (each one of the processes contains one special activity, which goal is to measure effort and time spent on tasks into the process). The idea for the measurements came from PSP, but in all other directions the eXPERT approach and PSP seem to be incomparable. All measures in the eXPERT approach are performed only when they are necessary, and their main goal is to optimize the time and cost planning. These measurements itself should be not so heavy extension for the SME’s applying the eXPERT approach, if specialized tools for gathering and analyzing data from the measurements are available. That is why eXPERT could be considered as light but well balanced approach.

RILA SOLUTIONS CONTEXT OF APPLYING THE EXPERT APPROACH

At Rila Solutions, as in most software developing SMEs, the necessities of providing high quality software solutions has increased enormously. Clients need to have the feasible system as soon as possible and constantly make amendments of the functional scope. The need of flexibility of the software development process apparently becomes one of the major issues in the new development practices. Delivering software solutions is hard and delivering quality software on time and budget is even harder. The new trends in software development are more than clear: deliver high quality in less time and less budget.
The Rila software development Process (developed and applied by the company) is flexible enough to allow different Project Management (PM) methodologies to be adopted depending on the matter of the project. Some part of the Rila projects (but now-a-day—a small number) are the ones with well written specifications, clear customer understanding on what the customer really wants and by what means this will be achieved. They have well defined business models, technologies and goals. Technology used is well described and no variations upon the solution development are possible.

With other projects (possibly around 70%) changes are most probably to occur because the system definition is not stable enough. Rila is working in direction to improve its PM process and to adopt world best practices, which should allow delivering solutions on time, on budget and with the desired functionality. For this kind of projects they applied as an experiment the eXPERT methodology.

To make clearer the current situation, we should add that Rila Solutions uses a Quality Management System, which is ISO 9001:2000 certified. This also has its impact on the application of new methodologies, and consequently on the gap analysis - the first step, aiming at discovering all discrepancies between the existing Rila Software Development Process and the eXPERT approach.

**LESSONS LEARNT**

The SMEs, planning to apply the eXPERT approach, should have in mind some of the steps in Rila experiment as an example. They could repeat at least two of them: to identify whether they really need the eXPERT approach (could use similar or the same as Rila’s questionnaire) and to train the staff how to apply eXPERT approach.

Using the eXPERT in the real project in Rila showed that the benefits of the eXPERT approach are the reduced number of documents, simplification of some of the documents and the time for customers’ feedback. With the application of the eXPERT approach the project documentation is kept to a reasonable minimum. At the same time the total time for shipping the product to the customer reduces. The effort and time spent on analysis and design is replaced by iterations with the constant customer monitoring (Fig.2).

![Fig. 2- Traditional Approach vs eXPERT](image)

It is essential for the project success the appropriate selection of the staff in general to be carefully performed. When the company tries to implement a new methodology the management should choose appropriate pilot project. Young and enthusiastic people should carry out the pilot project. The training and the adapting to the new approach get more easily. If part of the team is already trained then training of the new developer(s) involved in the team could be done on the way.

As the most important benefit from the eXPERT implementation the improvement of the discipline is considered. All measurements and records stimulate developers for better discipline. The eXPERT approach positively influences the developers and as a final result there is an organizational and business impact.
The eXPERT approach is considered as useful for making developers work more efficiently. From a management point of view the logging process, as it is described, allows to make an analysis on the percentage of time used by the developers effectively (delta time) and the percentage of the idle time. Collecting the data for effort spent and the application of the PROBE method provide good results for estimation of time and effort. Only using automated tools could do collecting metrics in a non-intrusive way.

The application of eXPERT approach leads to closer collaboration between developers and makes possible to them to see the whole picture of the project (how work goes on, where the problems are, etc.) better. That helps them feel better about the project success chance. As a result the developers’ team is happy when knows the whole picture and shares the opinion that the application of the eXPERT approach creates a positive atmosphere (with more democracy in teamwork).

Applying the eXPERT approach in Rila led to some specific peculiarities and changes to the practices described in the pure eXPERT definition. These changes were results of the developers and project management view on how the approach is applied in real projects.

Pair programming is used also as a way to improve skills for one of the developers. But in cases when team members work on other company projects at the same time, applying pair programming all the time requires additional efforts on co-ordination of pair members.

Unit tests are easily and mainly performed for business logic and not applied or are difficult to apply for the user interface part.

The Customer on-site practice could not be applied as is described in XP. It is unrealistic to have the customer present at the team office during the development – communication with him is through meetings on the customer site, phone calls, e-mails, as well as providing him with web-access to the application. The developers’ team is certainly the initiating site in that communication.

It is difficult to plan from the beginning how many releases and in each release - how many iterations will be performed. When the customer performs a constant monitoring on the project and the project results the new ideas on the functionalities come on the way.

The defect logs showed that application of test-before-code practices as part of the eXPERT approach leads to reduction of the errors’ appearance in later project phases, reduction of not fixed errors and finally to reduction of the total time of the development and increase quality of the product.

Using strict coding standards makes the code readable and understandable form all of the project members. Several code reviews should be performed for fully adopting this practice and reduce the time for further refactoring of the code smells.

Nevertheless some of the practices in the approach were found as unrealistic to be used in Rila pilot project (apart from customer on-site) and are reported as not used eXPERT practices. These are:

- Design checks - could be substituted by very informal peer reviews
- Pair programming is difficult to be applied 100% (Developers find it very heavy to work 40 hours a week with that paces.)
- Test first is difficult to be applied 100% (there are cases where tests are more time consuming than useful)
- CRCs should be altered
- eXPERT might be improved by removing the design inspection from the approach.

CONCLUSION

The generalized conclusion derived from the detailed and ranked results shows that the gap between the Rila Solutions processes and the eXPERT approach is essential. The main reasons seem to be the very important difference in the granularity of the processes,
as well as the typical top-down approach of Rila Solutions. However we can state, that due to the Rila Solutions approach flexibility, the gap existing with the eXPERT approach had successfully been overcome.

One of the major issues of the eXPERT approach is convincing the clients and the top management that already feel comfortable with the traditional software engineering approaches about advantages of the eXPERT approach. We also have to note that factors not directly connected to the application of the eXPERT approach influence its success. Among them the most important are the willingness and readiness of the staff to try to apply the eXPERT approach in appropriate projects, the explicitly shown interest of a number of staff members toward eXPERT and the high qualifications of the persons directly involved of the experiment.

The biggest difficulty in eXPERT approach implementation appeared in the necessity of introducing some changes in the people’s culture and in the way of people’s thinking. It seems that a lot of efforts will be necessary to acquire the needed new knowledge, to formulate the new rules, to start thinking differently and to stick to a new discipline. This has been the case in Rila where established processes were quite different and new specific changes were introduces during the adoption of the eXPERT approach and the requirements of the PSP.

REFERENCES

ABOUT THE AUTHOR
Ilian Hristov Mihaylov, Rila Solutions, phone: +359 2 9797300 , e-mail: Ilian.Mihaylov@rila.com
Penko Ivanov Ivanov, Rila Solutions, phone: +359 2 9796314 , e-mail: penko.ivanov@rila.com
Assistant Prof. Eliza Petrova Stefanova, Departament of Information Technologies, Faculty of Mathematics and Informatics, Sofia University, phone: +359 2 8656157, e-mail: eliza@fmi.uni-sofia.bg
Avram Mois Eskenazi, Bulgarian Academy of Science, Institute of Mathematics and Informatics, phone: +359 2 9792873, e-mail: eskenazi@math.bas.bg
Assoc. Prof. Sylvia Hristova Ilieva, Departament of Information Technologies, phone: +359 2 717127, e-mail: sylvia@acad.bg