



Agile Software Development of  
Embedded Systems

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## Mobile Entertainment: Agile Industrial Trial Experience Report

### **Abstract**

The purpose of this document is to present experiences and results of industrial trial conducted in Nemetschek using agile methods, tools and practices. The trial is a project for creation of games for mobile devices.

## CHANGE LOG

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0.1	03.05.2006	B. Angelov	Initial version – preliminary results report
0.4	06.08.2006	B. Angelov	Updated version – new data from trial added
1.0	01.11.2006	B. Angelov	Final version

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## 1 Introduction

The purpose of this document is to describe the progression and the key results of a Nemetschek Agile trial project called “Mobile Entertainment”, which was conducted under project called AGILE ITEA. The aim of the trial was to find the best agile practices for Nemetschek context and to support Nemetschek agile product development model. Another purpose was to compare the efficiency of the traditional and agile software developments for embedded devices in the company as well as to establish how the agile practices could be utilized also under the traditional development model used in the company and to evaluate the adherence to standards.

The document is organized as follows: section 2 presents background information, trial environment and deployment approach. Section 3 describes the methods piloted and the tools evaluated. Section 4 presents the data collection approach. Section 5 describes the trial plan and execution. Section 6 presents the results of the trial and the recommendations for future use of the approach. The last section concludes the document by summarizing the key findings.

## 2 Background Information

### 2.1 Description of the Company

The trial was conducted by Nemetschek OOD, a software vendor in various domains – document management, CAD applications, web based b2b applications, SCM and CRM solutions, etc. The company has some background in the usage of agile methodologies, mainly XP, from previous projects. The company has ISO 9001:2000 certification and is going towards CMMI certifications and is especially interested how agile software development would affect this. Another key interest of the company is how agile methodologies can be applied for the development of software for embedded devices since a lot of its customers in the last years are using such devices and require software for them. Last but not least the company has high focus on the tools that can support agile development and data collection (since data collection is a key aspect needed by some CMMI practices).

### 2.2 Trial Environment

The trial conducted is in the field of a rapidly evolving software development domain – mobile devices. The specific subdomain is mobile entertainment, e.g. games for mobile devices and other entertaining applications. The reason for choosing this subdomain for the introduction of agile methodology is its low criticality, the high demand for fast releases (new mobile devices are emerging every day) and the unstable requirements and customer environment. The Boehm/Turner [2] diagram representing the initial agility assessment of the project is represented in Figure 1 below. The project team consists of three members who have moderate experience in the development of applications for mobile devices and have had initial training on the used agile methodology. The project scope is the trial of agile development of several games for mobile devices using Scrum as basic methodology.

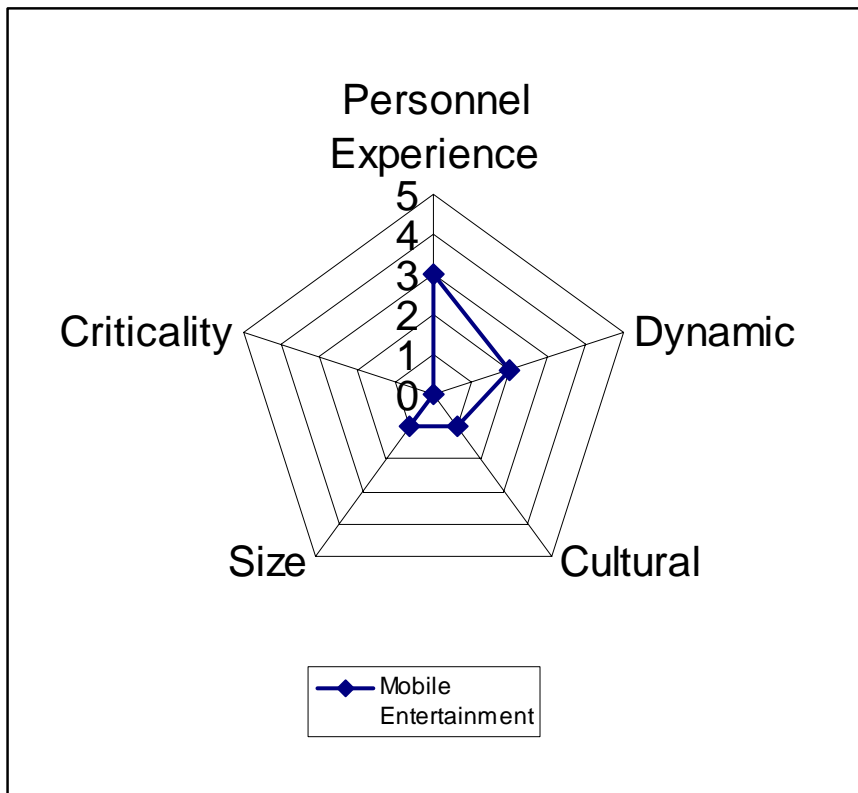


Figure 1

As can be seen from the diagram, the initial agility of the project is moderate (curve close to the center implies the usage of agile methodology ).

### 3 Piloted method/ practice/ tool

The agile methodology used for the trial pilot is based on the Scrum method proposed by Ken Schwaber in [1]. Scrum was chosen for its relatively simple practices, its high focus on unstable requirements environment and its independence from specific development environment and practices. The practices identified as highly promising for successful implementation were the Daily meetings, the Product and Sprint backlogs and the Reflection workshops. As a supporting tool to evaluate for the methodology implementation was chosen ScrumWorks for its free license.

### 4 Objectives and Metrics of the Trial

The objectives of the trial are to evaluate the applicability of the agile methodology in the project environment, to enable data collection using tools (ScrumWorks), to evaluate the approach and empower the team to self organize its work and draw conclusions from the results. The data will be collected by using ScrumWorks on daily basis (see Figure 2) to log the changes to the requirements and the effort spent. Other objective metrics like LOCs will also be collected for comparison purposes. Qualitative data will also be collected during the Sprint planning meetings, daily meetings and reflection workshops. It will show the success and failure factors that affect the development and the key benefits from the application of the selected methodology.

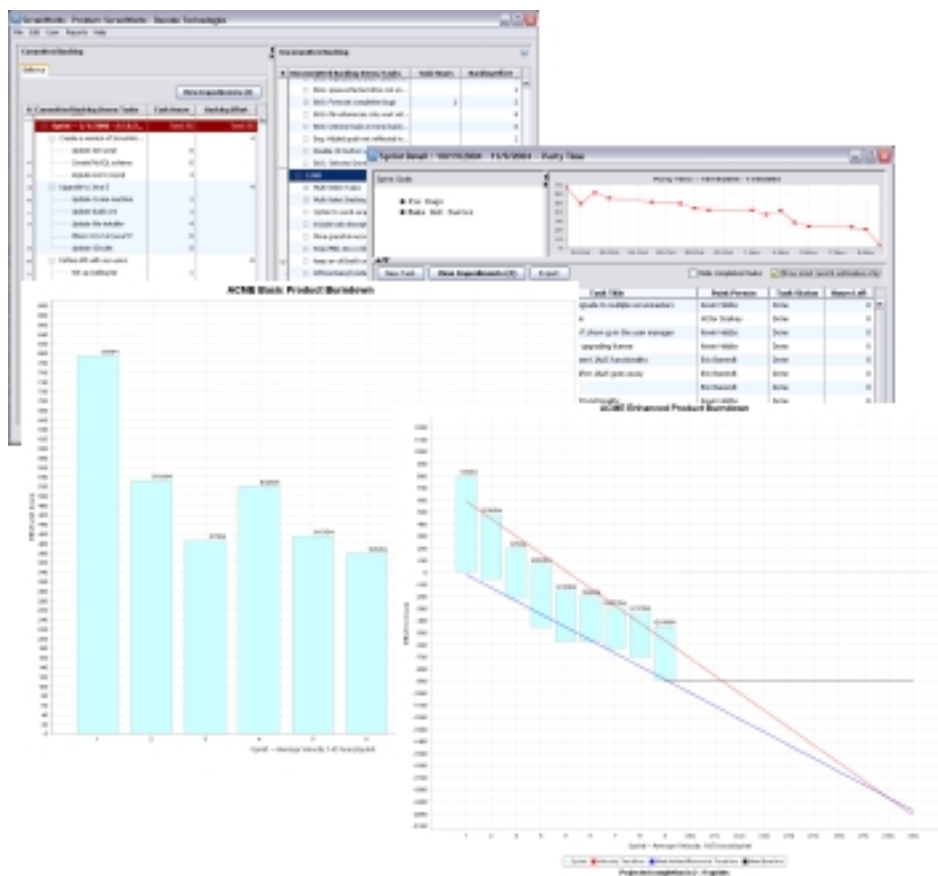


Figure 2

During the analysis the data will be compared to the data that the company has been collecting for its previous projects and conclusions will be drawn on the approach applicability, the possible modifications and future use.

## 5 Trial Implementation

As described in the Industrial trial plan, the project consists of several iterations, producing several releases of different mobile entertainment applications. The applications produced are 4 - 3 games (3D Tetris, Shift Puzzle and Backgammon) and 1 application for shopping management. The overall project length is 7 months. The deployment approach includes the support of product and sprint backlogs, sprint planning before each iteration (Sprint), daily meetings of the team members and any interested parties (management mostly) and reflection workshop after each iteration. During the project implementation all impediments were addressed at the moment they were uncovered and the approach was adjusted to avoid them in the future.

## 6 Preliminary Results and Analysis of the Trial

### 6.1 Results of the Trial

After the 10 iterations conducted, the metrics data collected is enough to draw some conclusions based on it. The data shows reduced estimation deviation in the latter iterations (Figure 3), which is a very positive sign for the probability of reduced schedule slips for future releases. Also the pace seems to be stable through iterations, which is a good basis for enabling more precise estimations for future iterations.

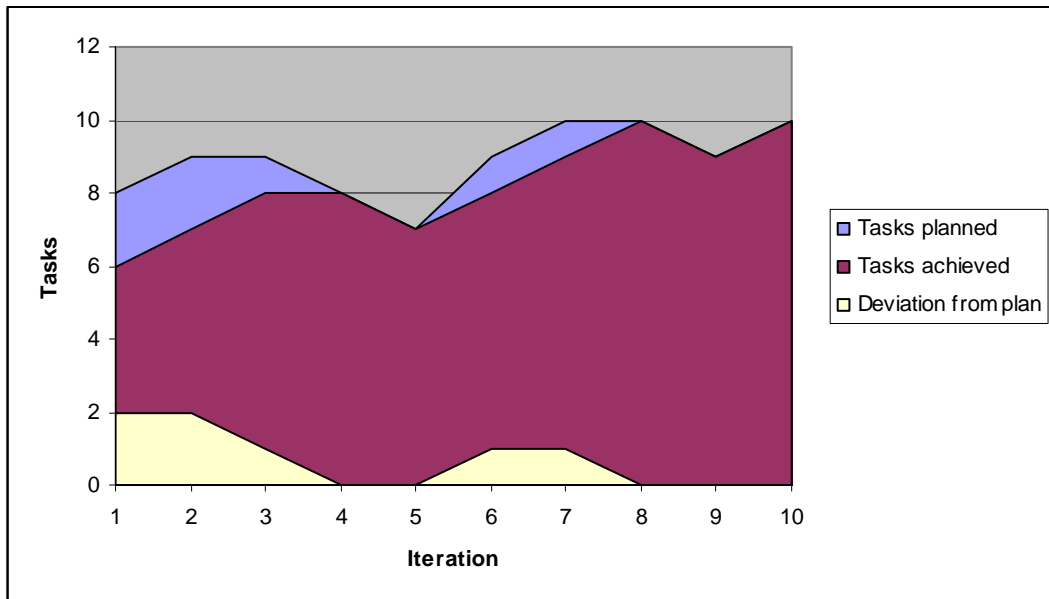
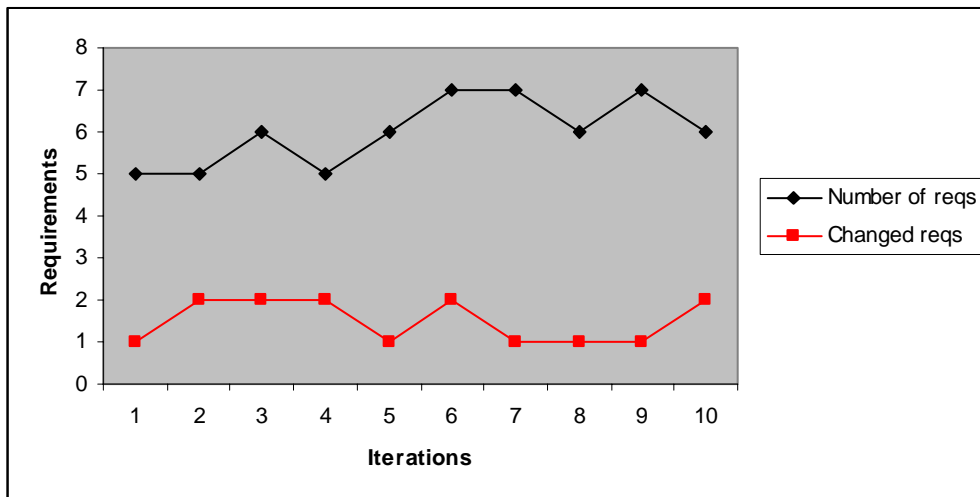


Figure 3

As expected, requirements changes appeared (see Figure 4), but due to the nature of the Sprint planning and execution, they did not affect the iteration schedule, which is another very positive sign for reducing the schedule slips. Actually the requirements changes only affected the planning for the next iterations where the changes were incorporated.



Фигуре 4

The data collection seemed to be at a reasonable level and most important – not distracting or slowing the main development activities. The effort spent on data collection was negligible and that is a good sign that this can be easily turned into a permanent activity during the development.

## 6.2 Empirical Evaluation

For the period the trial has been running, the empirical data showed some important success and failure factors as shown in Table 1. The numbers in the table show the importance of the corresponding factor.

Success Factors in Scrum	Weight
Communication (Daily scrums, reflection)	3
Reduced documentation	1
Short iterations	3
Developers freedom	2
Increased motivation	1
High level development language used	2
Software emulation of the hardware device	2
Failure Factors in Scrum	
Developers experience (both technical and process)	3
Large teams	1

These preliminary results are in-line with the general characteristics of the agile methodologies, which all rely on good communication, short iterations and experienced developers to succeed.

## 6.3 Method/Tool/Practice Suitability to Pilot Environment

The trial results show that the method chosen is suitable for the trial environment. The support of Product backlog with priorities along with the client proves to be an effective way to manage the customer requirements and also does great job on change management. The Sprint backlog is an efficient way to plan the iteration work and commit to the work that needs to be done. It also provides the means to keep the schedule as promised and not allow changes to be introduced in the middle of iteration. The communication inside the team and with the customer was on a very high level. The Daily meetings allowed the team to get a good sense of the progress made and to address any impediments in timely manner. This raised the team motivation. The estimation precision was getting better and better with every iteration due to the Reflection workshop and the small iterations. The tool used to maintain the work structure and track the progress (ScrumWorks) is easy to use and provides easy planning and backlog maintenance and good level of information on the current progress. A fallback of the tool is that it is not easily customized.

## 6.4 Future work

As the method proved useful for the trial environment, the method will be used in more projects in the company. The results achieved will be added to the AGILE project results and disseminated. The method might be adopted as standard way of developing software in the company as soon as it proves to not compromise Nemetschek's CMMI certification activities.

## References

1. Ken Schwaber, Mike Beedle, *Agile Software Development with Scrum*, 2002, ISBN 0-13-067634-9
2. Boehm, B. and R. Turner (2003). *Balancing Agility and Discipline. Balancing Agility and Discipline -A Guide for the Perplexed*, Addison Wesley.