



Agile Software Development of Embedded Systems

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FICOSA RaPiD7 Trial Experience Report

Abstract

The purpose of this document is to present the experience and the results of the trial of the RaPiD7 method for the rapid creation of documents in seven steps. This method has been applied on the creation of a specification document for an electro-mechanical module for the automotive market.

This document tries to help other Agile-ITEA partners to learn about the trial.



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Agile Industrial Trial Experience Report
Jordi Aubert
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CHANGE LOG

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1 Introduction

The purpose of this document is to present the experience and the results of the trial of the RaPiD7 method for the rapid creation of documents in seven steps. The RaPiD7 method was first developed at Nokia, and is currently being applied in other companies within the Agile project.

Our goal was to build a specification document that could serve as a contract with our customer. The document would have to include all aspects of the product, including hardware, software, mechanics, testing and quality requirements, safety and others.

A very important part of the trial consisted on the collection of appropriate metrics that could serve as feedback to the Agile consortium.

2 Background Information

2.1 Description of the Company

Ficosa was a traditional mechanical company whose business were mechanical components for the automotive industry. But in the last years this industry has evolved so new more technologically advanced components need to be provided. This evolution has converted mechanical components into mechatronic ones with electronics and embedded software inside.

These multi-disciplinary teams have to work together, but there is no explicit method for a lot of activities, so additional practices, techniques or methods shall be used in those cases. This is the case of RaPiD7.

2.2 Trial Environment

The initial information consisted on:

- norms and standards from the customer
- a rough concept presented to the supplier
- informal information from a number of meetings with the customer (2 or 3)
- previous experience on similar products

The team had about a month to cover the specification phase of that project. The goal (output of the specification phase) is:

- have a written specification which could be approved by the customer, and which also served for the design and other areas involved in the project (processes, manufacturing, testing, ...)
- get a good-enough knowledge on the system and the customer requirements

The period to do that job covers from end of November to end of December (we will see later that the timing was not kept).

The team was formed by 7 people, one of them being the moderator. The skills and role of each member is:

- Member 1 – software engineer
 - Member 2 – hardware engineer
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Member 3 – process engineer

Member 4 – software team leader and moderator

Member 5 – EMC test engineer

Member 6 – mechanics engineer

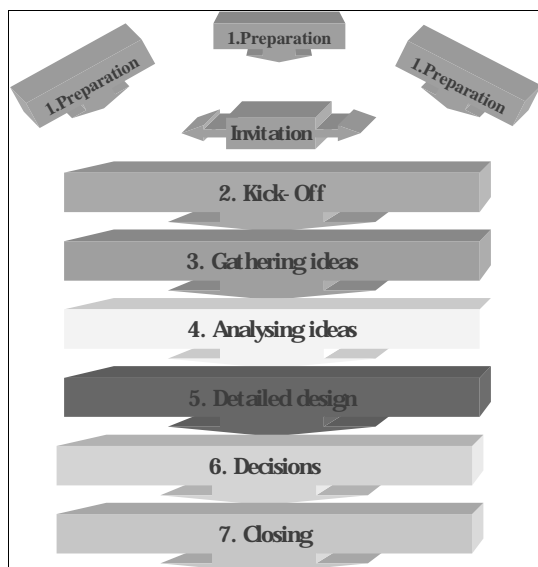
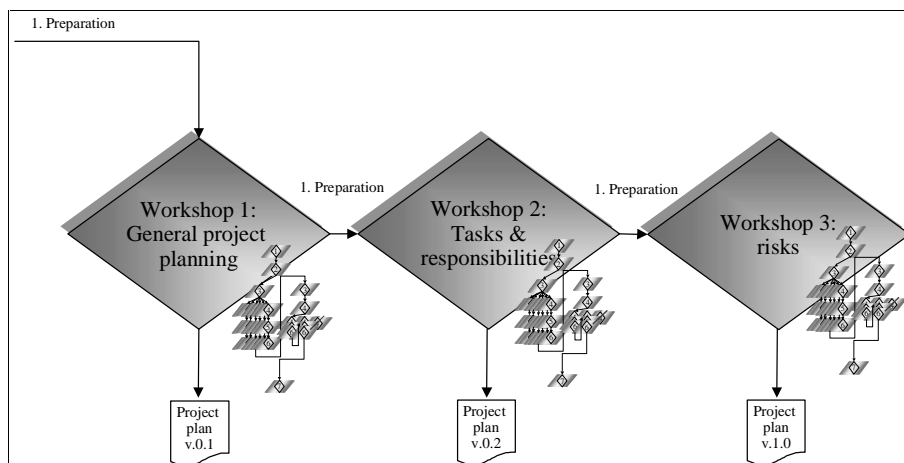
Member 7 – hardware team leader

The experience of all members varies from 2 to 6 years in the company.

There was no previous experience from any of the team members on RaPiD7, including the moderator.

3 Piloted method/ practice/ tool

The Rapid7 method consists on a series of workshops each one consisting on 7 defined steps. The first step is the only one that is done separately, while the other 6 are done in group each workshop.



More information about RaPiD7 can be found from the author (Roope Kylmäkoski) so we will not extend on the method itself to be able to concentrate on the trial experience.

4 Objectives and Metrics of the Trial

The objectives of the trial were:

- Write a specification document that had to take into account a number of disciplines. Such document had to be used for customer approval.
- Collect subjective and objective results about the RaPiD7 method that could serve to evaluate the convenience of using the method in other documents at Ficos. This would include a subjective evaluation by means of a questionnaire and object evaluation consisting on calendar time and effort spent for such a document.

5 Results and Analysis of the Trial

5.1 Results of the Trial

The trial consisted on the following sessions:

- 1 training session of 1 hour, where the method was explained to all participants
- 5 RaPiD7 workshops, with proper preparation previous to each workshop.

During the training sessions, some conventions were established:

- all participants must have read all available documentation before the first session (this means, customer norms and standards and other documents)
- after each workshop each participant will have the mission to get information about a specific topic that has been committed to him/her, and have the answer by the next workshop
- the term t.d.b (to be defined) and t.b.c (to be confirmed) will be used whenever there is a issue that the team is unable to determine.
- during the session there will be 2 computers: a working computer where the document will be written and a second computer that will be used to get rapid access of complementary information
- the writer of the document will not care about esthetical (format, style) of the document. This will be done in the end.

Since all the participants were dedicated part-time to this project, we couldn't concentrate many workshops in a short period, so we decided to make one per week approx. We planned all the workshops during the first session in order to avoid conflicts with other compromises. During the execution of the trial, we had to change some dates, so the planning had to be changed.

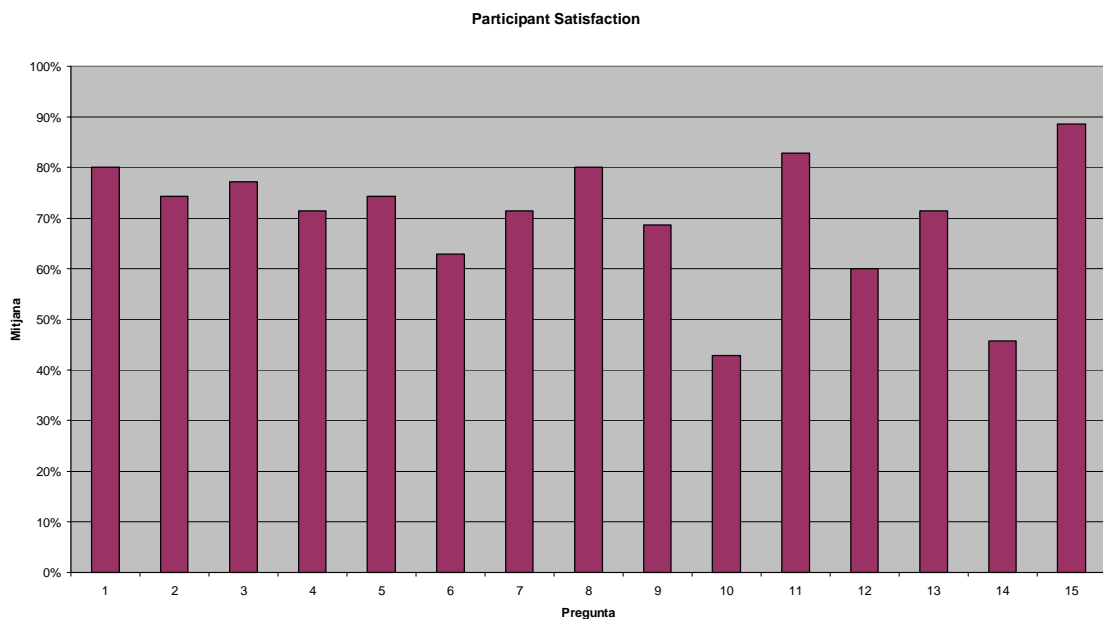
The initial plan was to have the document by the end of 2004. Due to the delays, we finished it by January the 12th (last workshop was the 10th, plus 2 more days for styling and formatting of the document).

During the first workshop the team concentrated on the index of the document. Similar documents were discussed as a basis. The index created during this first workshop was slightly modified during future workshops, and mostly to change chapter order, etc.

5.2 Empirical Evaluation

The table below shows the results of the questionnaire filled by each participant. Note that on all questions but #9 and #10, a higher results means good, while on these two higher result means bad. In general, as can be seen in the graphic below, the participant opinion about the method is good.

QUESTION (5 = fully agree, 1 = fully disagree)	usr1	usr2	usr3	usr4	usr5	usr6	usr7
1 I believe that the quality of the document generated is of a higher quality (compared to not using rapid7)	4	4	5	4	4	4	3
2 My knowledge about the requirements of the product are higher than the ones that I would have if I haven't used Rapid7	5	3	3	5	3	4	3
3 I would use Rapid7 again when I had the occasion	4	3	4	5	3	5	3
4 I believe that the 7 steps defined by Rapid7 have been useful to organize and schedule the workshops	4	4	5	2	2	4	4
5 I prepared each workshop to get my work done	4	4	5	3	4	3	3
6 The total effort is optimum considering the complexity of the document	4	1	4	3	3	4	3
7 My contribution has been useful to the creation of the document	4	4	3	4	4	3	3
8 I like how the document (specification) looks like, in the end	4	5	4	4	3	4	4
9 I would suggest to do a final review at the document before delivery	3	3	5	2	4	5	2
10 I would have preferred to work each member at his own, and then someone to join all parts	1	4	1	1	3	3	2
11 The role of the moderator is crucial for the consecution of the workshop objectives	4	4	5	4	3	4	5
12 I was proud at the end of each workshop for the result obtained	3	1	3	5	2	3	4
13 I got enough training about the method Rapid7 before putting into practice	4	4	5	3	3	3	3
14 I think the document generated has been created in a short calendar time, considering complexity	4	1	2	1	2	3	3
15 RaPid7 improves the internal communication on the team	4	5	5	5	4	5	3



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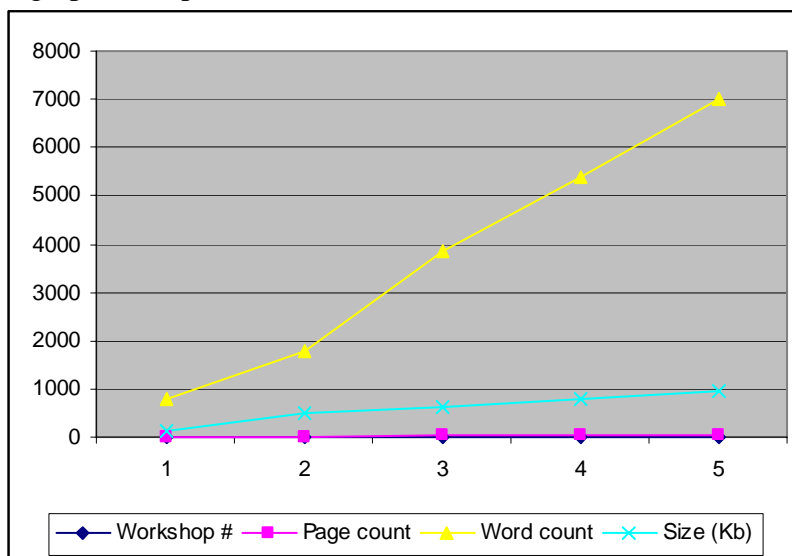
The metrics collected for the effort and calendar time evaluation can be seen in the following table:

EFFORT AND SCHEDULE INFORMATION									
Time spent (hours)									
Prepare 1st Workshop	2	2	0	1	6	3	1		
Execute 1st Workshop (29-11-2004) (3h)	3	3	3	3	3	3	3		
Prepare 2nd Workshop	1	0,5	1	1	2	0	2		
Execute 2nd Workshop (2-12-2004) (2h)	3	3	2	2	2	2	2		
Prepare 3rd Workshop	0,5	0	3	1	3	0	1		
Execute 3rd Workshop (21-12-2004) (2h)	2	0	2	2	2	0,5	2		
Prepare 4th Workshop	0	1	1	1	0	0	2		
Execute 4th Workshop (5-1-2005) (3h)	2	3	3	3	0	0,5	3		
Prepare 5th Workshop	3	0	0	1	2	1	2		
Execute 5th Workshop (10-1-2005) (4h)	4	3	2	4	4	0,5	4		
After last workshop	0,5	0	0	2	0	0	1		
	21	15,5	17	21	24	10,5	23		132 h
									Calendar time
									44 days

The size of the document increased on each workshop, as shown in this table:

Workshop #	Page count	Word count	Size (Kb)
1	8	788	128
2	14	1765	510
3	21	3869	625
4	28	5374	795
5	33	7010	954

A graphical representation of this information is shown below:



Some simple calculations show that the team had a production of 53 words per hour. Or, in another way, we could say that the team needed 4 hours to write each page.

As a conclusion we have identified two benefits of this method:

- the resulting document has a good quality,
- the team members are likely to use it.

On the other hand, we have identified to cons:

- The effort (productivity rate) is low, especially considering the culture of the company to multiplex as much as possible.
- When the team is not 100% dedicated to this project is very difficult to have all in one room for so much time, and there are a lot of calendar conflicts that need to be solved, sometimes producing schedule delays.

5.3 Future work

RaPiD7 has been successfully completed for this trial, and the intention is to use in other trials with different documents to evaluate the convenience of using this method on each document type.

6 Summary

In this document it has been explained the experience of using the RaPiD7 method on the creation of a specification document at FICOSA International. During this trial different metrics and subjective data were collected and have been presented here to show the benefit of using this method, and also some cons have been identified.

References

- Efficient Authoring of Software Documentation Using RaPiD7 (Roope Kylmäkoski, Nokia), published in ICSE 2003.
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