Using the COSMIC Method to Evaluate the Quality of the Documentation of Agile User Stories

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Abstract— **Agile Project Management (APM) must adopt dynamic project plans to better handle the uncertainty and unpredictability associated with the Agile Software Development (ASD) methodologies. For these dynamic project plans, the functional size of the evolving requirements can be measured with COSMIC measurement method. To support this measurement activity, the quality of the documentation of the user stories, which represent the user requirements, is important to be interpreted correctly. In the research reported here, the COSMIC method is used to analyze and report on the quality of the documentation of user stories.**

Keywords- Agile, quality of documentation, COSMIC, functional size measure

I. INTRODUCTION

Agile Project Management (APM) includes a series of commonly used project management approaches to better handle the uncertainty and unpredictability associated with the Agile Software Development (ASD) methodologies. Since Agile projects include continuously changing requirements in addition to incomplete requirements at project initialization, they must adopt dynamic project plans. In order to better monitor these dynamic project plans, the functional size of the evolving requirements can be measured, for instance with either the locally defined story points [1, 2] or the COSMIC measurement method [3] for dynamic planning and monitoring. While the story points are currently popular within the Agile community, they lead to a relative size which is context sensitive and not transportable across organizations. In contrast, the COSMIC measurement method has only been recently reported being used in Agile projects [4], but with an international standard which meets the metrology criteria that allow comparisons across projects and organizations making it useful for both estimation and benchmarking purposes.

With either measurement methods, the documentation of the user stories, which represent the user requirements, needs to be interpreted correctly. Better documentation yields better understanding of the requirements and directly affects the quality of the functional size measurement results. The purpose of this research work is to develop an approach for assessing the quality of the documentation used in Agile projects for measuring the functional size of the software requirements which will be developed. The approach reported here uses the COSMIC method [3, 5] to assess the quality of the documentation [6].

In the Agile approach, user requirements are identified in terms of user stories and the documentation for these stories includes the explanations of the requirements. Since user stories (US) are short sentences that represent the customer requirements at a high level [7, 8, 9, 10], they do not include all related explanations. Therefore, to assess the quality of such documentation used for the requirements development, and measurement purposes, more details need to be provided in addition to these short sentences (user stories).

The paper is organized as follows: Section 2 presents the related work. Section 3 presents the proposed approach and related benefits. Section 4 provides an example. Section 5 presents a summary and the main contributions of this research work.

II. RELATED WORK

Research work on the quality of the documentation using a Functional Size Method (FSM) is recent. This research approach was initially carried out in a master thesis directed by one of the co-author of this paper [11] and further refined in [12], together with a case study with three (3) organizations where the documentation was assess using the rating scale in Table 1 [12].

It was next adopted rapidly by industry and integrated within the recent COSMIC guidelines for assuring the accuracy of measurements [6] which recommend to assess and document the quality of of the software documentation used for measurement purposes (for the software artifacts rating, see Table 1), in a less subjective way than making a single judgment to select a rating like “Good”, “OK” or “Poor”. In this context, the quality rating operation is also a good support to the

measurement and it provides indirectly the capability of analyzing the quality of the measurement result. After each functional process is measured in terms of COSMIC Function Points (CFP), the quality of the documentation for each functional process can be identified according to predefined rules in this COSMIC guide [5]. The documentation, which quality is identified, consists of the available information which is used during the functional size measurement of the functional processes. This documentation includes all obtained information about functional processes. With the expression "quality of the documentation", it is intended to state what kind of information is available to be used for measurement. This information is completely related with the measured functional processes and there may be different levels of information for each functional process. For example; documentation for one functional process may have all needed information with all details whereas the other one may have less information about just for expressing requirements basically. From Table 1, it can be seen that as the rating increases from *e* to *a*, the quality of the documentation also increases.

In this short paper this rating technique is applied in the context of Agile projects at different time in the life cycle process.

III. PROPOSED APPROACH

Through the use of the COSMIC measurement method, it is possible to assess the quality of the documentation through an analysis of the documentation of the functional processes documented in the requirements, such as in the user stories. The hypothesis is that once this quality rating is obtained, the information can be used in a feedback loop to improve the user requirements.

Since in an Agile project a user story does not provide all data groups, the existing documentation includes the detailed explanations of the requirements and their representations.

The rating scale for the documentation quality is from *a* to *e* and their descriptions according to COSMIC guide [5] are shown in Table 2.1.

Table 1. Documentation quality rating scale

Rating	Description
a	The functional process is completely documented together with its data movements by type.
b	The functional process is documented but the description of the data moved is unclear. The input, output, stores and retrievals of each functional process are also described but not clearly enough to identify the number of data movements.
c	The functional process is identified only but their data movements are not.
d	The number of the functional process is given but they are not specified.
e	The functional process is not mentioned in the artifacts but is implicit.

The recommendation of the approach is to rate each identified functional process in the set of software artifacts on the scale *a* to *e* as shown in Table 2. This evaluation of the quality of the documentation is based on facts, some of which can be listed as:

- The presence or absence of a data model.
- The presence of absence of information to identify the data movements (entry, read, write, exit).
- The presence (or absence) of documentation enabling identification of each functional process.

According to the provided information, each functional process needs to be rated for its documentation quality. For this reason, after the measurement step, each functional process will be assigned a rating for documentation quality. This means that each functional process will have a size value in terms of CFP and a quality rating value from *a* to *e*. This will help to increase the quality of the documentation within an organization, which results in better analysis of the requirements. This will also help to decide whether the measurement results are reliable or not and will have an important role in whole measurement process.

After the quality of the documentation is identified for each functional process, there may be additional iterations according to provided or changed information. Since, there are continuously changing requirements and incompleteness in the requirements in Agile projects, it is very common that new information is obtained during the project lifetime. By applying new iterations, the quality of the documentation for this new or changed information will be also identified. Additionally, it will be understood whether previous measurement results are changed or not; because according to the first iteration measurement results the documentation may be updated in order to have better quality rating.

IV. ILLUSTRATON OF THE APPROACH IN AGILE PROJECTS

The proposed approach is implemented over eight user stories of a Film Renting Project with three iterations in order to show its applicability. Since one user story may contain more than one functional process, the quality identification is implemented on each functional process

instead of each user story. Table 2 presents the quality of the documentation rating of each functional process for three iterations.

Table 2. Quality ratings of functional processes for 3 iterations

	Doc. quality Iteration 1	Doc. quality Iteration 2	Doc. quality Iteration 3
US1-FP1	c	B	A
US1-FP2	d	C	B
US2-FP1	c	B	A
US2-FP2	d	D	B
US3-FP1	b	B	B
US4-FP1	c	B	B
US5-FP1	c	C	B
US6-FP1	c	B	A
US6-FP2	c	B	A
US7-FP1	c	B	A
US7-FP2	c	b	a
US8-FP1	c	b	a
US8-FP2	c	b	a

Quality ratings of the documentations are presented in Table 2. The columns of the table represent three iterations whereas rows represent the functional processes of each user story in film renting project: in Table 2, US is the alias for User Story and FP is the alias for Functional Process. It can be seen from Table 2 that, quality rating are never decreasing from iteration to iteration. For example, second iteration documentation quality of a functional process always equals to or higher than the first iteration. This is also true for the third iteration; in the third iteration the documentation quality of a functional process is always equals to or higher than in the second and first iterations: in later iterations, new information is either gained or existing information is updated so that the quality of the documentation for the functional process improved. Table 3 and Figure 1 show the percentages of the quality of the documentations according to quality ratings.

Table 3. Percentages of quality ratings of functional processes for the 3 iterations

	Iteration 1	Iteration 2	Iteration 3
% a	0	0	62
% b	8	77	38
% c	77	15	0
% d	15	8	0
% e	0	0	0

The graphical representation for the percentages of the quality ratings are displayed in Figure 1.

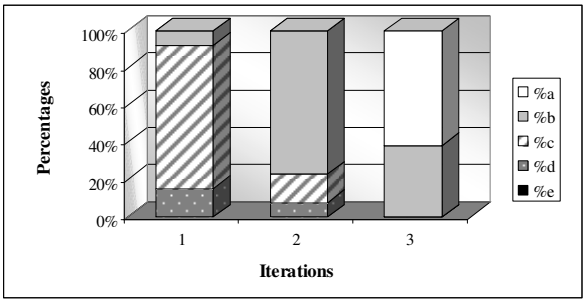

Figure 1. Percentages of each quality rating

According to Table 3 and Figure 1, there is no *c* or *d* ratings at the end of the third iteration, whereas the first and second iterations included *c* and *d* ratings. This is the cause of gathering all details of the requirements at later iterations. As it can also be seen, there is no *e* rating in any of the iterations and most of the functional processes are rated with *a* at the end of the third measurement steps.

V. CONCLUSION

Using the quality of the documentation, it is possible to obtain indirect information about the quality of the functional size unit score. It can be assumed that a lower quality of documentation will (probably) lead to a less precise value, and therefore a less precise estimation of the effort needed. The example in section III shows that, as the measurement steps progress, more information about the user stories is obtained and the quality of the documentation increases on average. Of course, there is still work to do to show how the quality of the documentation could be related to the quality of the estimation and planning tasks.

In this paper, COSMIC method is used to identify the quality of the documentation used for measurement purposes. The results of the method provide a rating for the quality of the documentation of each functional process in the software. These results can be used in increasing the quality of the documentation and analyzing the reliability of the measurements.

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