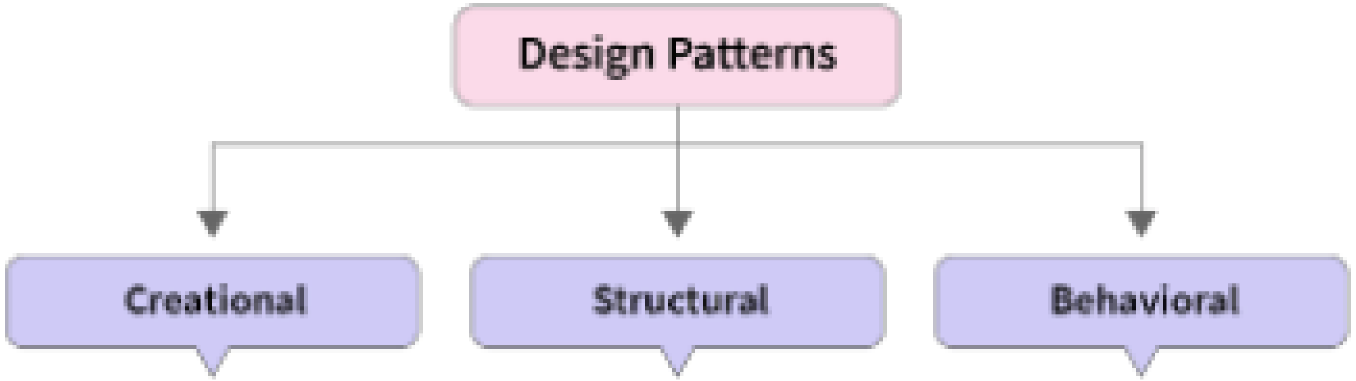
CSci 3081W: Program Design and Development

Introduction to SDLC, Requirements, and Documentation (Doxygen)

Homework 2

Program Design and Development

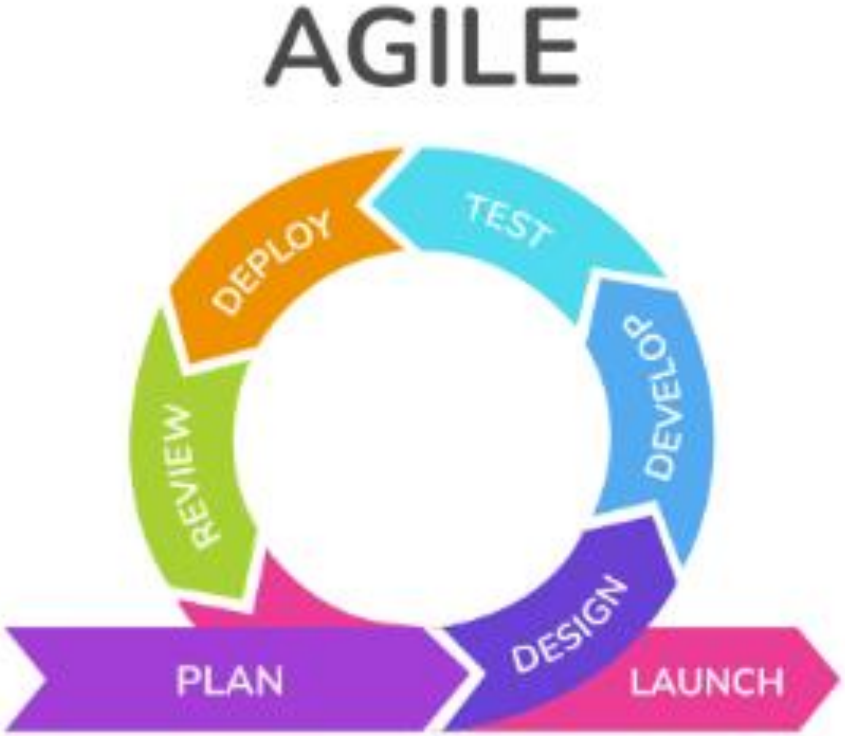


Design Patterns

Creational

Structural

Behavioral



Requirements

MODERNANALYST.COM
THE GOOD NEWS IS THAT AT OUR REQUIREMENTS TEAM MEETINGS THEY'RE GOING TO START INCLUDING A HUMOR SECTION TO GET SOME LAUGHS. THE BAD NEWS FOR ME IS THAT THEY'RE USING MY REQUIREMENTS DOCUMENTS AS THE JOKES.

What is a "requirement"?

A requirement in software engineering is a feature of new software that someone either wants, needs or commands.

Requirements

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What is a "requirement"?

It describes what a software does as well as its limitations.

Requirements

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What’s the goal when making a requirement?

What do we want the system to do?

What are the needs of the users?

What does the system need to do in order to achieve those needs?

Requirements

Requirements can be split into two categories: functional and nonfunctional requirements

Functional Requirement

Functional requirement: describes what the software does

Express in terms of: data storage, any process that transforms data, and any outputs that it produces

Non-functional Requirement

Non-functional requirement: defines limitations that the software has

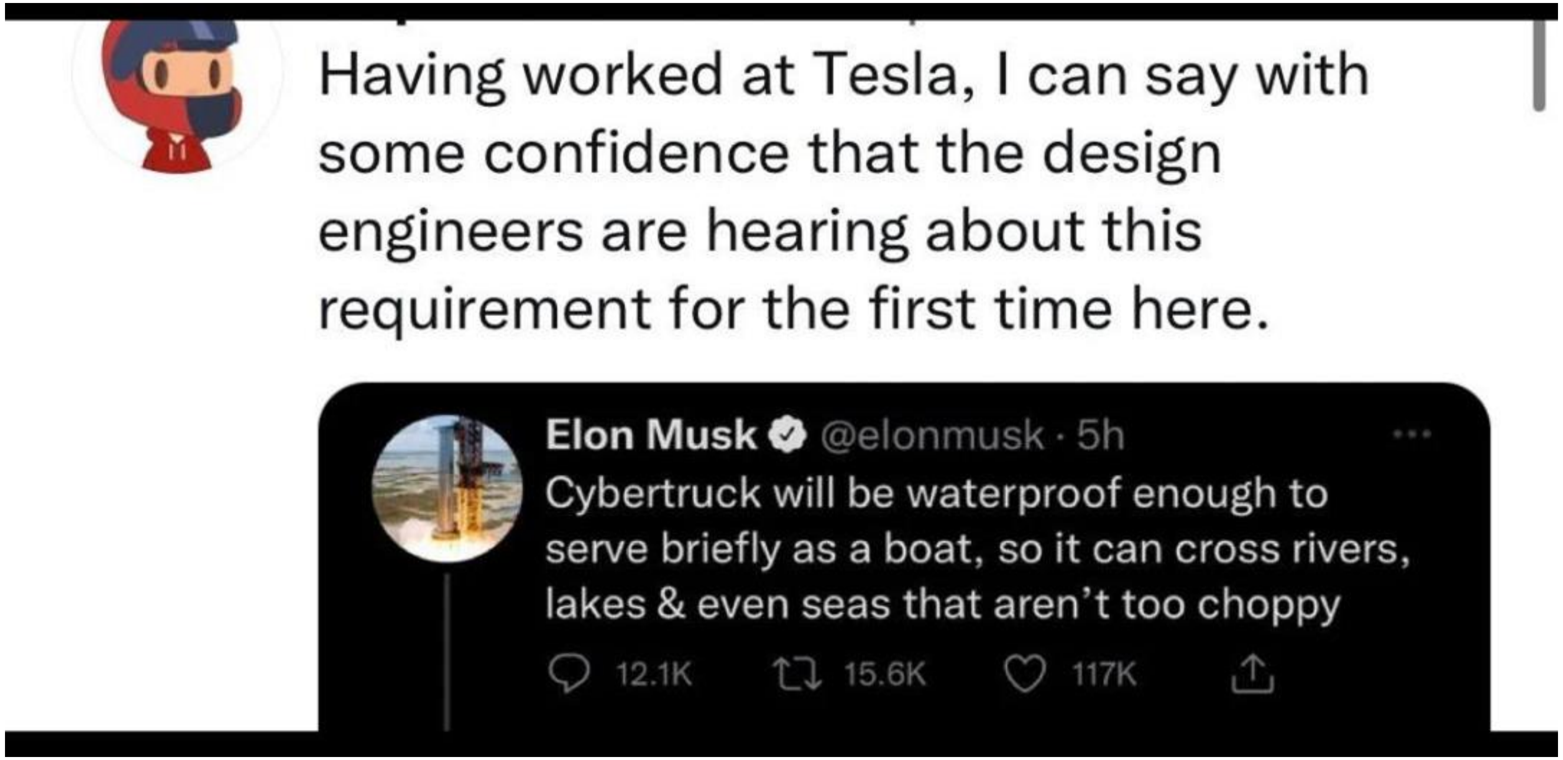
Express in terms of: performance, security and access, technical constraint, project constraint, organizational constraint, usability and reliability issues

Requirement Analysis / Engineering

Requirements engineering (RE) is the process of defining, documenting, and maintaining requirements in the engineering design process. It is a common role in systems engineering and software engineering.

- Wikipedia

Requirement Analysis / Engineering



Having worked at Tesla, I can say with some confidence that the design engineers are hearing about this requirement for the first time here.

Elon Musk @elonmusk · 5h

Cybertruck will be waterproof enough to serve briefly as a boat, so it can cross rivers, lakes & even seas that aren't too choppy

I don't know if this is real*

Requirement Analysis / Engineering

What’s the output of requirements analysis?

Create a document that describes the software to be built.

Software Requirements Specification Document (SRS)

Requirements Specification Document

Contains: overview of what the system will do, description of all the requirements, and a list of the functional requirements

Doesn’t contain: any info about the algorithms or logic, UI discussion, details about data entities or types, technical specifications

Requirements

Poor requirements engineering is one of the reasons why a software engineering project can fail or produce a highly defective piece of software.

Requirements

Many reasons for failure: miscommunication between management and developers, poor testing, poor user experience, unwillingness to pivot, complex to use

IBM’s list of benefits of good requirements engineering

Lower cost of development, fewer defects, faster delivery, reusability, traceability, requirements get tied to test cases, global config management

Qualities of well written requirements

Atomic

Uniquely Identified

Complete

Consistent and unambiguous

Traceable

Prioritized

Testable

Qualities of well written requirements

Atomic – cannot be separated out into components

Initial Requirement:

Students will be able to enroll in undergraduate and post graduate courses.

Updated Requirement:

Students will be able to enroll in undergraduate courses.
Students will be able to enroll in post graduate courses.

Qualities of well written requirements

Uniquely Identified – number your requirements in an organized way

Initial Requirement:

Students will be able to enroll in undergraduate courses.
Students will be able to enroll in post graduate courses.

Updated Requirement:

1. Students will be able to enroll in undergraduate courses.
2. Students will be able to enroll in post graduate courses.

Qualities of well written requirements

Complete – give as much information as possible

Initial Requirement:

Students will log into the system by providing their username, password, and other relevant information.

Updated Requirement:

Students will log into the system by providing their username, password, and their x500.

Qualities of well written requirements

Consistent and Unambiguous – no conflicting requirements allowed

Initial Requirement:
1. Students will be able to enroll in undergraduate courses.
2. Students will be able to enroll in post graduate courses.
3. Students will not be able to enroll in both undergraduate and graduate courses.

Updated Requirement:
1. Students will be able to enroll in undergraduate courses.
2. Students will be able to enroll in post graduate courses.

Qualities of well written requirements

Traceable – each business requirement should be mapped to a design requirement

Initial Requirement:
1. Students will be able to enroll in undergraduate courses.
2. Students will be able to enroll in post graduate courses.

Updated Requirement:
1. Students will be able to enroll in undergraduate courses. (mapped to spec 1)
2. Students will be able to enroll in post graduate courses. (mapped to spec 2)

Qualities of well written requirements

Prioritized – the team should know what to implement first and so on

Initial Requirement:
1. Students will be able to enroll in undergraduate courses. (mapped to spec 1)
2. Students will be able to enroll in post graduate courses. (mapped to spec 2)

Updated Requirement:
1. Students will be able to enroll in undergraduate courses. (mapped to spec 1) PRIO1
2. Students will be able to enroll in post graduate courses. (mapped to spec 2) PRIO2

Qualities of well written requirements

Testable – requirements must be testable

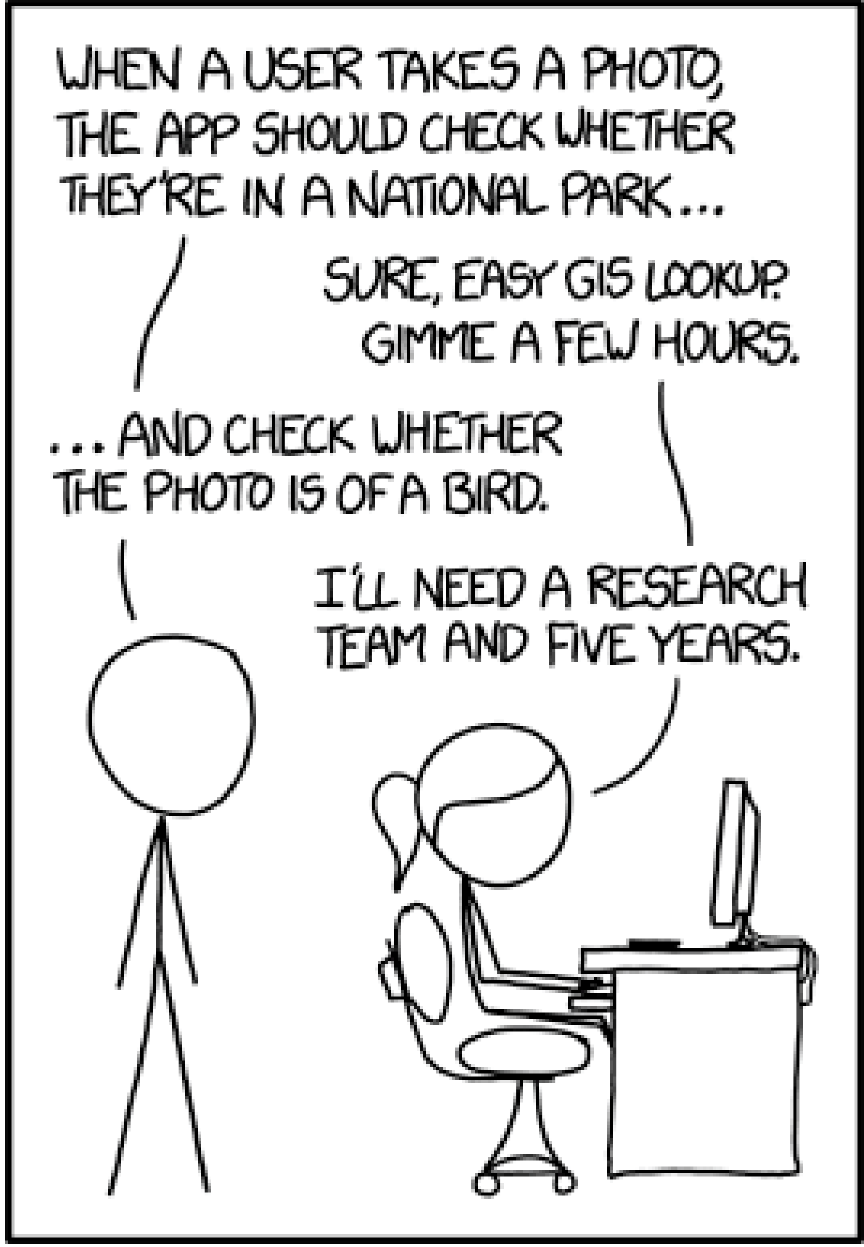
Initial Requirement:
Students will log into the system in an acceptable time frame.

Updated Requirement:
Students will log into the system in less than 3 seconds.

What we didn’t cover today

(we will eventually though)

- Specifications
- Resource Planning
- Design
- Development
- Testing
- Maintenance
- **Development processes**


WHEN A USER TAKES A PHOTO, THE APP SHOULD CHECK WHETHER THEY'RE IN A NATIONAL PARK...
SURE, EASY GIS LOOKUP. GIMME A FEW HOURS.
...AND CHECK WHETHER THE PHOTO IS OF A BIRD.
I'LL NEED A RESEARCH TEAM AND FIVE YEARS.

IN CS, IT CAN BE HARD TO EXPLAIN THE DIFFERENCE BETWEEN THE EASY AND THE VIRTUALLY IMPOSSIBLE.

Documentation in this course

We will not be making a requirements specification document in this course

Instead, we will document our project after the fact. After we finish coding and commenting, we will use a software called Doxygen.

Doxygen

Doxygen is the de facto standard tool for generating documentation from annotated C++ sources.

Generates an online documentation browser in HTML (or .tex) from documented source files

Can also visualize relations between entities via diagrams which are automatically generated