Multivocal Literature Review on User Story Models for COSMIC Sizing

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Abstract. *User Story is a technique widely used in Agile development. It is characterized as short and high level description of required functionality, written in customer language during very early stage of requirement gathering. COSMIC method is a second generation technique of function size measurement. The requirement estimation precision in COSMIC is directly proportional to requirement detailing level. The current user story writing models may have lacks of important information for COSMIC measurement purposes. Considering this, the paper presents a multivocal literature review which presents current user story models found in traditional and gray literature. Furthermore, we analyze the effectiveness of this models for COSMIC sizing purposes.*

1. Introduction

Agile methods were born from the need to smooth the heavyweight plan-based methods used in large-scale software-development projects [Abran et al. 2004]. Many agile methods are available in the literature, popular approaches are Rapid Application Development (RAD)[Martin 1991], Scrum[Schwaber and Sutherland 2011], Feature-Driven Development (FDD)[Palmer and Felsing 2001], and eXtreme Programming (XP) [Maurer and Martel 2002]. This last in particular introduced the idea of User Story (US) that is basically use cases, which briefly capture functional requirements [Maurer and Martel 2002]. Ideally, it should take a team one to five engineering weeks of effort to implement the tasks each story implies. Stories should be testable [Maurer and Martel 2002].

User Stories have gained popularity among agile approaches being one of the main techniques used when the subject is requirements engineering in agile environments. There is a common spread template to write US, however a number of different extension have been appeared adding or suppressing information depending on the application context.

One of the characteristic of US is the, besides being testable, user stories should be measurable. In this work, we considered COSMIC method as Functional Size Measurement (FSM) technique for sizing estimation of US. COSMIC method has being called by its owners as second generation of FSM techniques [Abran et al. 2015]. The COSMIC method is perfectly suited for measuring software evolving through iterations and increments as typically found in Agile development without any adaptation [Berardi et al. 2011].

COSMIC method must be used to estimate user stories with no difficulties. If there is any difficulty, then this is almost certainly due to weaknesses (ambiguities or omissions) in the User Stories [Berardi et al. 2011].

Traditional User Story template, even expressing basic information that is enough for COSMIC sizing, it does not support some key points for a more precise estimation. For example, connections between data groups in a functional process and feedback to functional user clearly.

Considering that beyond traditional template, there are several other ones for US writing, we conducted a Multivocal Literature Review (MLR) to find the biggest number of proposed templates then we analyzed all of them in terms of cosmic sizing.

Multivocal Literature Review is a form of a Systematic Literature Review (SLR) which includes not just formal literature (e.g., journal and conference papers), but also grey literature, such as, blog posts and white papers[Garousi et al. 2017]. MLRs are useful for researchers and practitioners since they provide summaries the state-of-the art and practice in a given area [Garousi et al. 2017].

The rest of the paper is organized as follows. The section 2 present a background of User Story and COSMIC Method. Section 3 present the MLR protocol. The section 4 shows the analysis of MLR result in terms of COSMIC sizing. The section 5 is threats do validity and finally, section 6 present conclusion and future work.

2. Background

User Story technique is widely used in Agile development. They are characterized as short and high level description of required functionality written in customer language. The traditional US Template is:

"As a <role>, I want to <goal/desire>, so that <benefit>" [Abran et al. 2004].

US is used in very early of requirement gathering. It intend to contain just enough information in order to be able to produce estimate effort for implementation. A procedure it indicated to be written by the customer before the implementation for appropriated acceptance.

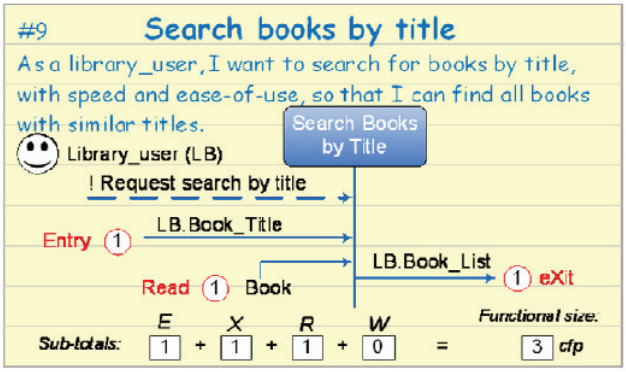
The agile guideline has the purpose of providing additional advice beyond the COSMIC Measurement Manual on Agile projects [Berardi et al. 2011]. The COSMIC method is perfectly suited for measuring the typically requirement sources found in Agile development without any adaptation [Berardi et al. 2011].

Sizing software in Agile development requires exactly the same knowledge, principles and rules of COSMIC Method when used in any other project management method [Berardi et al. 2011].

Message Sequence Diagram may be used to estimate user stories as shown in Figure 1. The vertical line represents a functional process and horizontal arrows represent data movements. Entries and Reads are shown as arrows incoming to functional process and Exit and Writes as outgoing arrows, appearing in the required sequence as top-down order [Berardi et al. 2011].

Besides the traditional template several number of templates have been appeared

Figure 1. User Story and Message Sequence Diagram. Source: [Berardi et al. 2011]



along the years intending to increase the expressiveness of the user story. A MLR was chosen as literature technique, based on the necessity of finding US template proposal which are not in traditional literature.

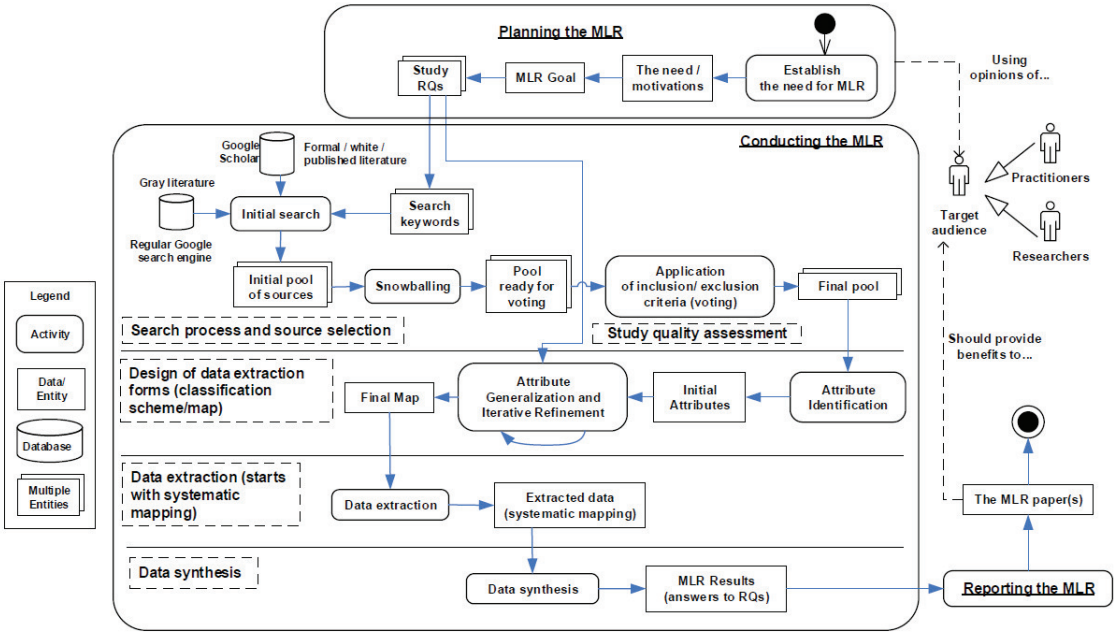
3. Multivocal Literature Review

The MLR is presented bellow, the section 3.1 presents the detailed study planning. Section 3.2 details de study conduction and finally, section 3.3 presents the result of the study.

3.1. MLR Planning

The general MLR process is presented in Figure. 2

Figure 2. Multivocal Literature Review Process. Source: [Garousi et al. 2017]



In Figure 2 it may be observed that MLR process is basically adding gray literature in the search step jointly to traditional literature. Based on this, a common protocol was created and it is presented in Table 1.

Table 1. MLR Protocol.

Research Objective

- Find the current user story models and/or templates in traditional and gray literature.

Research Questions

- Does the paper propose a template or model for user story writing?

Research Engines

- Scopus
- IEEE Xplore
- SpringerLink
- ACM DL
- ScienceDirect
- Compendex

Research Query

- TITLE((user story) OR (user stories)) AND KEY((user story) OR (user stories))

Including Criteria

- Paper must show an user story template/model.
- Paper must propose an user story template/model.

Excluding Criteria

- Paper not written in English.
- Paper does not show an user story template/model.

Quality Assessment

- Does the paper propose or cite an user story template?

Answers and Weight

- Paper which propose an US template -> 1.0
- Paper which cite an US template -> .5
- Paper does not propose or cite an US template -> -.5
- Full paper is Inaccessible -> -1.0

Data Extraction

- Proposed user story template/model.
- User story template/model reference.

3.2. MLR Conduction

The first step is the search in each search engine, second step is detection and elimination of duplicated papers, the third step is application of including and excluding criteria. The fourth step is the quality assessment and the last step is consideration of papers with weight higher than .5, in other words, papers which propose an US template. Table 2 presents the number of result for each search base in the table on the left and detailed number of paper after each step is in in the Table on the right. The final list of paper is presented in Table 3. The Table 4 shows with ID "FL" templates found.

Table 2. Papers returned for each search base and in each step.

Search Base	Papers
ACM Digital Library	14
El Compendex	89
IEEE Digital Library	15
Science@Direct	4
Scopus	71
Springer Link	0
Total	**193**

All results - 193
After duplicated detection - 100
Accepted - 74
Higher than 0 - 20
Higher than .5 - 3

Table 3. Papers from First result.

ID	Paper Name
FL01	Agile user stories enriched with usability [Moreno and Yagüe 2012]
FL02	User stories template for object-oriented applications [Zeaaraoui et al. 2013]
FL03	UserX story: Incorporating UX aspects into user stories elaboration [Choma et al. 2016]

After finding these result, we conducted the second search which is considering the gray literature. The protocol is basic the same, but with changing in search engine, that was replace by google. The including and excluding criteria, quality assessment and data extraction were kept the same.

Unlike common Systematic Literature Review, different stopping criteria for gray literature searches are needed in MLR [Abran et al. 2004]. We defined stopping criteria the first ten pages in google search, where each page shows 10 results, since there were evidence of exhaustion or saturation.

The search string used in google was *"\"user story\" template model standard example"*. This string returned 99.600 results. The resulting pages which a different US template was found were investigated until the root reference of this template (Snowballing), as happened in Wikipedia. The result of this search is presented in Table 4 with ID "GL".

3.3. MLR result

The final results are presented in Table 4. User story templates found in SLR are with ID FL, templates found in google search are with ID GL and previous known template is with ID KL.

The template FL01 [Moreno and Yagüe 2012] does not present so much contribution, just introduce and specific use of the user stories to express usability requirements, so in comparison with traditional template there is no relevant difference.

As mentioned before, the template FL02 [Zeaaraoui et al. 2013] does not also present significant difference, just explicit that the object must be present in the user story, which is a natural practice if you are using the traditional template idea.

Template FL03 [Choma et al. 2016] present contribution in terms of usability engineering. The last part which is responsible for express the feedback or expectation from the user point of view in traditional template, in FL03 this part is specific for Nielsen's heuristic values, which should be met in the user story.

Template GL01 [Cohn 2008], found in gray literature, was introduced setting the last part of traditional template as optional. Considering this, the user story is shorter and does not provide information about feedback or user expectation.

Template GL02 [Matts 2011] takes the received benefit, which is present as last part in traditional template, and put it as first part, before the user, then it follows the traditional approach.

The template GL03 [Pupek 2008] is also known as "Five Ws", it is added with more relevant information from from the user perspective. The added information are exactly, "when" and "where", the other "Ws" have already been present in traditional template.

Template KL01 was found in COSMIC Agile Guide [Berardi et al. 2011], the added information is precisely about non-functional requirement found in user story functional requirement. The guide goal was not propose this template but, the root reference for that was not found. Considering the counting example presented in the guide, this added information is not relevant for sizing estimation.

Table 4. List of Templates.

ID	User Story Template
FL01	"As a <role>, I want <usability requirement>" [Moreno and Yagüe 2012]
FL02	"As a <role>, I want to <action> <object>, so that <business value>" [Zeaaraoui et al. 2013]
FL03	"As a <persona>, I want/need <goal> so that <Nielsen's heuristic> will be met" [Choma et al. 2016]
GL01	"As a <role>, I want <goal/desire>" [Cohn 2008]
GL02	"In order to <receive benefit> as a <role>, I want <goal/desire>" [Matts 2011]
GL03	"As <who> <when> <where>, I <what> because <why>." [Pupek 2008]
KL01	"As a <role>, I want to <goal/desire>, <non-functional requirement>, so that <benefit>" [Berardi et al. 2011]

4. Result Analysis in terms of COSMIC

In terms of COSMIC sizing, the biggest part of found templates which add, in fact, modifications to traditional template, does not have significant contribution.

Templates which add usability information, provide valuable information for usability engineers, but it is more related to non-functional requirements, while COSMIC is a functional measurement method.

The "Five Ws" template, add few relevant information in terms of COSMIC sizing. Information of when the requirement should happen or be available and the information of where the user should run the requirement present in the user story, are in fact valuable for COSMIC estimators.

Despite this, There is still a gap of information for COSMIC sizing. The movements identification in a functional process are direct connected with the linked data groups or entities, present in the system.

5. Threats to Validity

Considering that this work presented in the paper is based on multivocal literature review, there are threats do validity mapped.

We performed a snowballing, in each gray literature that presented a new template and in the papers found in SLR, to find the root proposal of each US template.

Threats to validity the best result in gray literature. As mentioned in [Garousi et al. 2017], stop rules should be stated among the huge result number in a google search. We stated as considering the first 10 pages, with 10 links each page. In case of we perceive no saturation at this point, more pages would be considered, but in fact, results were found in only in the first page, so the following 9 pages did not presented any new result.

Another threat to validity, is that study was performed by only one researcher. In order to minimize this threat, we decided to perform a multivocal literature review instead of a systematic literature review. By this, any other result not considered in SLR could be found in gray literature step, moreover, a snowballing was performed in each resulting paper, book, or web page.

In order to avoid google shows result based on user experience, the search was performed in an incognito window of chrome browser, therefore, the search result tend to be replicable.

6. Conclusion and Future Work

We performed a multivocal literature review, in order to find proposed templates for user story writing. Furthermore, an specific analysis was made to find the relevance of these templates for COSMIC sizing purposes.

The result is that there are several approaches to extend the traditional template for US writing. Huge part of result found in this study are concerned with usability aspects in requirements. The information added or rewritten is concerned to usability information instead of other worries.

There was only one result that provide relevant information in terms of COSMIC sizing, The "Five Ws" template. Despite of this, the added information tend to solve two of the information gaps in traditional US template. The more important gap in traditional US template, that are entities linked to requirement expressed in the US are not solved.

As future work, we intend to study the viability to propose an extension to traditional user story template. This extension, will be performed to solve the gaps mentioned above and then, an empirical validation to this extension with the COSMIC community.

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