CS 4530: Fundamentals of Software Engineering
Module 1.2: Requirements and User Stories

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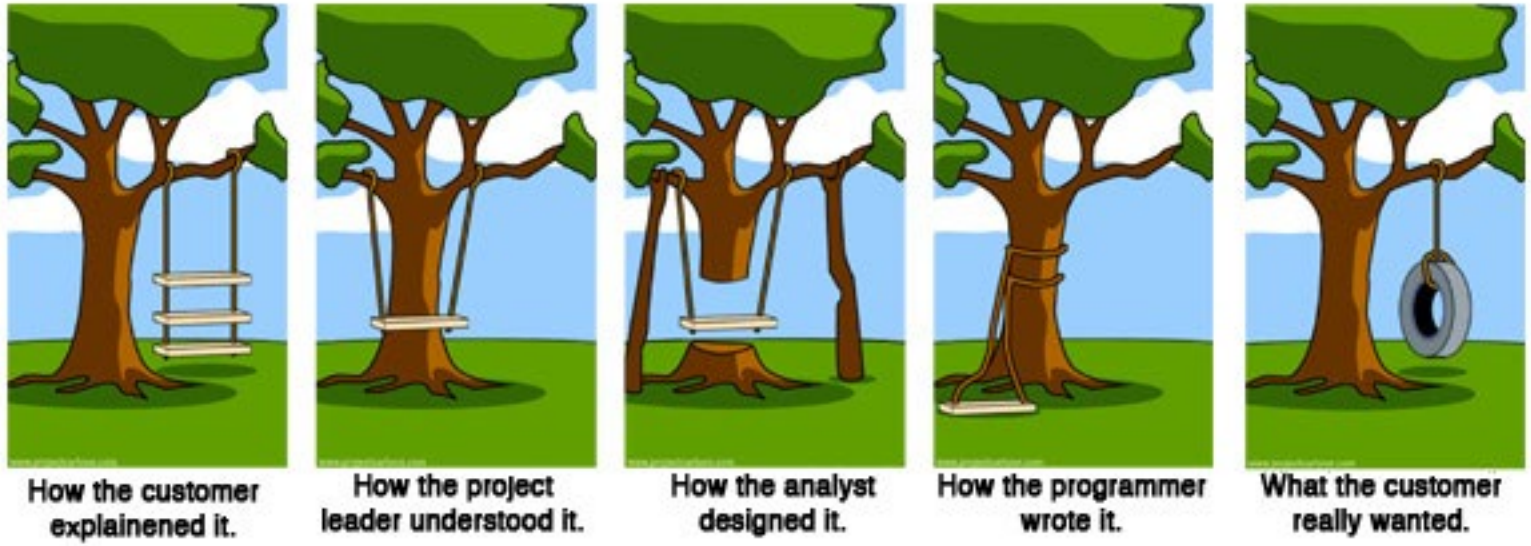
Learning Goals for this Lesson

- At the end of this lesson, you should be able to
  - Explain the overall purposes of requirements analysis
  - Enumerate and explain 3 major dimensions of risk in Requirements Analysis
  - Explain the difference between functional and non-functional requirements, and give examples of each
  - Define the notions of user stories and conditions of satisfaction, and give multiple examples

Overall question:
How to make sure we are building the right thing



Requirements Analysis

Planning & Design

Implementation

Why is requirements analysis hard?

Problems of understanding

Do users know what they want?

Do users know what we don't know?

Do we know who are users even are?

Problems of scope

What are we building?

What non-functional quality attributes are included?

Problems of volatility

Changing requirements over time

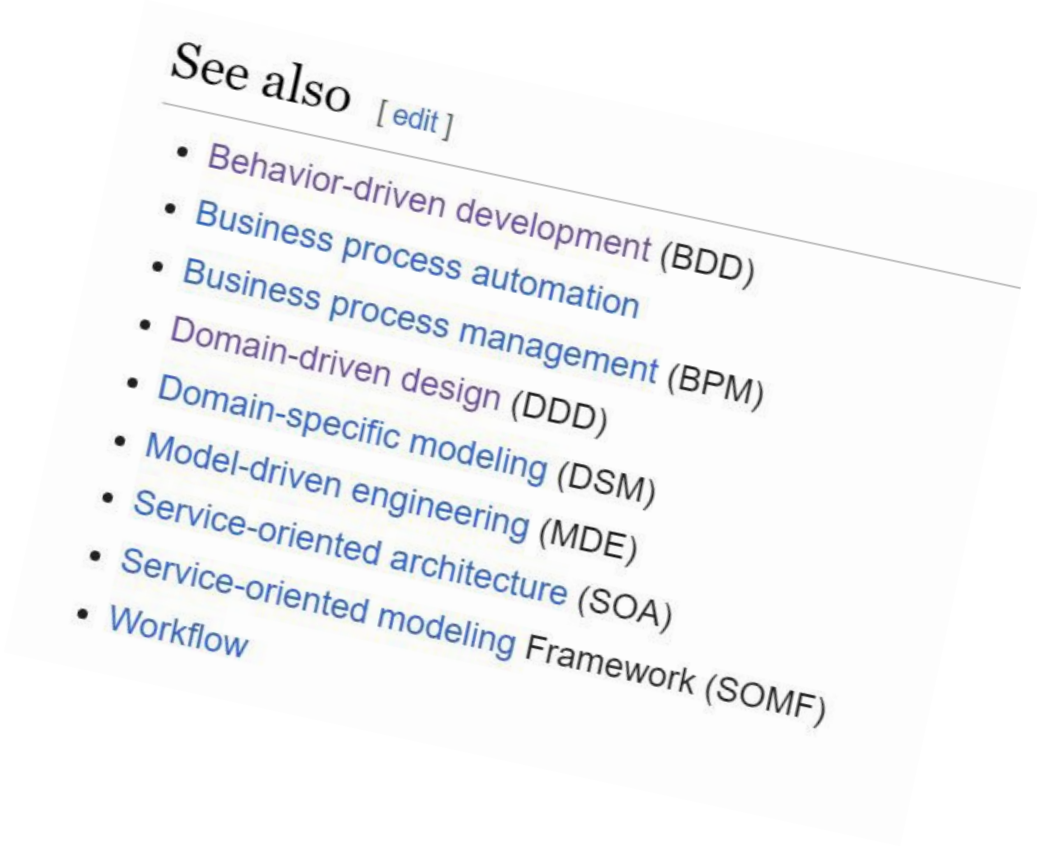
How the customer explainened it.

What the customer really wanted.

How the project leader understood it.

How do we capture the requirements?

- There are many methodologies for this.
- Often described as x-Driven Design (for some x)
- They differ in scope & details, but they have many features in common.


See also [edit]

- Behavior-driven development (BDD)
- Business process automation
- Business process management (BPM)
- Domain-driven design (DDD)
- Domain-specific modeling (DSM)
- Model-driven engineering (MDE)
- Service-oriented architecture (SOA)
- Service-oriented modeling Framework (SOMF)
- Workflow

Common Elements

1. Meet with stakeholders
2. Develop a common language
3. Collect desired system behaviors
4. Document the desired behaviors
5. Iterate and refine!!

Different Methodologies Produce Different Forms of documentation

TDD: executable tests

BDD: "scenarios"

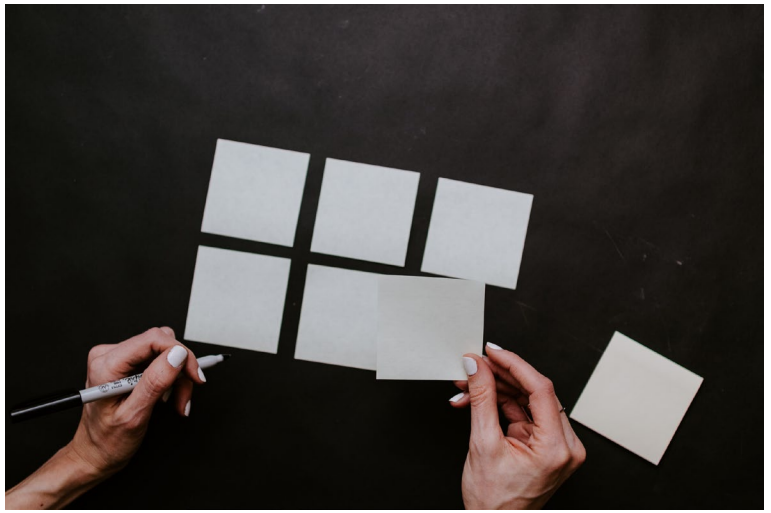
DDD: an OO architecture

We'll use a least-common-denominator approach: user stories

User Stories document requirements from a *user's* point of view

As a <role> I want <capability> so that I can <get some benefit>

User stories specify what should happen, for whom, and why



Properties of a user story

- short: fits on a 3x5 card
- may have prerequisites
- has *conditions of satisfaction* that expand on the details
- has a priority
- satisfies the INVEST criteria (more on this later)

Examples:

- As a online blackjack player, I want a game of blackjack implemented so that I can play blackjack with other users. (Essential)
- As a citizen, I want to be able to report potholes so that the town can do something about them. (Essential)
- As a College Administrator, I want a database to keep track of students, the courses they have taken, and the grades they received in those courses, so that I can advise them on their studies. (Essential)

Conditions of Satisfaction fill in details of the desired behavior

- Each condition of satisfaction
  - Describes a testable behavior, from the user's point of view
  - Must have a priority
  - Should be numbered within its user story

Examples

- 1.1 There should be an accessible blackjack table (Essential)
- 1.2 A user can initiate a game of blackjack (Essential)
- 1.3 Users can enter a blackjack table as a player if no other player is currently occupying the slot (Essential)
- 1.4 Players can successfully hit (take a card) each turn (Essential)
- 1.5 Players can successfully stand (refrain from taking a card) each turn (Essential)
- 1.6 Players successfully win if the dealer goes above 21 before me (Essential)

Priorities

- **Essential** means the project is useless without it.
- **Desirable** means the project is less usable without it, but is still usable.
- **Extension** describes a user story or COS that is desirable, but may not be achievable within the scope of the project.

Minimum Viable Product

- A user story is "implemented " when all its essential COSs are implemented.
- The set of essential user stories constitutes the minimum viable product (MVP)
- Caution: when proposing a project, don't make your MVP too hard to complete (but don't make it too easy, either)

Another Example: a Pothole reporting system

- A town wants a system where citizens can a report potholes and the town can monitor progress on repairing them.

User Story #1

- As a citizen, I want to be able to report potholes so that the town can do something about them. (E)

Conditions of Satisfaction

- 1.1 I should be able to report a pothole to the system (E)
- 1.2 I should be able to to see whether the pothole I report has been repaired (E)
- 1.3 I should be able to see whether someone else has already reported a given pothole (D)
- 1.4 I should be able to see an estimated time when the pothole should be repaired (D)

User Story #2

- As a repair-truck driver, I want the system to display the potholes I should be working on today. (E)

Conditions of Satisfaction

- 2.1 I should be able to see my list of potholes for today (E)
- 2.2 I should be able to report that I repaired a given pothole (E)
- 2.3 I should be able to report that I was unable to repair a given pothole, and to supply a reason (E)
- 2.4 My daily list of potholes should be listed in an order that cuts down the time I spend driving from job to job (D)

User Story #3

- As a maintenance supervisor, I want to be able to control the order in which potholes are repaired (D?)

Conditions of Satisfaction

- 3.1 I should be able to give a higher priority to potholes on a particular street (E)
- 3.2 I should be able to give a higher priority potholes in a particular neighborhood (E)
- 3.3 I should be able to see on a map where there are a lot of potholes (D)
- 3.4 I should be able to see on a map which potholes that have been reported multiple times (D)

Yet another example: a University Transcript database

User Story

- As a College Administrator, I want a database to keep track of students, the courses they have taken, and the grades they received in those courses, so that I can advise them on their studies.

Satisfaction Conditions

The database should allow me to:

1. Add a new student to the database
2. Add a new student with the same name as an existing student.
3. Retrieve the transcript for a student
4. Delete a student from the database
5. Add a new grade for an existing student
6. Find out the grade that a student got in a course that they took

Non-Functional Requirements:

- What other properties might a customer want to know about the product?
  - How quickly can a transcript be retrieval? (Performance)
  - How many student transcripts can our system store? (Scalability)
  - How long did I spend on the phone with support to set up the software? (Usability)
  - After my system is setup, is the access controlled at all? (Security)
  - Are these any times when I can’t use this system? (Availability)

Example:

- “With a 4-core server and 16 GB RAM, the system should be able to service at least 200 simultaneous clients with less than 300ms latency”

Other non-functional requirements

- Accessibility
- Availability
- Capacity
- Efficiency
- Performance
- Privacy
- Response Time
- Security
- Supportability
- Usability

Still more non-functional requirements

- Qualities that reflect the evolution of the system
  - Testability
  - Maintainability
  - Extensibility
  - Scalability

Writing User Stories: INVEST

- Independent
- Negotiable
- Valuable (has value to client)
- Estimable (able to estimate development effort)
- Small
- Testable

As a <role> I want <capability> so that I can <get some benefit>

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