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

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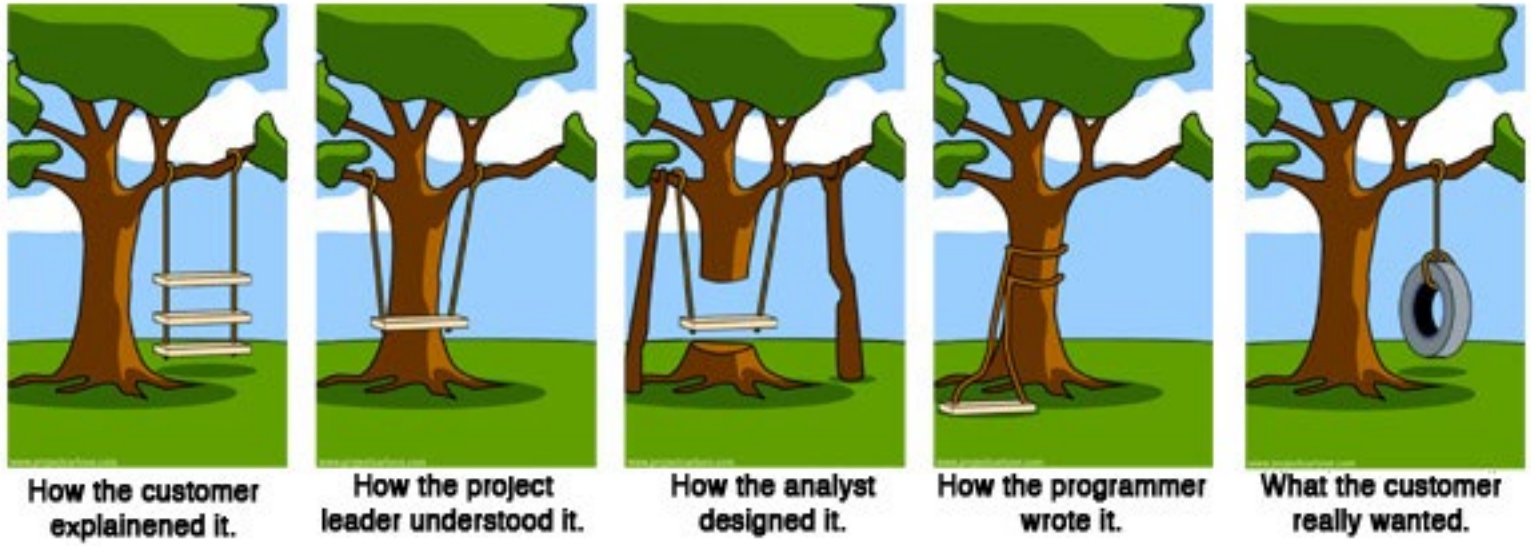
Learning Goals for this Lesson

- 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.
  - document requirements user stories.
  - track the completion of requirements using conditions of satisfaction.
  - explain the difference between functional and non-functional requirements.
  - Explain how Value Sensitive Design can be used to improve requirement gathering.

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

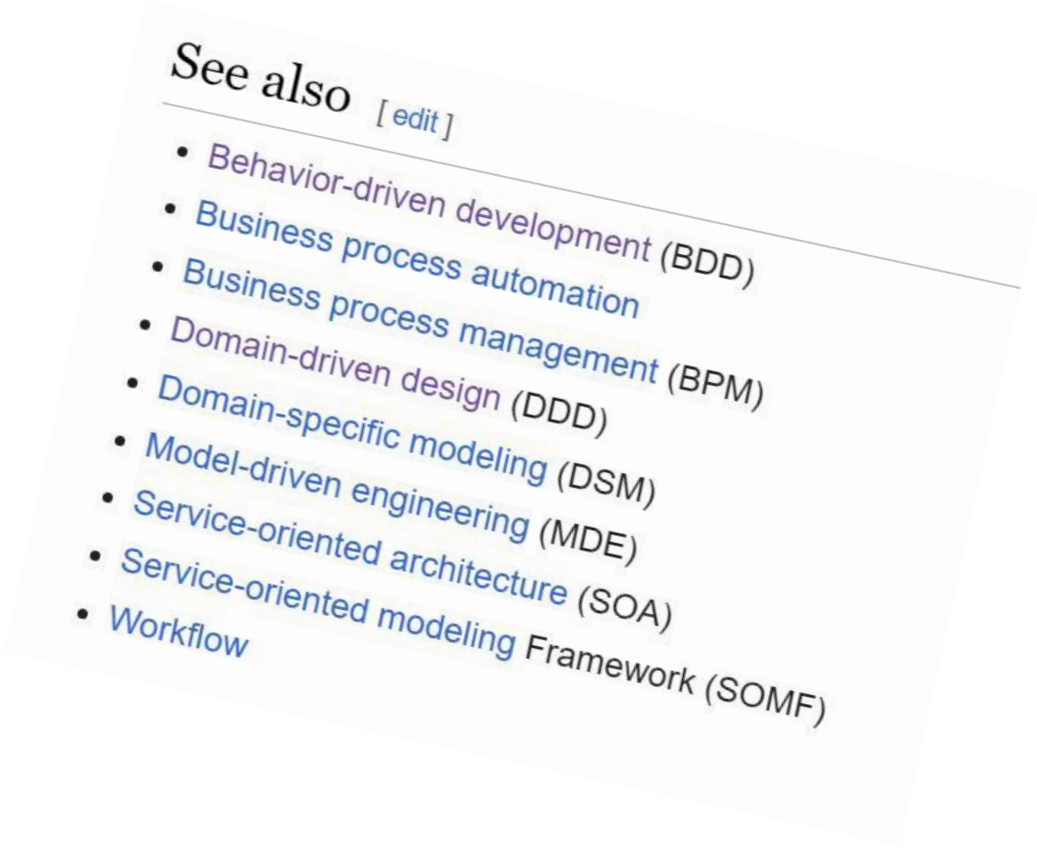
How the customer explainened it.

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 that offer value
4. Document the desired behaviors
5. Iterate and refine!!

Different Methodologies Produce Different Forms of documentation

TDD: executable tests

BDD: "scenarios"

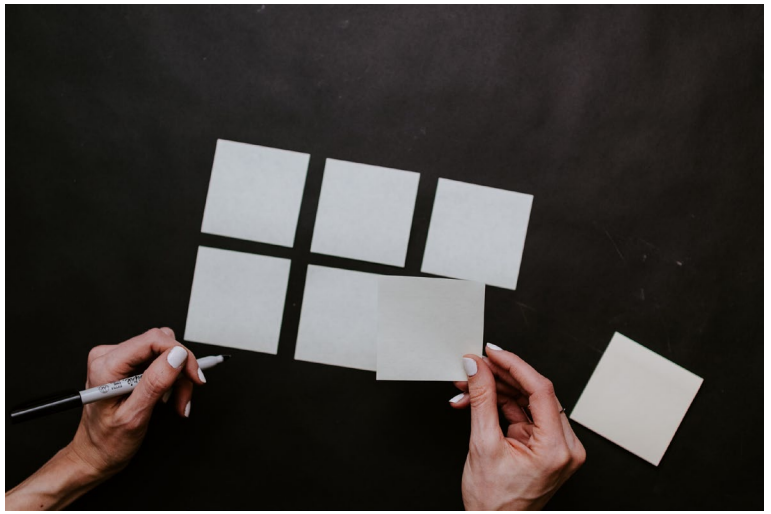
DDD: an OO architecture

We'll use a least-common-denominator approach for documenting requirements: user stories and conditions of satisfaction

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

As a <role> I want
<some 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+E criteria (more on this later)

Examples:

- As an 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)

Another Example:

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

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 may not be achievable within the scope of the project. These might be things you'd want "in the next version".

Minimum Viable Product

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

The MVP and Your Project Grade

- On your project, you will get 200 points (out of a total of 400) for code submission:
  - MVP (all essential user stories and their essential COSs delivered): 100 points
  - Extra features (desirable and/or optional features): 50 points
  - Testing: 50 points
- SO: be realistic about what you call "essential" ☺

Writing User Stories: INVEST+E

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

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

Kinds of Requirements

- Functional Requirements
  - specify how the system should behave (those are the ones we have seen so far, written as user stories)
- Non-Functional Requirements
  - capture the quality goals of the system
- Ethical Requirements
  - consider the impact of the system on its users and their human values

Non-Functional Requirements capture the *quality goals* of the system:

- As developers, we often spend most of our time and effort on features (i.e., functional requirements).
- But there is more ….
- 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)

Other non-functional requirements

- Accessibility
- Availability
- Capacity
- Efficiency
- Performance
- Privacy
- Response Time
- Security
- Supportability
- Usability
- Testability
- Maintainability
- Extensibility
- Scalability

Ethical requirements consider the impact of your choices on human values

- You should consider how your software can cause harm or may be used to do wrong. Examples:
  - A dictator who wants to suppress information so he can continue to oppress minorities
  - A site owner who wants to harvest user information for resale
- You should identify all the people who will be affected by your technology.
- This may lead to additional user stories and COS.
- You should consider their values. Do they conflict?
- This is called Value Sensitive Design (VSD)

Read the tutorial!

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