

Why do SW projects fail?

Failing projects:

- Don't do what customers want
- Are late
- Over budget
- Hard to maintain and evolve
- All of the above

How does Agile try to avoid failure?

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Recall: Agile Lifecycle

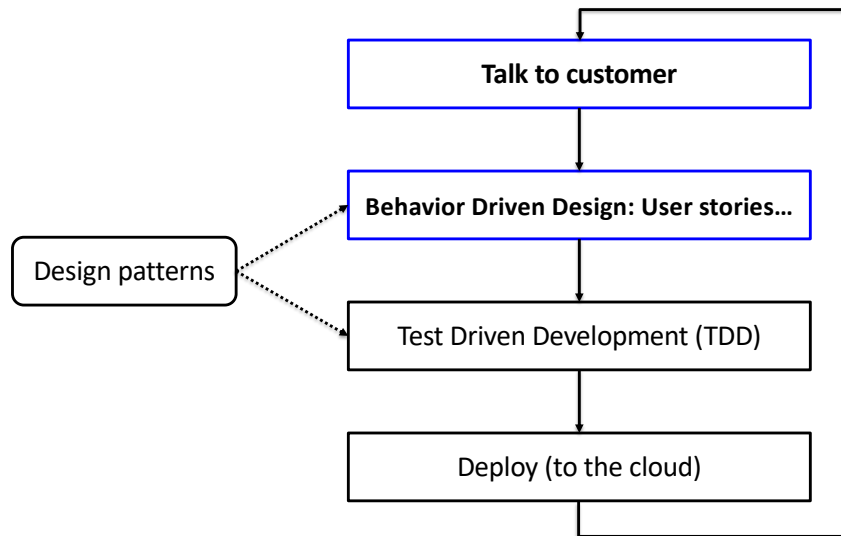
- Work closely and continuously with stakeholders to develop requirements, tests
Users, customers, developers, maintenance programmers, operators, project managers, ...
- Maintain a working prototype while deploying new features every *1-2 weeks*
- Check in with stakeholders on what's next, to validate building right thing (vs. verify)

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What is the difference between validation and verification? Validation is did we build the right thing, verification is did we build it right.

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*DD in our Agile iterations



Recall we covered TDD in previous classes. TDD is the process of writing the tests first.

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Behavior-Driven Design (BDD)

- BDD is a conversation about app behavior *before and during development* to reduce miscommunication
 - Recall “Individuals and interactions over processes and tools” in Agile manifesto
- Requirements written down as *user stories*
 - Lightweight descriptions of how application is used
- BDD concentrates on *behavior* vs. *implementation* of application
 - Test Driven Development (TDD) focuses on implementation

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Concentrate on what the application does as opposed to how the application does it.

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User Stories

- 1-3 sentences in everyday language

Fits on an index card

Written by or with the customer

- Often in “Connextra” format:

Feature name

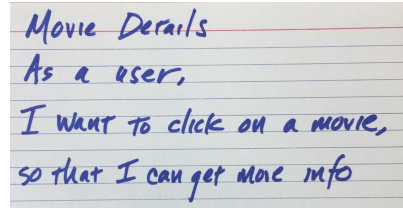
As a [kind of stakeholder],

I want to [some task],

So that [some result or benefit].

(all 3 phrases are needed, but can be in any order)

User stories will ultimately become work items in our product backlog (our team’s prioritized “to-do list”)



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Why index cards?

Nonthreatening: All stakeholders participate in brainstorming

Easy to re-arrange: All stakeholders participate in prioritization

Helps keep stories short and low-cost to change during development

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I.N.V.E.S.T. criteria

- **I**ndependent: Can be developed in any sequence
- **N**egotiable: Up to the team to decide how implement
- **V**aluable: Delivers some value to end users
- **E**stimable: We can predict how long it will take to implement
- **S**mall: Implement in one sprint, ideally
- **T**estable: Clear acceptance criteria

Example user story for Film Explorer

film buff
As a ~~user~~, *read plot synopsis*
I want to ~~see film details~~,
so that ~~I can get more information~~.
I can find I want to watch

Consider: As a user, I want to see film details, so that I get more information

Is our example user story meet our INVEST criteria?

Likely independent, negotiable, estimable, and small. But not clearly valuable and knowing if it is testable would likely require more information, such as what details. How could we rewrite this user story to better indicate the value?

One are of improvement is to be more specific (so the value can be clearer). For example, "User" is not a very specific stakeholder (and a term we should generally avoid as it doesn't tell us much of anything). What details? And how does the stake holder benefit from those details?

As a film lover, I want to read plot synopses, so that I can find movies I might like to watch

Note that we could conceive of multiple user stories that target the same feature from different perspectives. Maybe a casual fan is just interested in posters, or an industry professional is interested in dates or other data.

Student advice: Stories vs. Layers

- “Dividing work by stories helps all team members understand app & be more confident when changing it”
- “Tracker helped us prioritize features and estimate difficulty”
- “We divided by layers [front-end vs. back-end vs. JavaScript, etc.] and it was hard to coordinate getting features to work”
- “It was hard to estimate if work was divided fairly...not sure if our ability to estimate difficulty improved over time or not”

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The customer wants “login with Facebook” integrated into their site. Nobody on your team is familiar with how to do this. You should:

- A. Break up the story into very small user stories, to be on the safe side about how long each chunk takes.
- B. Do a “spike” to explore Facebook integration, then propose one or more stories to implement.
- C. Apologize to the customer that they can’t have this functionality

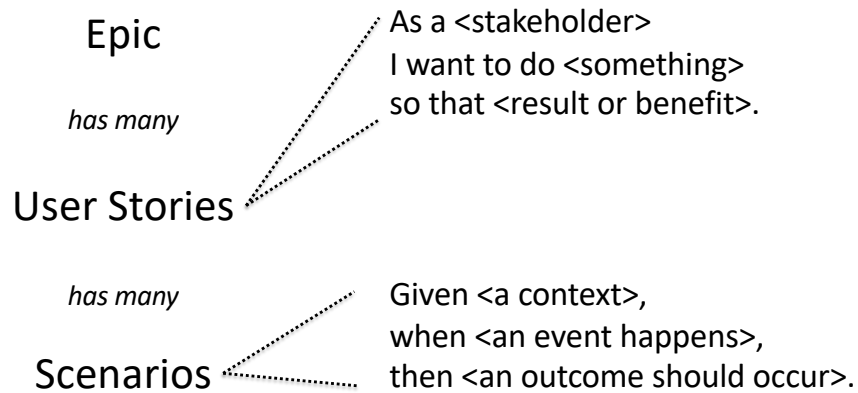
Answer: B

I think B is the best answer, but A could be arguable. C is not correct in this context, but that doesn't mean you should never say no to the customer.

A **spike** is a product-testing method originating from [Extreme Programming](#) that uses the simplest possible program to explore potential solutions^[1]. It is used to determine how much work will be required to solve or work around a software issue.

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Epics, User stories, Scenarios



Not all work items may be user stories. Some work-items will be bugs, Sometimes a task is necessary but far removed from the user, e.g., read an arbitrary byte range from a local or remote file.

Epic > User Stories > Scenarios

Epics provide a higher-level view of the project goals, e.g.,

Search in a music streaming app

- As a listener, I want to search from every page so that I can find music I am interested in
- As a listener, I want to search by lyrics, theme, etc. so that I can find songs when I can't remember the title or artist
- As a listener, I want my search customized to my previous listening so that I get more relevant results

Epic > User Stories > Scenarios

User Stories are expanded into scenarios

Scenarios are formal but not code.

Creates a “meeting point” between developers and customers.

With Gherkin syntax, we turn scenarios into automated acceptance tests:

Given [a context],

When [an event happens],

Then [an outcome should occur]




1. `Given` steps represent state of world before event, the preconditions
2. `When` steps represent event, e.g. simulate user pushing a button
3. `Then` steps represent expected post-conditions, the test expectations
4. `And` and `But` extend any previous step.

Testing scenarios

Map to function

Arguments extracted
with RegEx



```
Given I open the url 'http://the/test/url'  
When I click on the element 'Jurassic World'  
Then I expect the element  
    'img[src="http://the/poster"]' is visible
```

Note that you don't have to use Cucumber to implement "Given-When-Then"-style tests. For simplicity, we will use code instead of trying to incorporate Cucumber. Why? Cucumber brings non-trivial overhead. I think the real value is expressing scenarios in a way that can be readily translated into tests.

BDD is all about conversation

“Having conversations is more important than capturing conversations is more important than automating conversations”

[Liz Keough](#)

Which of the following statements most accurately describes the goals and use of BDD?

- A. BDD is designed to support validation (build the right thing) and verification (build it right)
- B. The best user stories include information about implementation choices
- C. User stories have no counterpart in plan-and-document processes
- D. Functionality should only be featured in a single user story for a single stakeholder

Answer: A

User stories are about behavior not implementation, and are similar to requirements in P&D. Multiple user stories may describe the same functionality, but from different stakeholders perspectives. Imagine a movie ticketing system that integrates with a social network. From the user's perspective "so that I can see movies with my friends", from a theater owner's perspective "so that I can sell more tickets". Knowing these perspectives can help us during the design and implementation of the feature.

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Building a successful UI

Our apps often face users, thus need UI

- How to get customers to participate in the UI design so they are happy with results?

Goal is to avoid WISBNWIW*

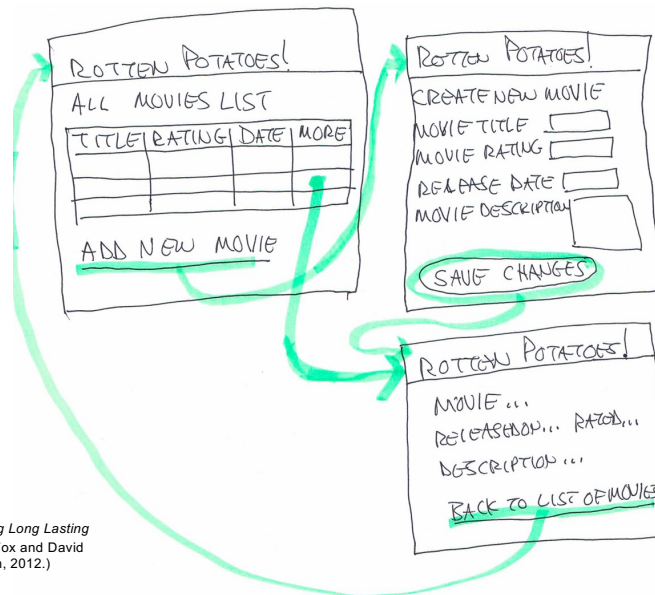
- How to get feedback cheaply?

Is there a UI version of User Story index cards?

* What-I-Said-But-Not-What-I-Wanted

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Lo-fi Storyboards



(Figure 4.4, *Engineering Long Lasting Software* by Armando Fox and David Patterson, Alpha edition, 2012.)

What would a storyboard look like for Film Explorer?

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Lo-Fi to React, HTML and CSS

Sketches and storyboards are tedious,
but easier than code! And...

- Less intimidating to non-technical stakeholders
- More likely to suggest changes to UI if not code behind it
- More likely to focus on *interaction* rather than colors, fonts, ...

What you think is cool may not be what your users (customers) think is valuable.

lo-fi prototypes are hugely important tools. It takes time to code up a nice looking application. It could all be wasted time if it isn't what we should be building. I always encourage to do some early exploration during the design phase when it is cheap to make changes. Always draw at least two designs and try to make them as different as possible. It is very easy to fall into creating "safe" designs that no one wants to use

Remember that what you think is cool, is not what your customer/user may think is valuable.

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Student Advice: BDD & Lo-Fi Prototyping

- “Lo-fi and storyboards really helpful in working with customer”
- “Frequent customer feedback is essential”
- “What we thought would be cool is not what customer cared about”
- “We did hi-fi prototypes, and invested a lot of time only to realize customer didn’t like it”
- “Never realized how challenging to get from customer description to technical plan”

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Design exercise

Design an interface for a “class interaction” application with the following epic

As a student, I want to interact with my classmates and the instructor, in person or remotely, so that I am more engaged in class

- Use the boards for sketches and storyboards
- Aim for 2 very different designs