

Software Engineering

CS50 for MBAs

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March 2022

What is the **goal** of
software development



Provide **Value** to the **Customer**



Customer Strategy

Know Your Customers' "Jobs to Be Done"

Is innovation inherently a hit-or-miss endeavor? Not if you understand why customers make the choices they do. **by Clayton M. Christensen, Taddy Hall, Karen Dillon, and David S. Duncan**

From the Magazine (September 2016)



Artwork: Marijah Bac Cam, Blue Landscape, charcoal, ink, marker, and pencil on paper

Let's build Instagram



If we want to provide
value to the customer,
how do we “break down”
a project



User Story

An informal, general explanation of a software feature written from the perspective of the end user [...] to articulate how a software feature will provide value to the customer.

User Story != Feature

User Story == A Goal

As a [persona], I [want
to], [so that].

As a new user, I want to
create an account, so
that I can share my
photos.

As a **user**, I want to
upload a photo, so that I
can **share it**.

As a **user**, I want to
apply a filter to my
photo, so that **it looks**
good.

Task

Some piece of work that needs to be done that doesn't directly provide value to the customer.

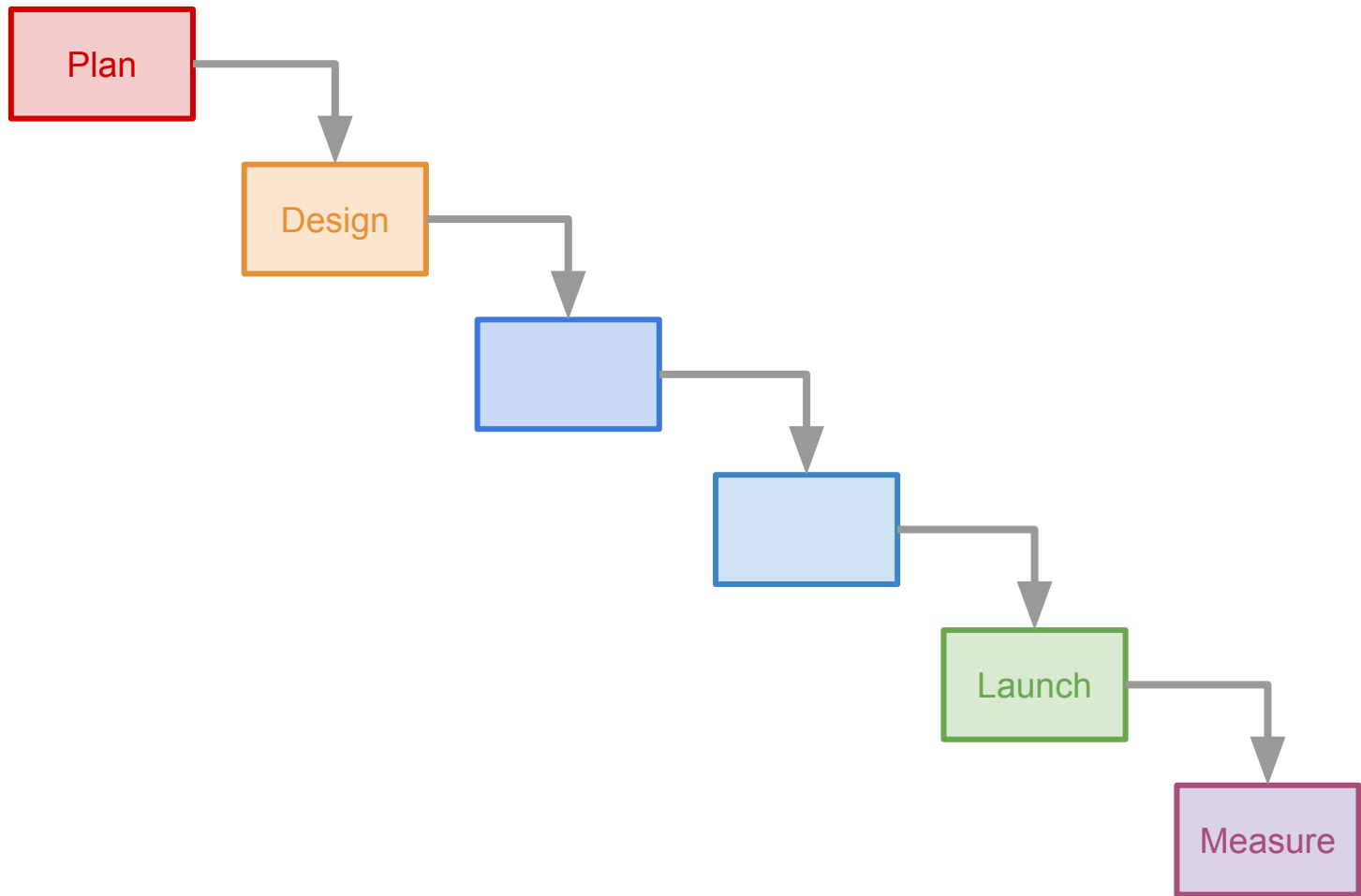
Setup ImageMagick on
server to resize images.

How should we decide
what to work on



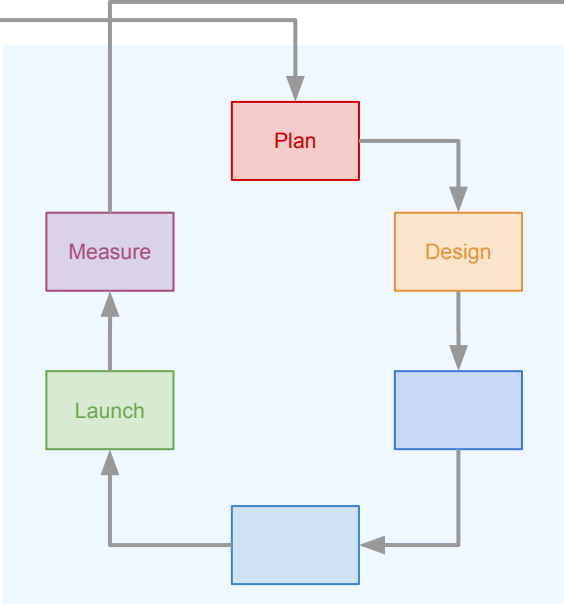
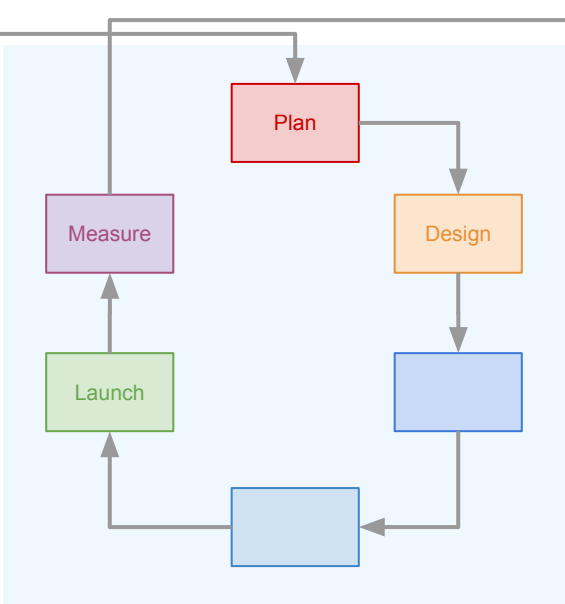
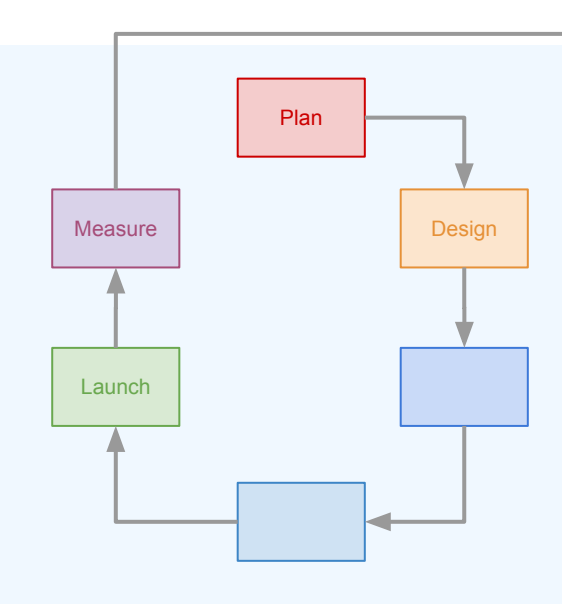
Waterfall

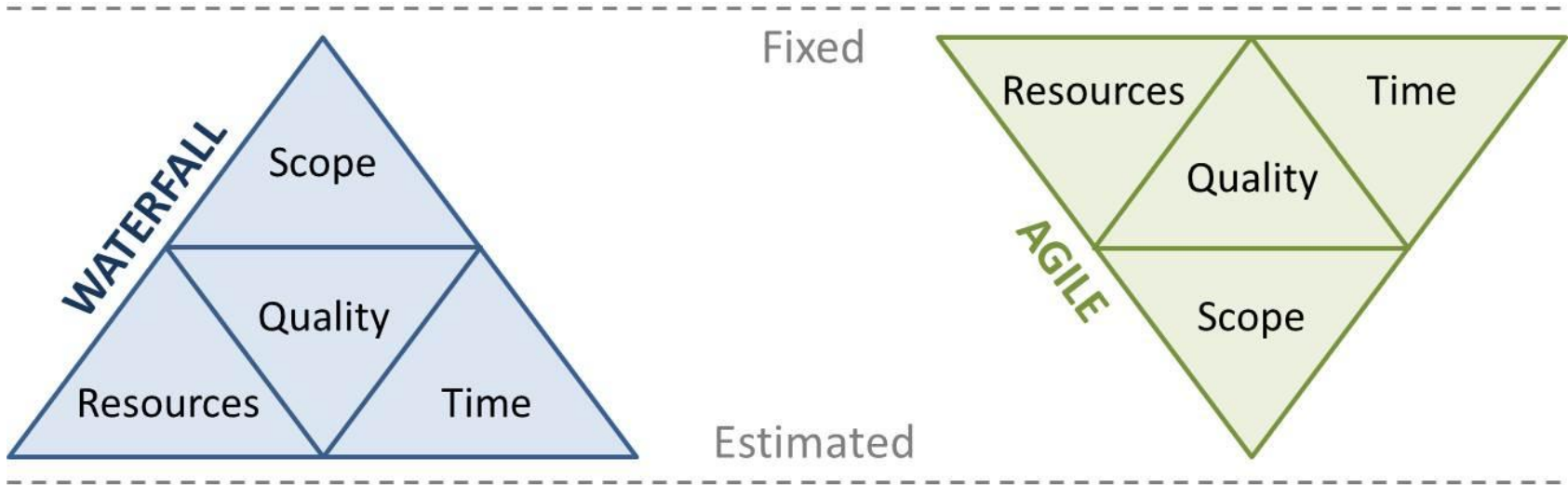
Waterfall project management maps out a project into distinct, sequential phases, with each new phase beginning only when the previous one has been completed.



Agile

Agile is an iterative approach to project management and software ... Instead of betting everything on a "big bang" launch, an agile team delivers work in small, but consumable, increments.





Prioritization

STORY

STORY

TASK

TASK

STORY

TASK

Prioritization

The **product owner** is responsible for the order

STORY

STORY

TASK

TASK

STORY

TASK

INITIATIVE

EPIC 1

STORY

TASK

STORY

STORY

TASK

EPIC 2

STORY

TASK

STORY

TASK

TASK

TASK

EPIC 3

STORY

TASK

STORY

STORY

STORY

If **scope** is what is
variable, how do we
know what we can
achieve



Estimation

The process by which the team assigns an estimate of complexity to a particular story.

Story Points

An estimate of complexity, level of effort, for a particular story.

Fibonacci

1, 2, 3, 5, 8, 13, ...

T-Shirt Sizes

XS, S, M, L, XL

As a **user**, I want to
upload a photo, so that I
can **share it**.

Story Points != Time

Story Points == Effort

How do we ensure the
product is moving
forward







Sprints

A sprint is a short, time-boxed period when a **scrum team** works to complete a set amount of work.

Kanban Board

A kanban board is an agile project management tool designed to help visualize work, limit work-in-progress, and maximize efficiency (or flow)

Example of a Kanban Board

Backlog	In Progress (3)	Peer Review (3)	In Test (1)	Done	Blocked
					
Fast Track/ Defect					

Includes
Eli Goldratt's
"Standing on the
Shoulders
of Giants."

Eliyahu M. Goldratt and Jeff Cox
THE GOAL
A PROCESS OF ONGOING IMPROVEMENT
30th Anniversary Edition

Eli Goldratt has been described by Fortune as a "guru to industry" and by Business Week as a "genius". His book, *The Goal*, is a gripping fastpaced business novel.

"Goal readers are now doing the best work of their lives."
Success Magazine

"A factory may be an unlikely setting for a novel, but the book has been wildly effective..."
Tom Peters

Required reading for
Amazon's management.

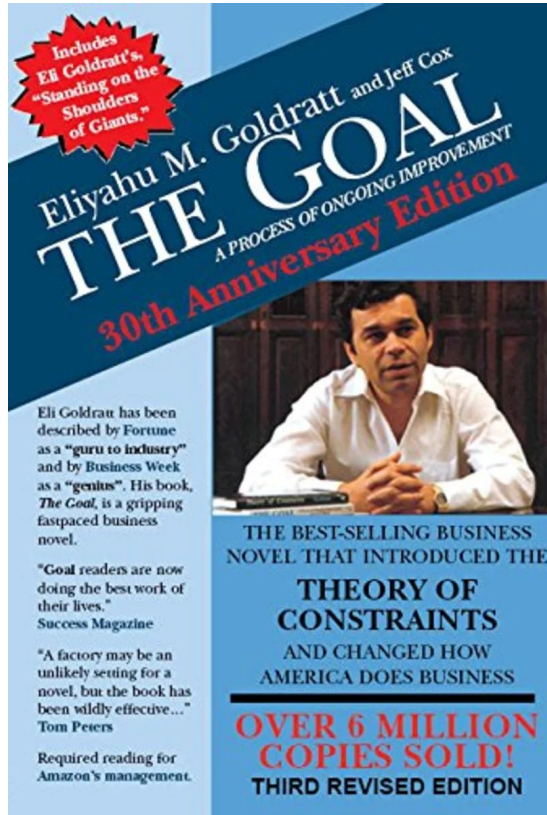


THE BEST-SELLING BUSINESS
NOVEL THAT INTRODUCED THE

**THEORY OF
CONSTRAINTS**

AND CHANGED HOW
AMERICA DOES BUSINESS

**OVER 6 MILLION
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THIRD REVISED EDITION



The throughput of a system is **constrained** by the **slowest part** of a system.

How do we ensure the
story is implemented
correctly



As a **user**, I want to
upload a photo, so that I
can **share it**.

Test Driven Development

Unit Tests

A unit test is a way of testing a unit - the smallest piece of code that can be logically isolated in a system.

User can see file submission form.

User can submit file to server.

Server returns error if no file provided.

Server returns error if file is not an image.

File can be saved to the cloud.

Integration Tests

Integration tests determine if independently developed units of software work correctly when they are connected to each other.



Given a logged in user,
When they successfully upload an image,
Then they are redirected to the image.

Given a logged in user,
When they provided a file that is not an image,
Then they see an error on the form.

Behavior Driven Development

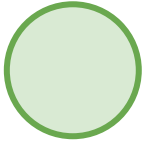
BDD uses human-readable descriptions of software user requirements as the basis for software tests.

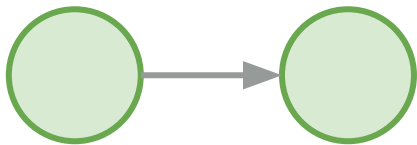
How should we release
this to the server

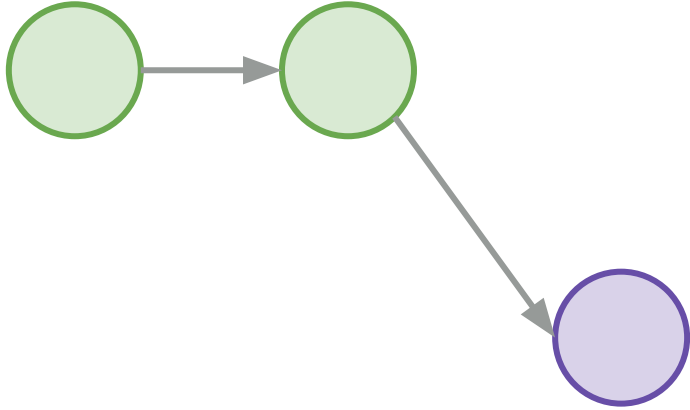


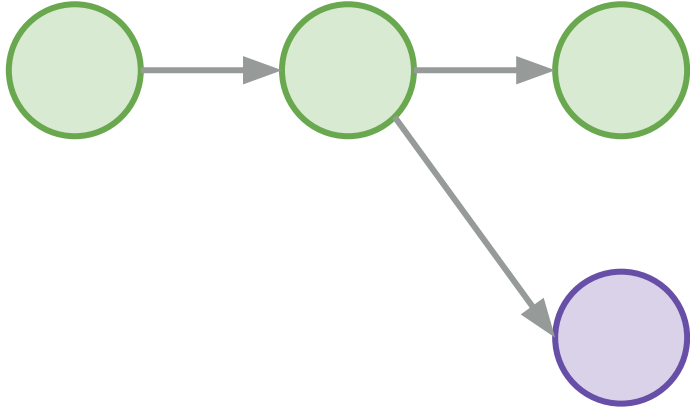
Continuous Integration

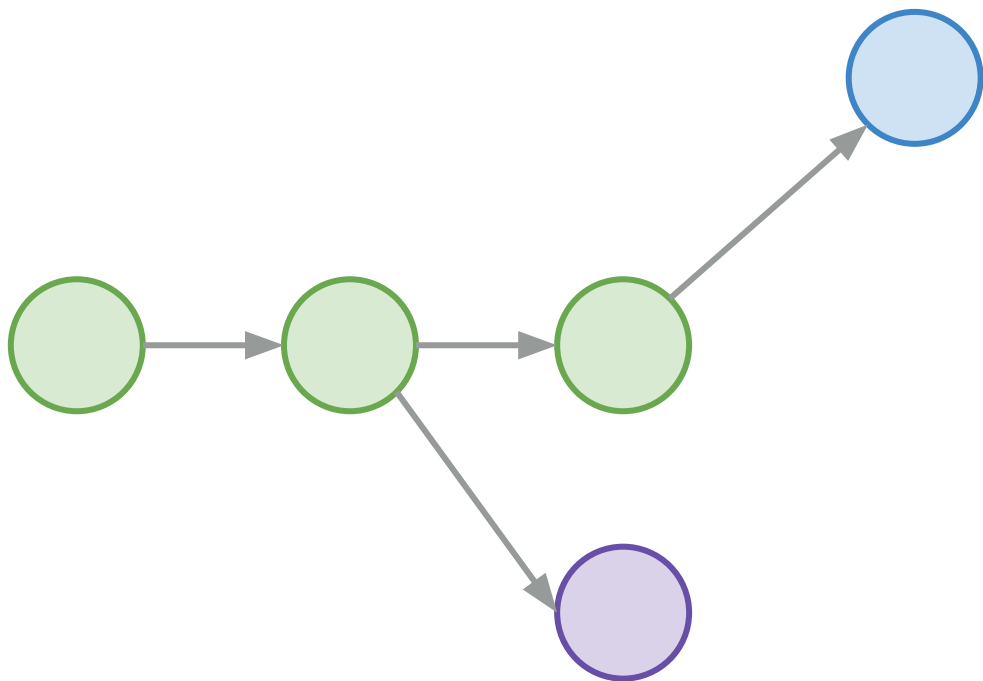
the practice of merging all developers' working copies to a shared mainline (several times a day).

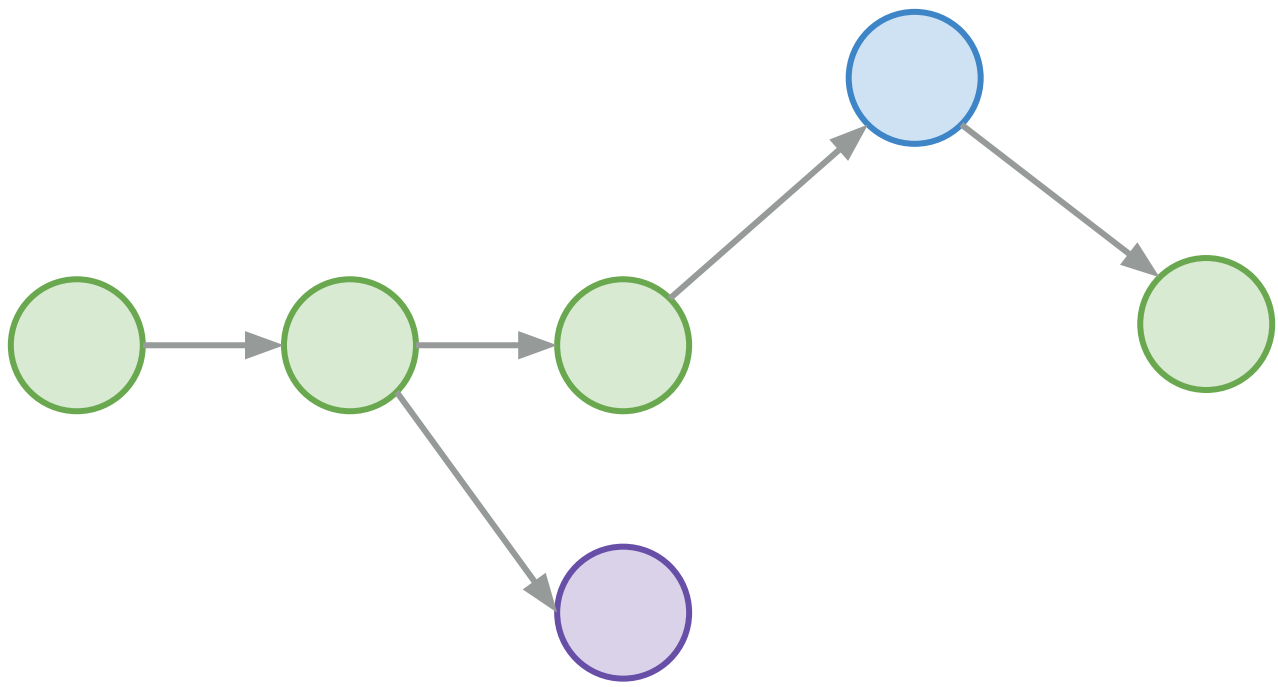


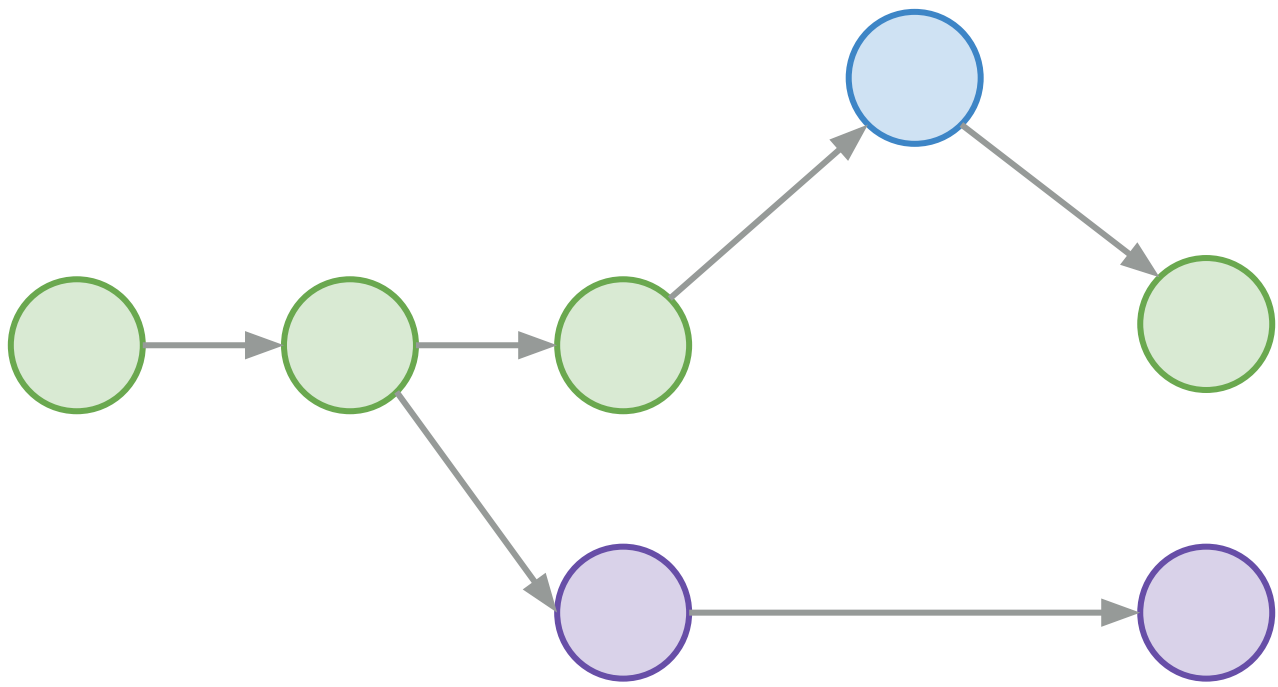


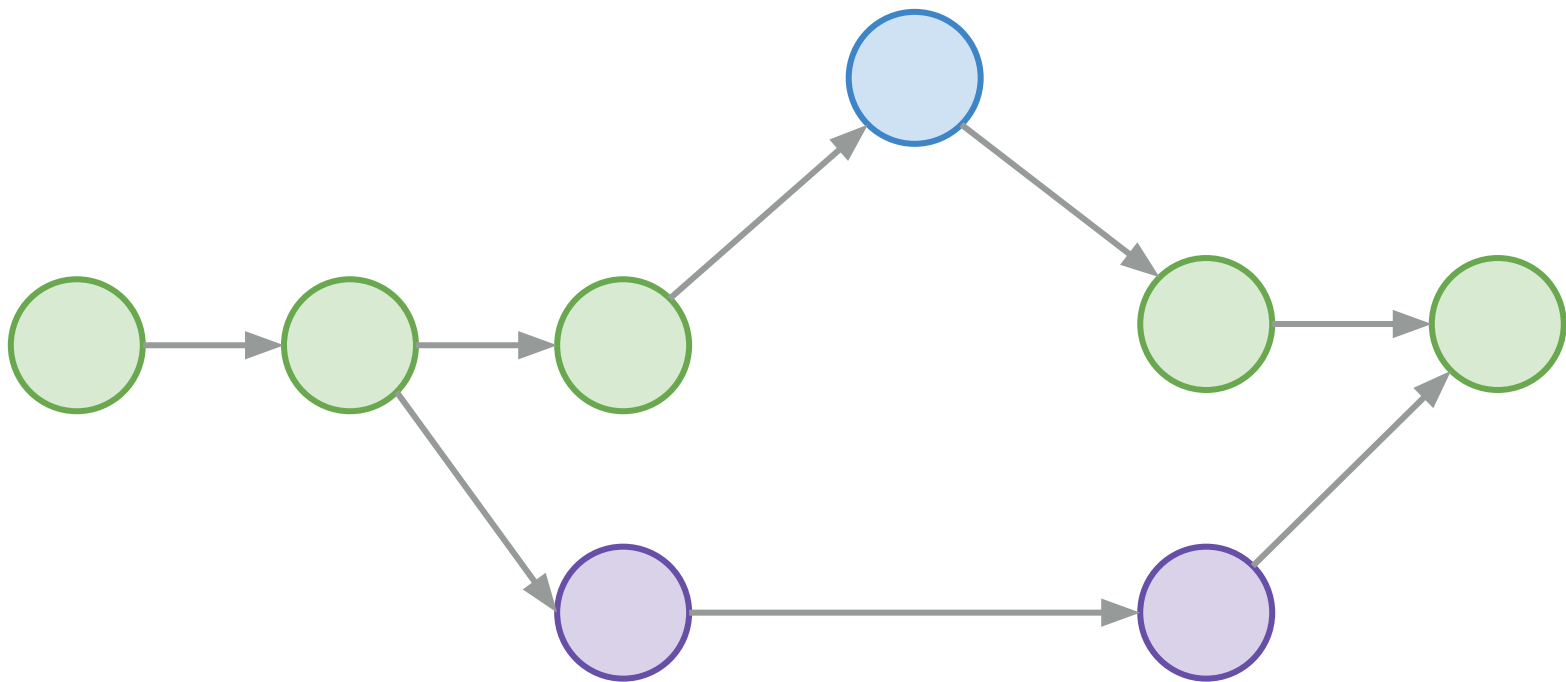












Continuous Deployment

[Practice in which] software functionalities are delivered frequently through automated deployments

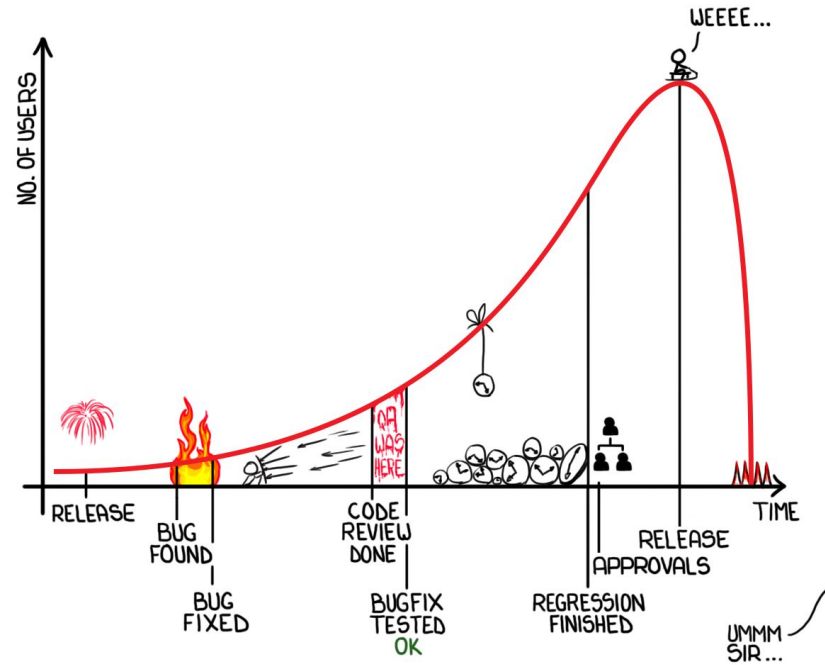
Continuous Delivery

[Practice in which] software functionalities are [...] frequently delivered and deemed to be potentially capable of being deployed but are actually not deployed.

What should we do if
something goes wrong
after we release



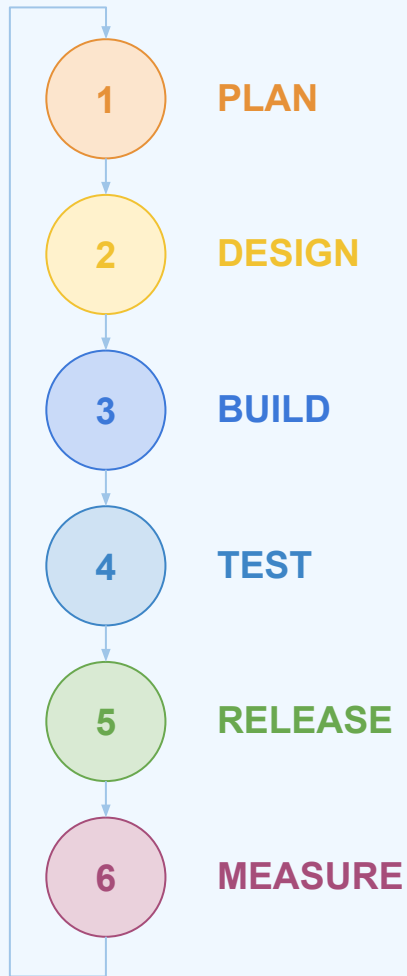
HOTFIX



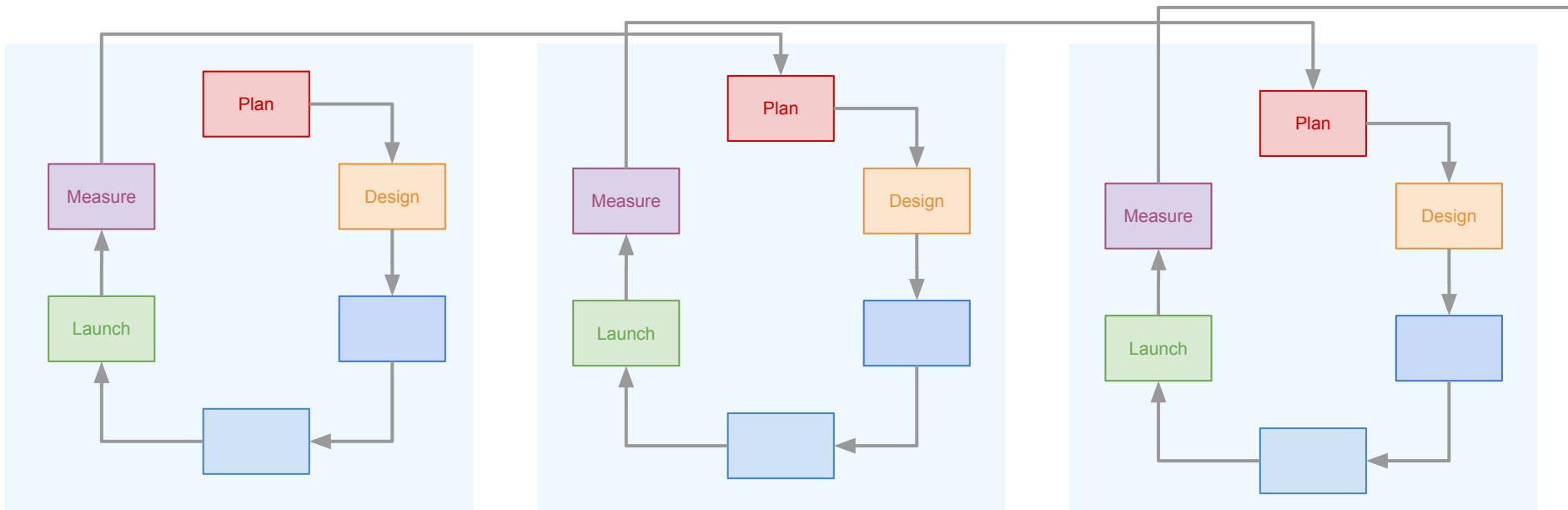
MONKEYUSER.COM

Congratulations!

You just went through
the Software
Development Life Cycle.



Software Development Life Cycle (SDLC)

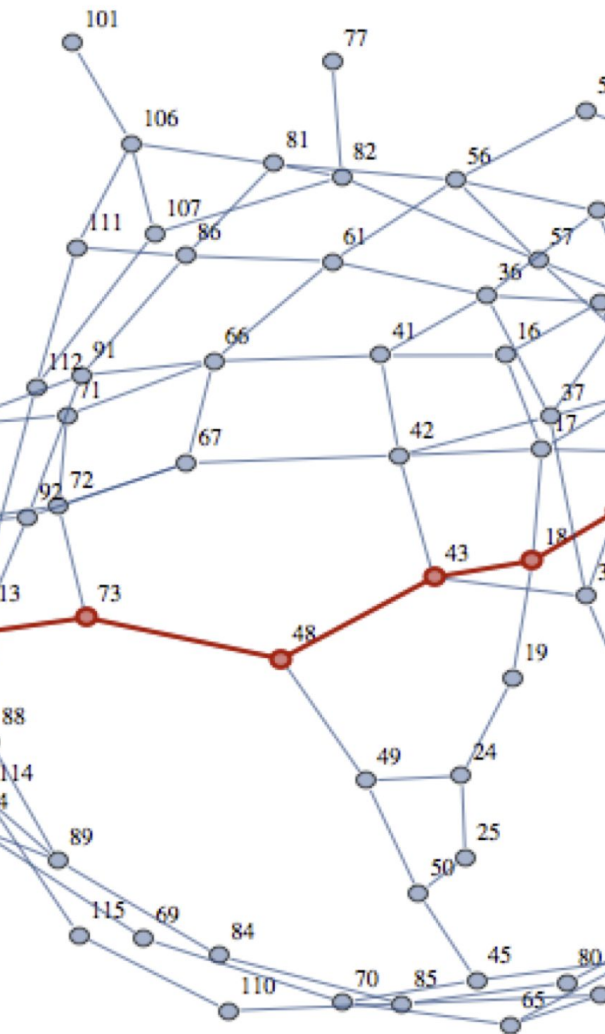


Wash, Rinse, and Repeat

So, what is software
engineering



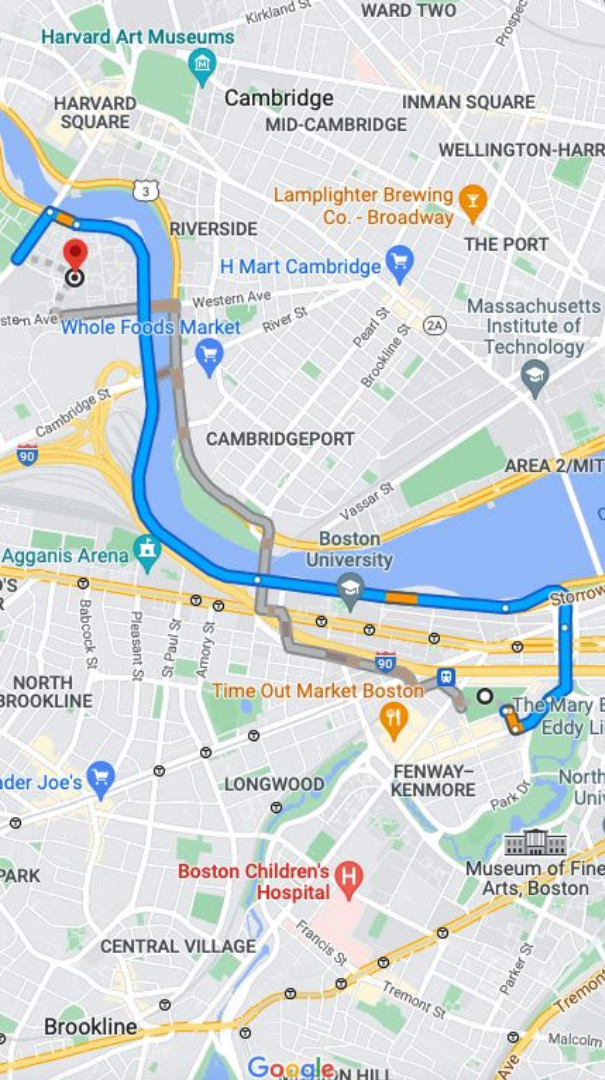
CS != Software Engineering



SHORTEST PATHS

Computer science

involves the study of or the
practice of computation,
automation, and information



NAVIGATION

Software Engineering

The application of a systematic, disciplined, quantifiable approach to the development, operation, and maintenance of software; that is, the application of engineering to software.