Sizing User Stories with the COSMIC FSM Method

Incorporating the COSMIC Functional Size Measurement (FSM) method[i] into the use of User Story Cards provides developers and product owners with a quick and simple means to measure the functional size of each story. In turn, this output measure can be used, with other measurements, to determine metrics such as productivity, velocity, defect density, etc.

The growth in popularity of agile methods of software development, such as eXtreme Programming (XP), Scrum and Kanban, has resulted in user stories becoming a popular method for capturing requirements.

A well-constructed user story describes a feature that represents value in the eyes of the customer. Requirements at different levels of abstraction can be expressed as user stories (one of my clients has defined 4 distinct levels of abstraction, from business-to-business requirements down to changes applied to individual software components). At the lowest useful level, each story is intended to be the smallest unit of scope that delivers value.

A user story is said to be 'a promise for a conversation' – it represents the developing understanding of needs as customer & development staff work together. It combines both functional and non-functional requirements. Associated with each story are acceptance criteria that define when it is 'done'.

Stories focus on the who, what and why of a feature, not how it is implemented. They often are written on 5" x 3" (127 x 76mm) index cards, to limit verbosity and to provide a convenient medium. This allows stories to be considered individually, sorted, displayed on a notice board, etc. Bigger cards, written with flip chart pens, are easier to read from a distance.

The structure of each story is based on a template[ii] as follows:

> As a … [stakeholder role] …
> I want to … [perform an action / record some information] …
> [With some frequency and/or quality characteristic] …
> So that … [description of value or benefit is achieved].

For example:

> As a library_user, I want to search for books by title, with speed and ease-of-use, so that I can find all books with similar titles.

Operational definitions for the 'fuzzy' terms 'speed' and 'ease-of-use' can also be written on the back of the card, to capture the non-functional requirements.

Many agile teams use 'story points' to estimate the work effort they expect to expend in developing a user story to the point it can be delivered. Each individual (or each team) estimates story points based on their own, local experience. So story points are not standardised, are not transferrable, and are not stable over the duration of a project.

Importantly, because story points only estimate the effort input, they cannot be used to derive metrics such as: productivity, velocity, or defect density.

This is where COSMIC can come to the rescue.

Using the concepts from the COSMIC FSM Method we can re-state the user story template like this:

> As a … [functional user] …
> I want to … [respond to an event / retrieve some data] …
> [With some frequency and/or quality characteristic] …
> So that … [description of value or benefit is achieved].

In the example, 'library_user' is a functional user, 'request search by title' is an event, the non-functional requirements are themselves, and 'list of all books with similar titles' represents an exit.

What is more, with just a few minutes work, we can express the user story as a Data Movement Sequence Diagram[iii] on the same User Story Card (figure 1).

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[i] Ref: COSMIC FSM Method version 3.0.1 Measurement Manual: Implementation Guide for ISO/IEC 19761

[ii] With acknowledgements to Mike Cohn, 'User Stories Applied: For Agile Software Development'.

[iii] With acknowledgement to Peter Fagg for the DMSD notation.

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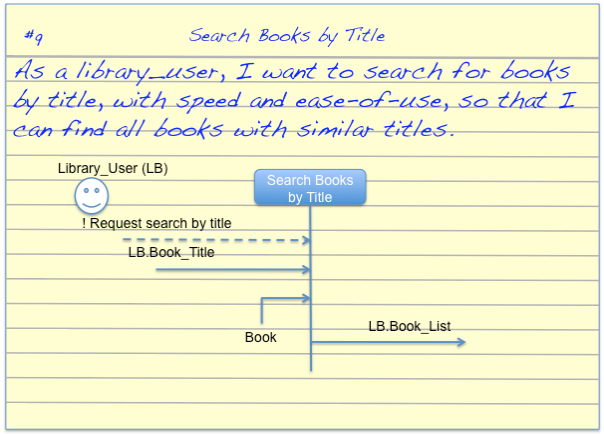

Figure 1: User Story Card with Data Movement Sequence Diagram

Then we can determine the functional size of the story in COSMIC Function Points (cfp) by counting the data-movements (Entry, eXit, Read & Write). See figure 2.

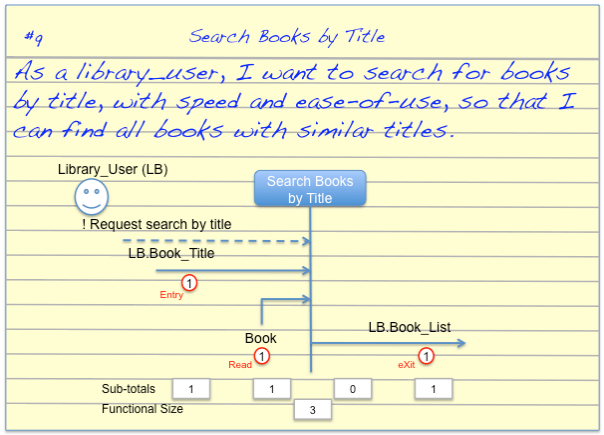

Figure 2: User Story Card showing calculation of functional size

In this simple example, the functional size of the user story is 3 cfp.

Naturally, many user stories are more complicated than this example (which does not even include a Write data-movement). But in my experience they follow a few standard patterns and the majority incorporate a maximum of around 20 data-movements (i.e. 20 cfp). Hence, it is relatively easy to fit the Data Movement Sequence Diagram onto the User Story Card (either on the front or on the back).

In this way, and in just a few minutes elapsed time and effort, we can visualise each user story and determine a measure of its functional size.

By simple addition, you can calculate the functional size for the entire product backlog, or the set of user stories prioritised for completion in a specific sprint, or any group of user stories.

Functional size is a characteristic of the user functional requirements. By intent it is independent of the technology used, the methods employed, and the skill & experience of the developers. It is a measure of the required output, of the functionality delivered, of the quantity of information processing. As such it can be used in conjunction with measures of the effort input, and the elapsed time taken from commencement to delivery, to calculate respectively productivity (as functional size / effort) and velocity (as functional size / elapsed time). If you keep a tally of the defects detected, you can calculate defect density (as #defects-detected / functional size). Over time, after completing development of a series of stories, you can determine the mean & median unit effort (workhours / cfp) and unit cost (Euro / cfp). It is also a simple matter to determine the typical number of COSMIC size units that a team can deliver per sprint (or other period), which is useful when planning.

COSMIC measurements are standardised and comparable across time, across teams, across projects, and across organisations. Developers, product owners, and their customers thus have a low-cost, effective tool to use when estimating, tracking progress, and assessing value-for-money.

Grant (PG) Rule Sept 2010