Agile Software Development

Produced by

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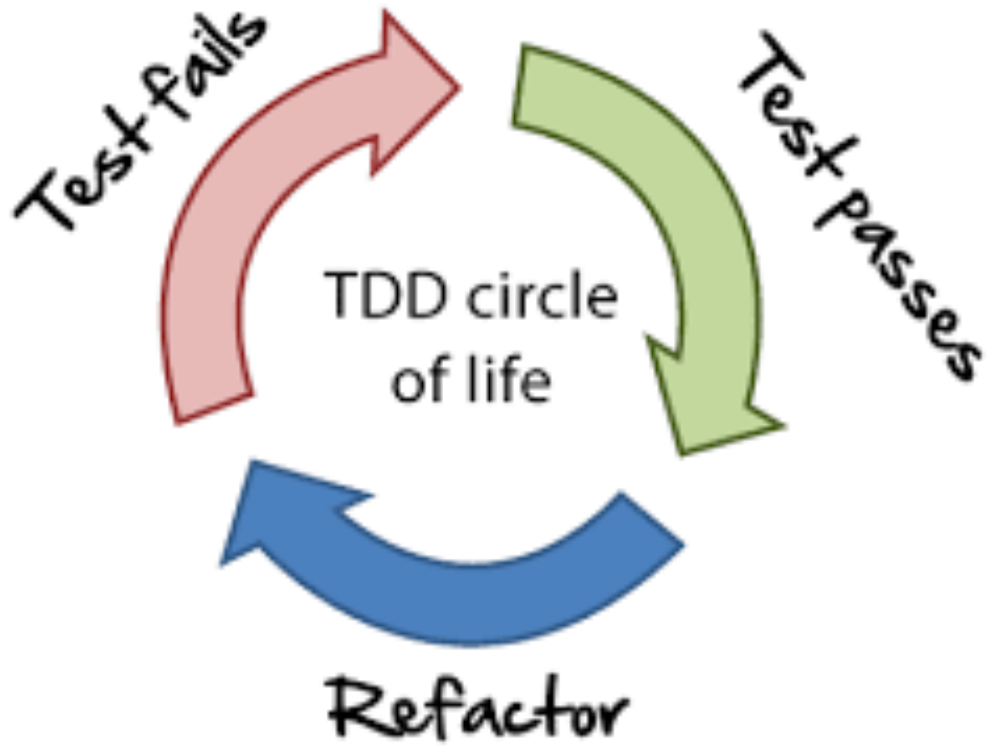
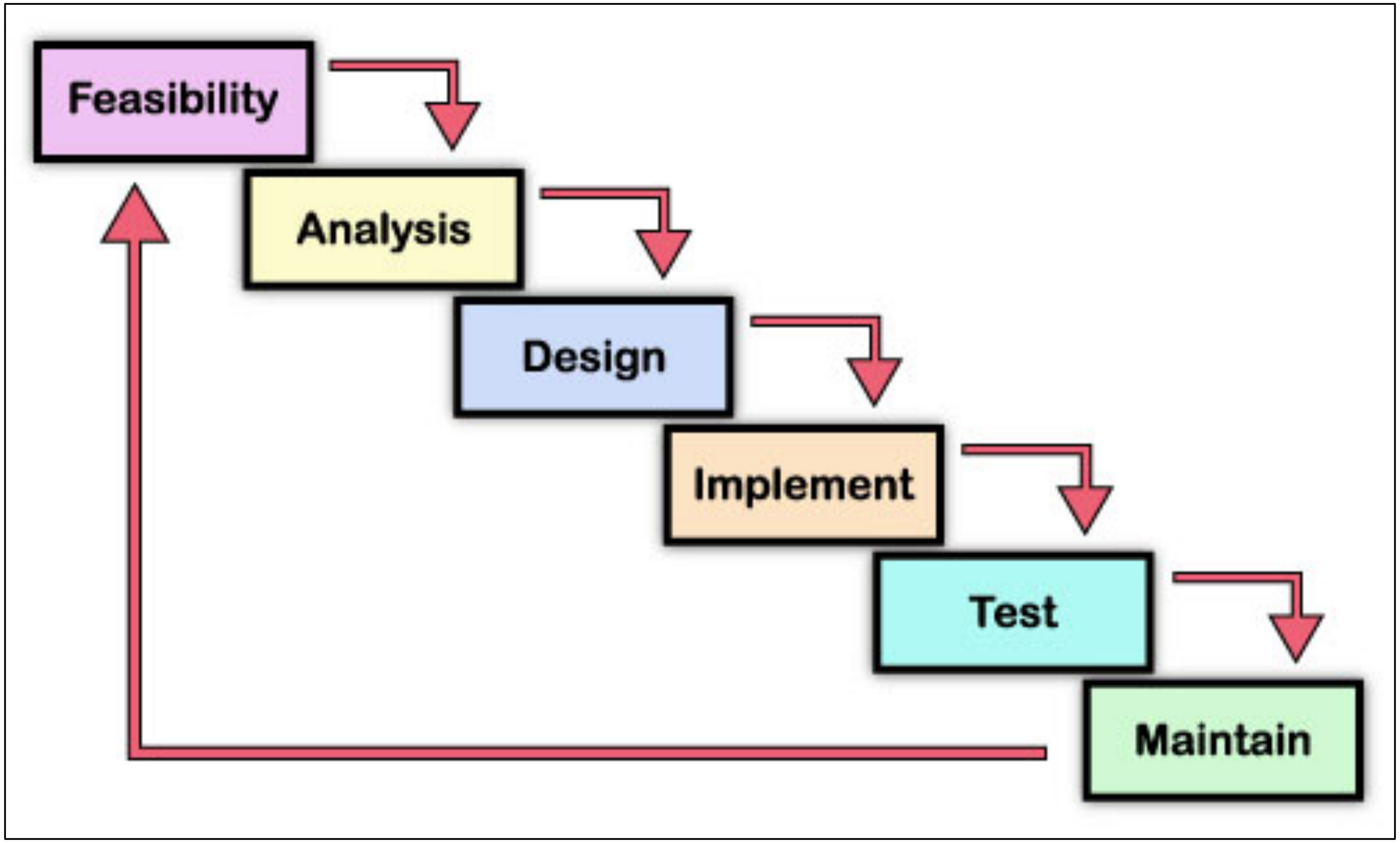
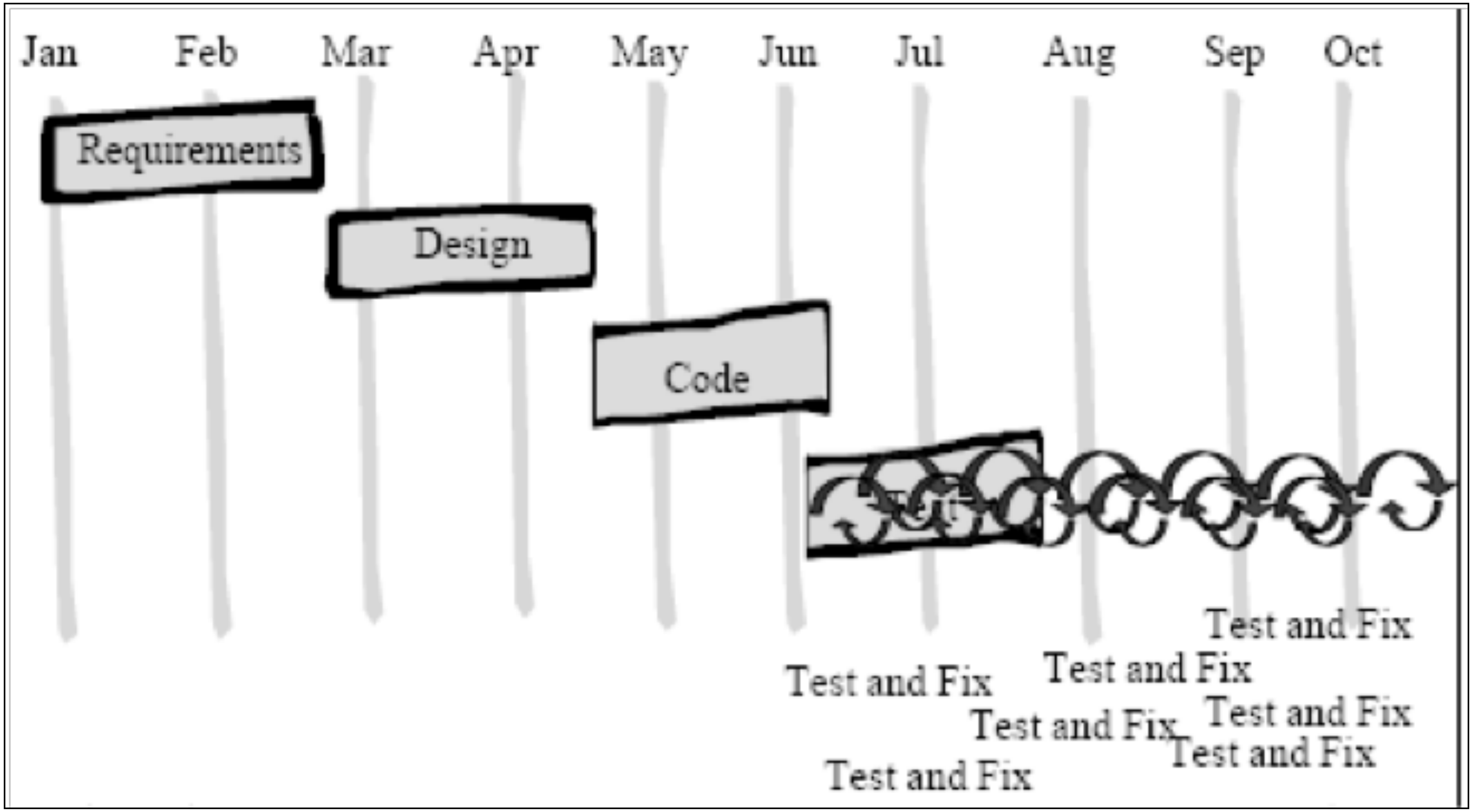
Agile and Test Driven Development (TDD)



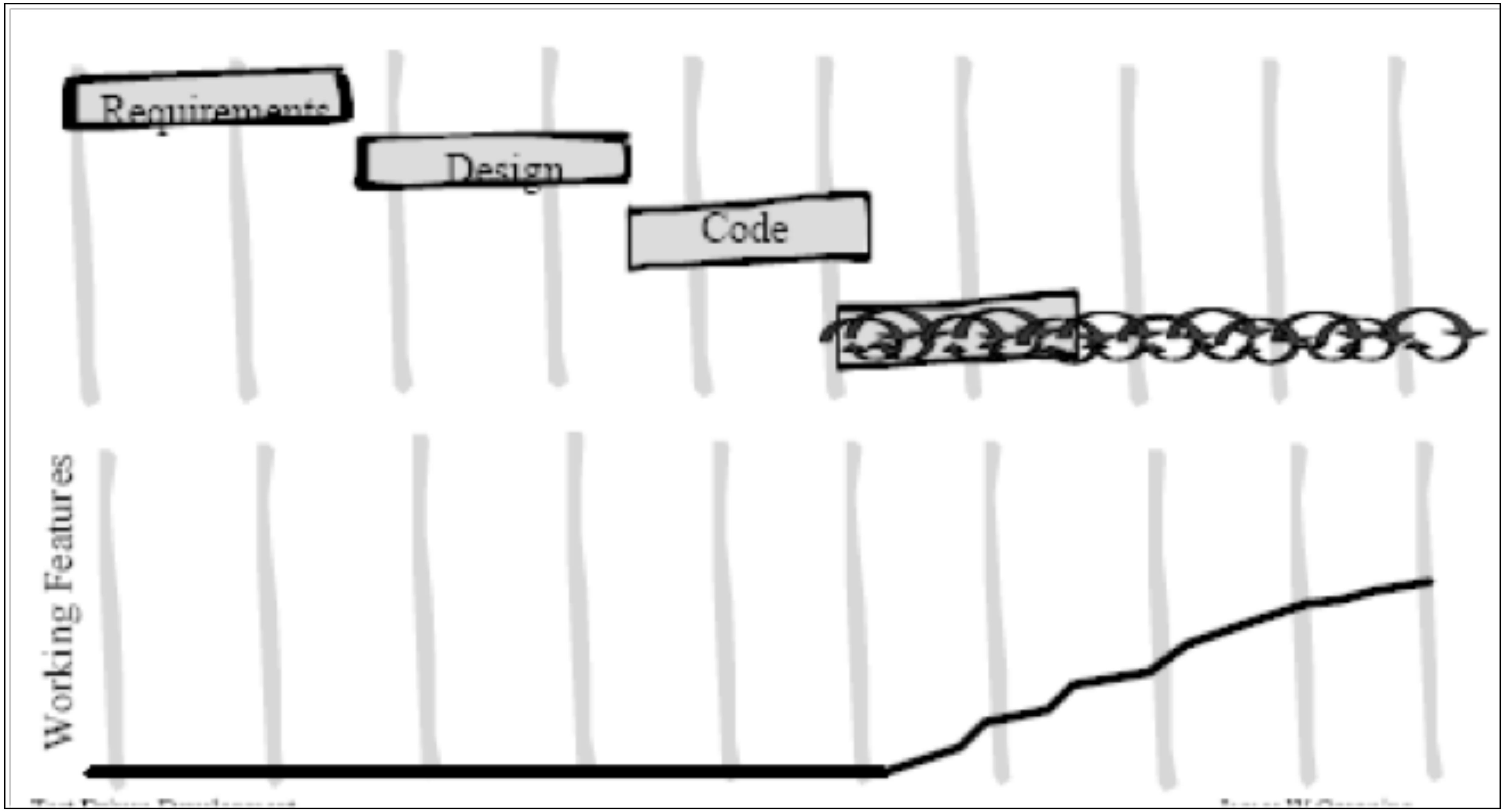
Waterfall - development approach

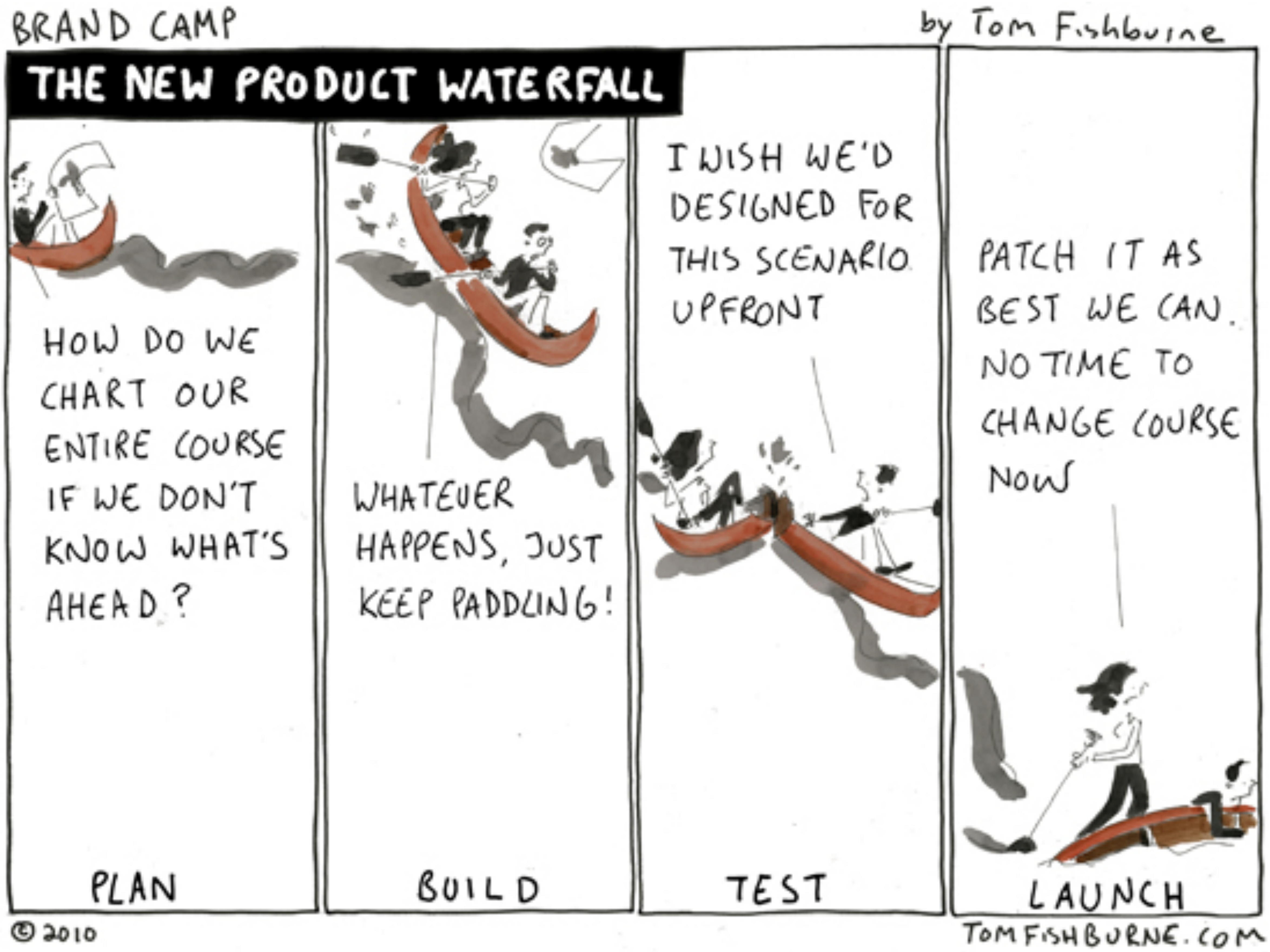


Waterfall - development approach



Waterfall - Working Features




BRAND CAMP
by Tom Fishburne
THE NEW PRODUCT WATERFALL
HOW DO WE CHART OUR ENTIRE COURSE IF WE DON'T KNOW WHAT'S AHEAD?
PLAN
WHATEVER HAPPENS, JUST KEEP PADDLING!
BUILD
I WISH WE'D DESIGNED FOR THIS SCENARIO UPFRONT
TEST
PATCH IT AS BEST WE CAN. NO TIME TO CHANGE COURSE NOW
LAUNCH
© 2010
TOMFISHBURNE.COM

https://www.linkedin.com/pulse/enterprise-performance-management-solutions-agile-projects-mkpadi/

Waterfall

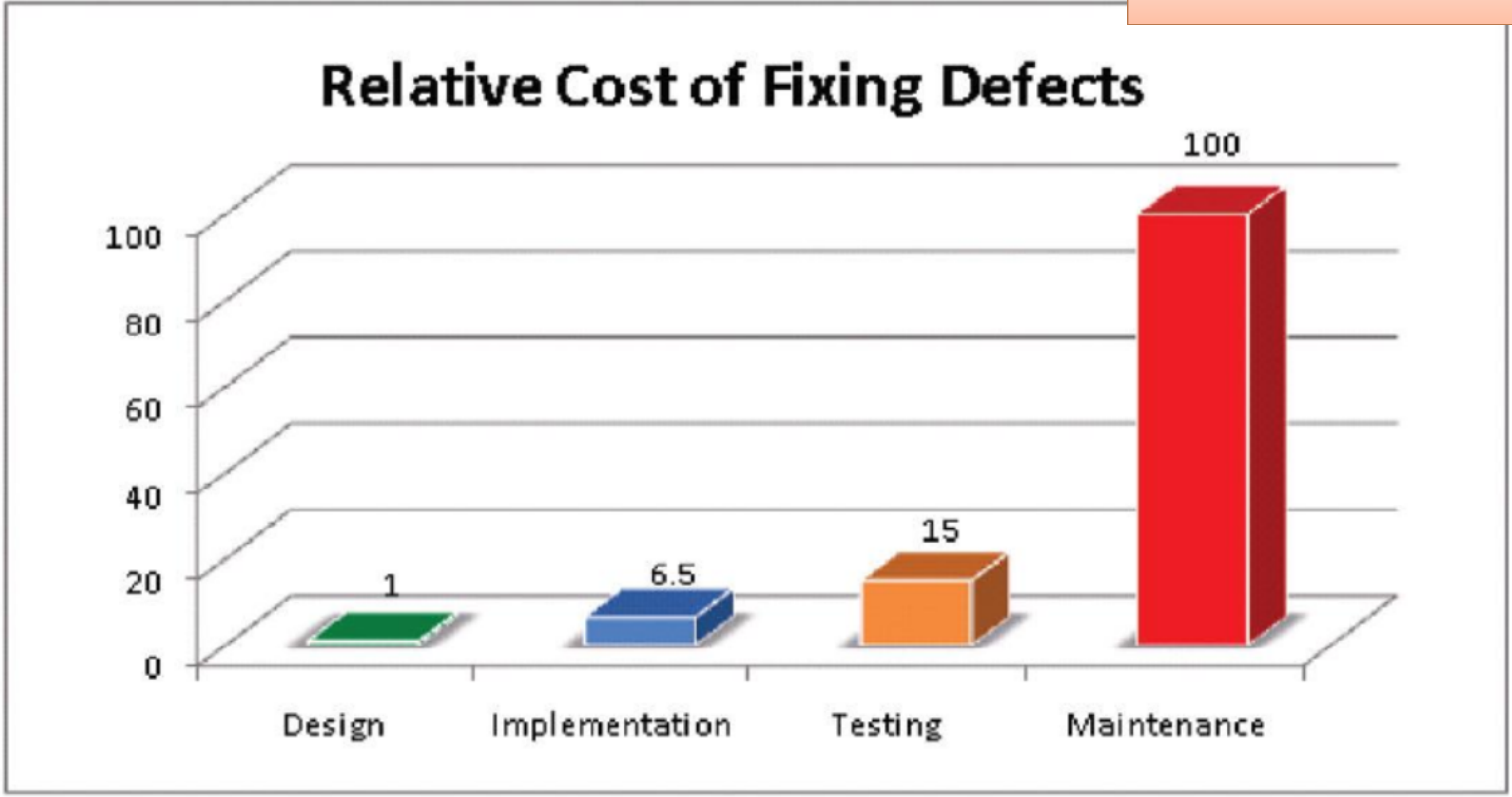
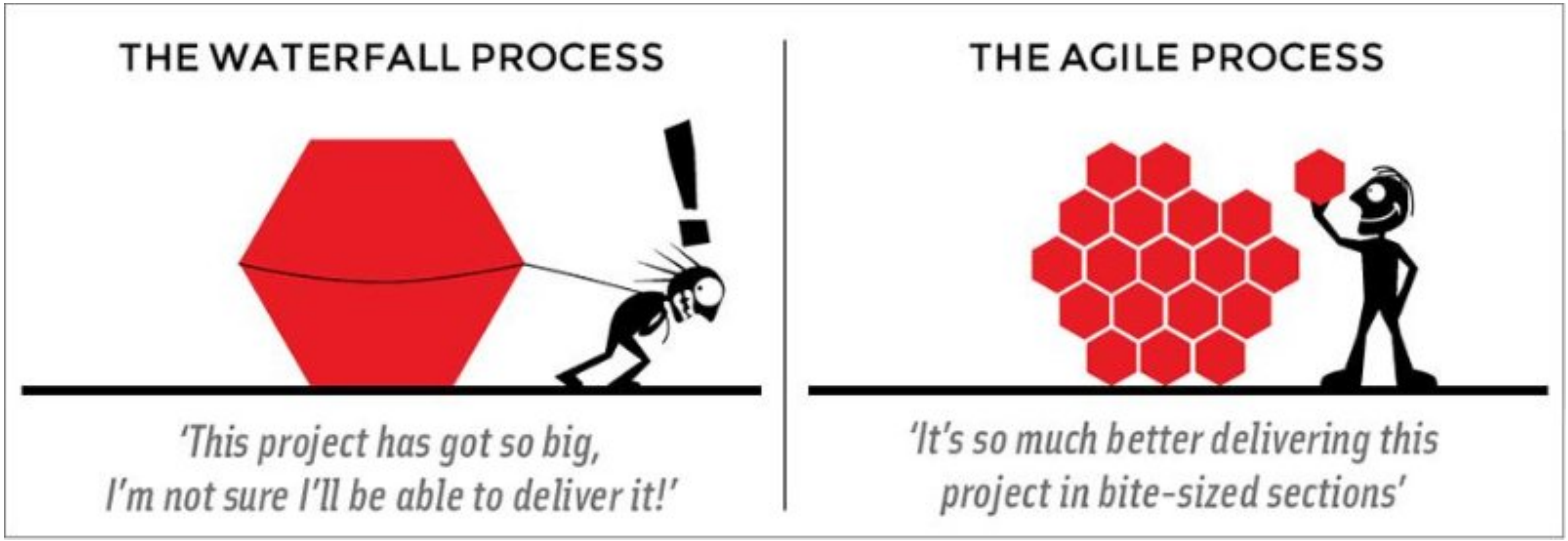


Figure 3: *IBM System Science Institute Relative Cost of Fixing Defects*

Defects found in testing were 15 times more costly than if they were found during the design phase and 2 times more than if found during implementation.

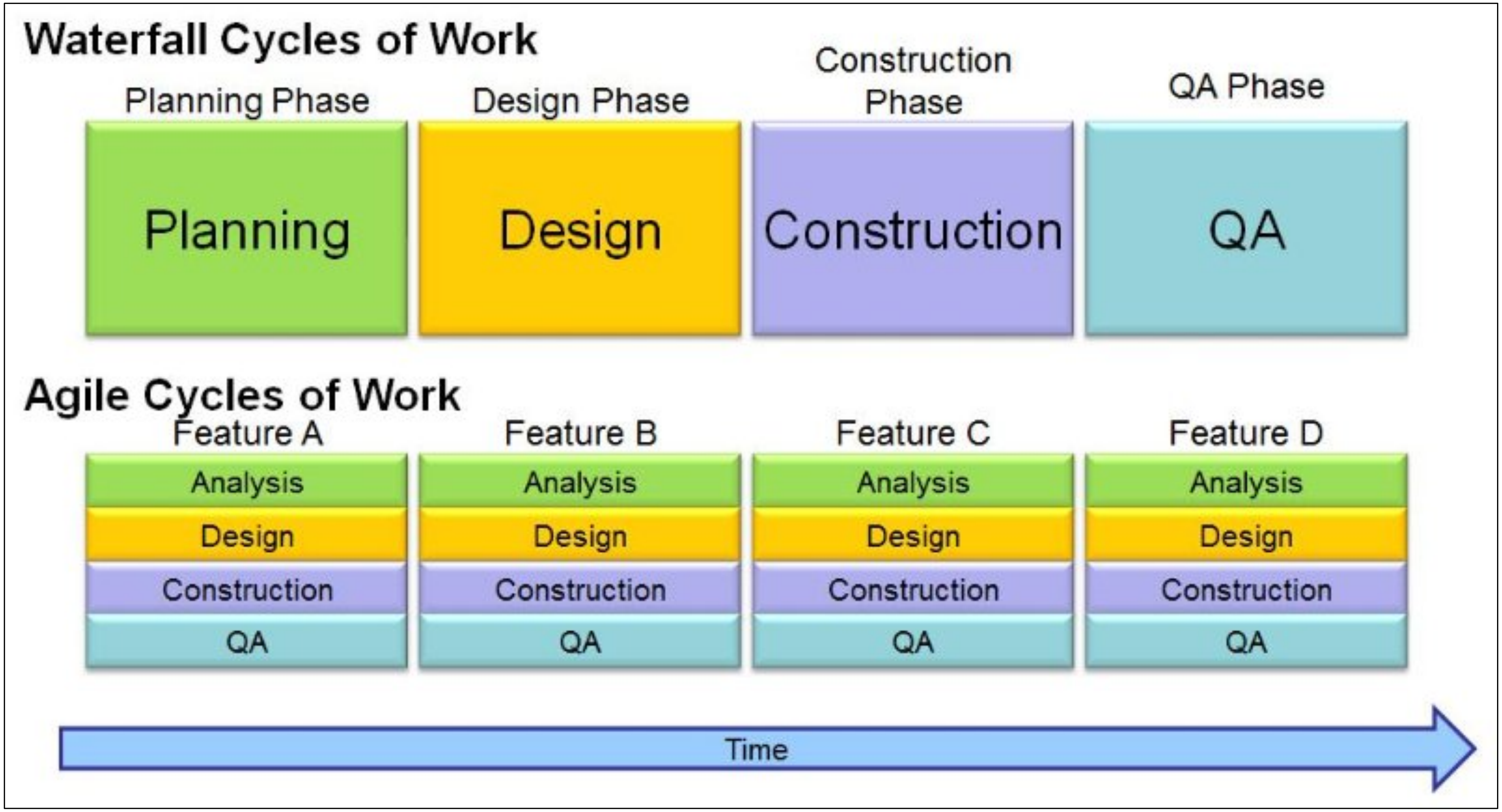
https://www.researchgate.net/publication/255965523_Integrating_Software_Assurance_into_the_Software_Development_Life_Cycle_SDLC

Waterfall Vs Agile


THE WATERFALL PROCESS
'This project has got so big, I'm not sure I'll be able to deliver it!'
THE AGILE PROCESS
'It's so much better delivering this project in bite-sized sections'

https://www.linkedin.com/pulse/pragmatic-pivoting-software-development-life-cycle-beyond-mkpadi/

Waterfall Vs Agile



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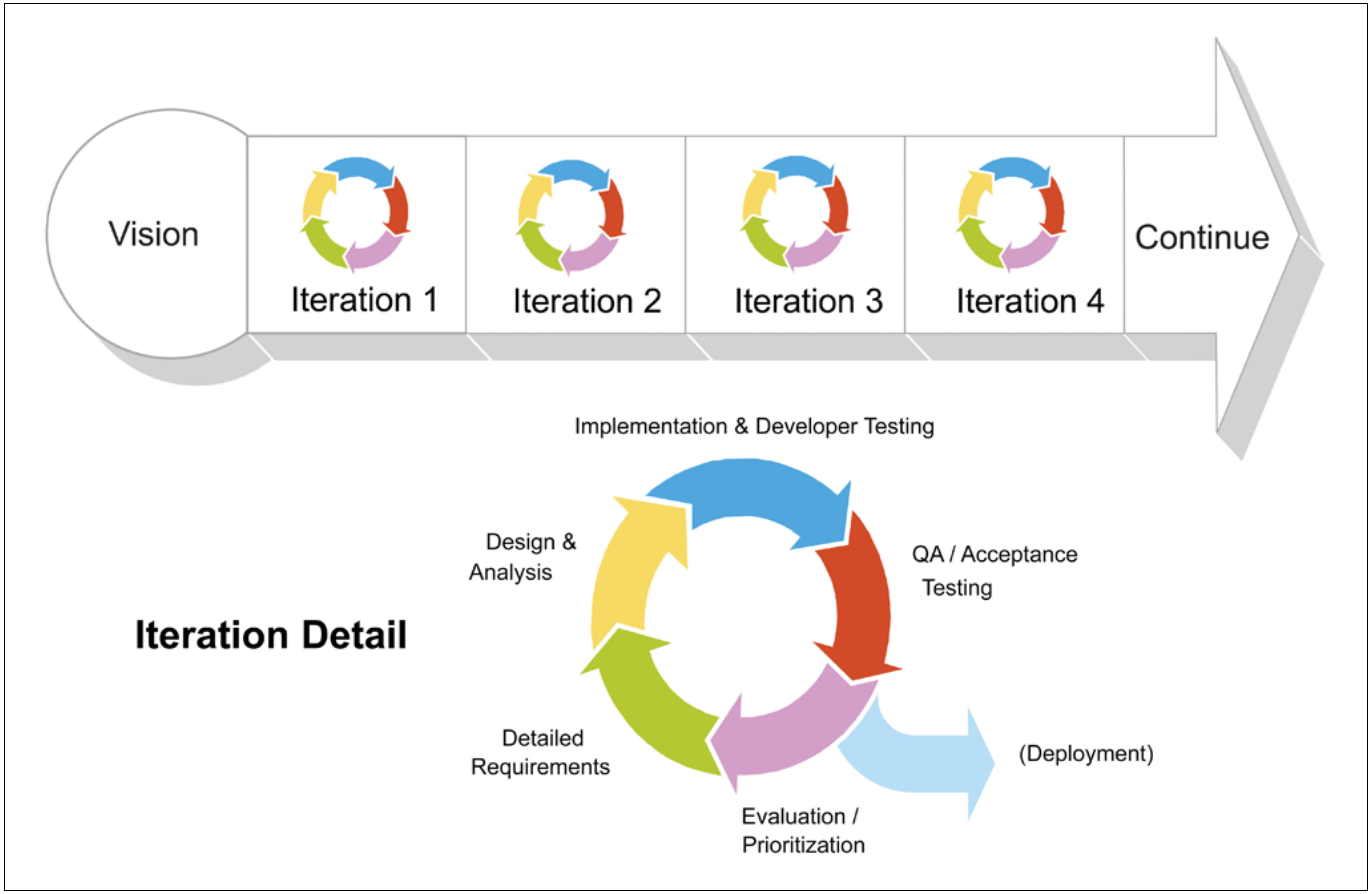
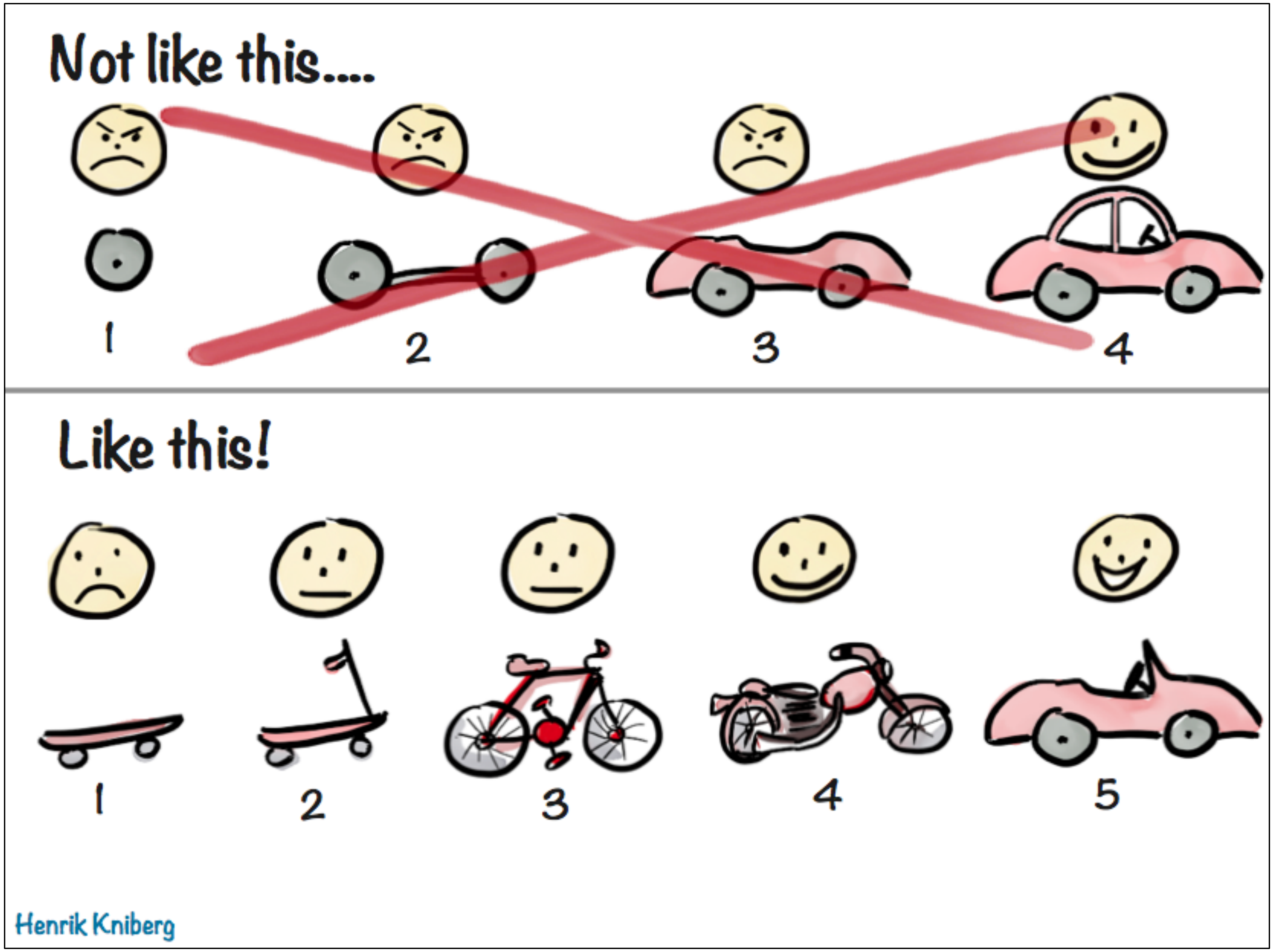
Agile – Iterative Approach



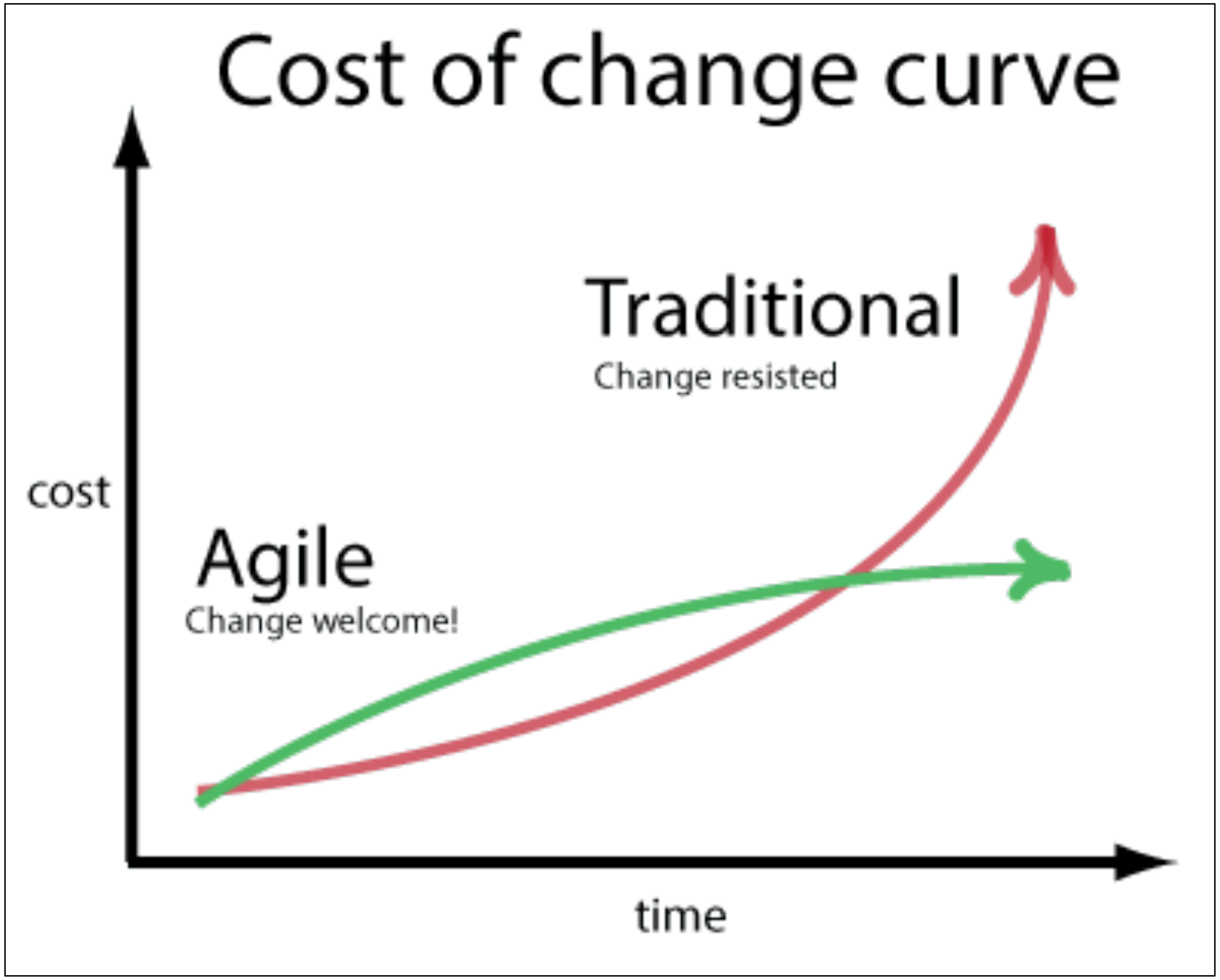
https://cloudhcm.wordpress.com/2014/09/13/project-management-tool-for-saas-implementation-projects/

Agile – Both Iterative and Incremental



https://m.dotdev.co/the-agile-bicycle-829a83b18e7

Waterfall vs Agile – Cost of Change



https://www.linkedin.com/pulse/enterprise-performance-management-solutions-agile-projects-mkpadi/

Developer landscape has changed just a ***little*** (!) …

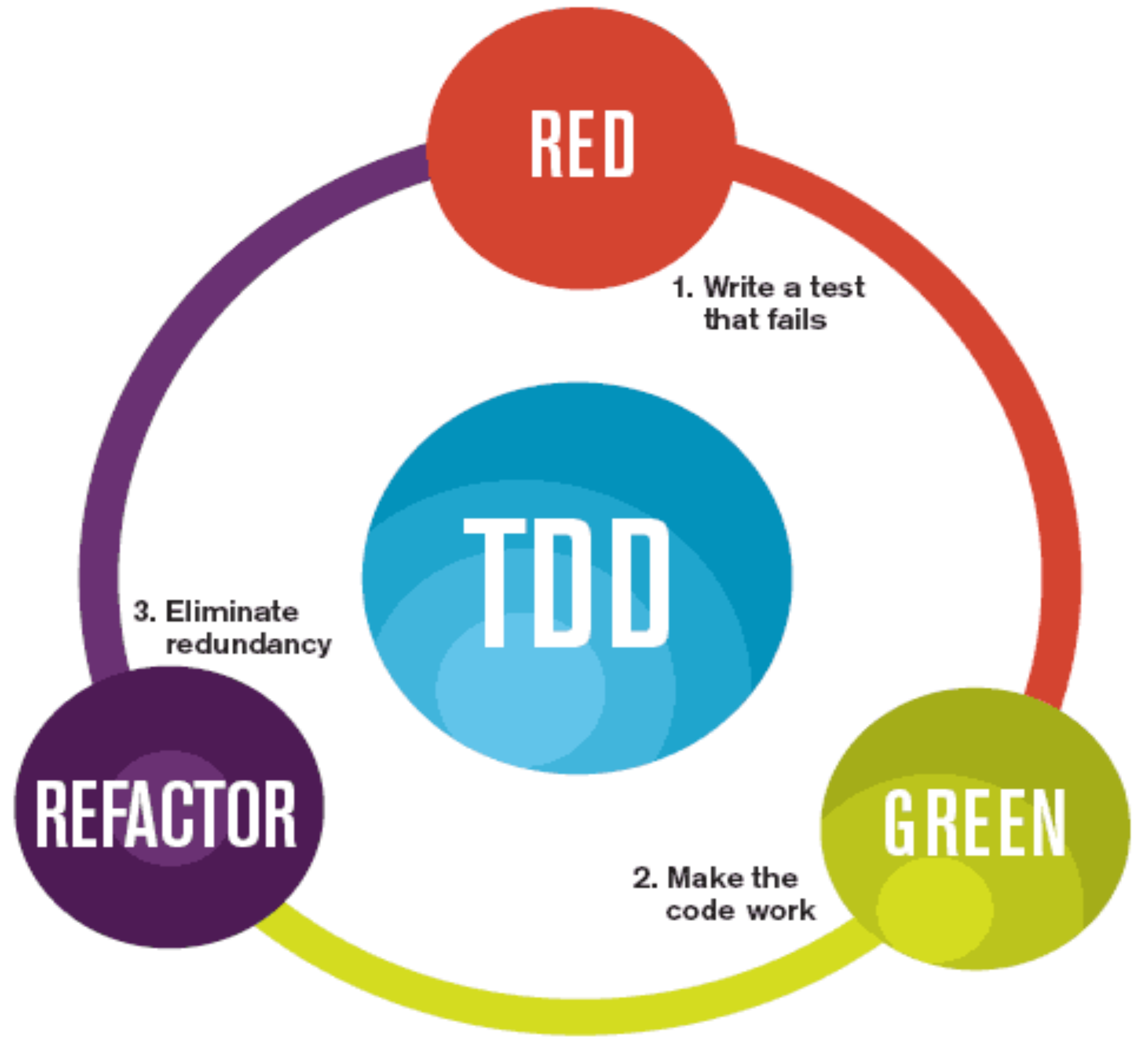
- New tools have dramatically eased mundane developer tasks:
  - **Automated test tools (e.g. JUnit)**
  - System build tools (e.g. Maven, Gradle, SBT)
  - Version control (e.g. Git repositories, Github hosting service)
  - Continuous integration
- Used properly, OO languages can make software much easier to change.
- The cost curve is significantly flattened, i.e. costs don't increase dramatically with time.
- Up front modeling becomes a liability – some speculative work will certainly be wrong, especially in a business environment.

TDD
ALL CODE IS GUILTY
UNTIL PROVEN INNOCENT

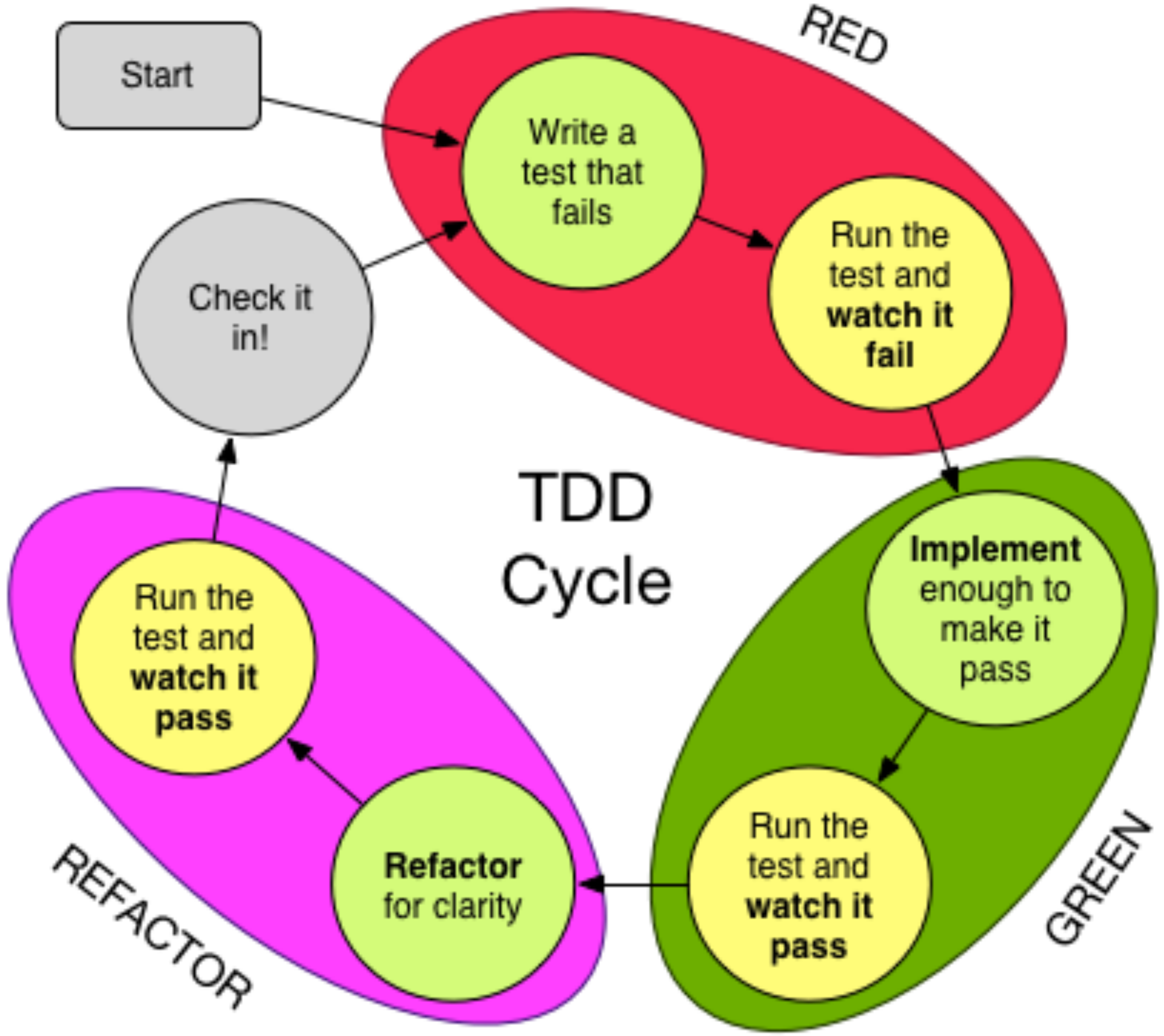
“Good programmers write code, great programmers write tests”

"Never,
in the field of programming,
have so many
owed so much
to so few"

- Martin Fowler on the developers behind JUnit



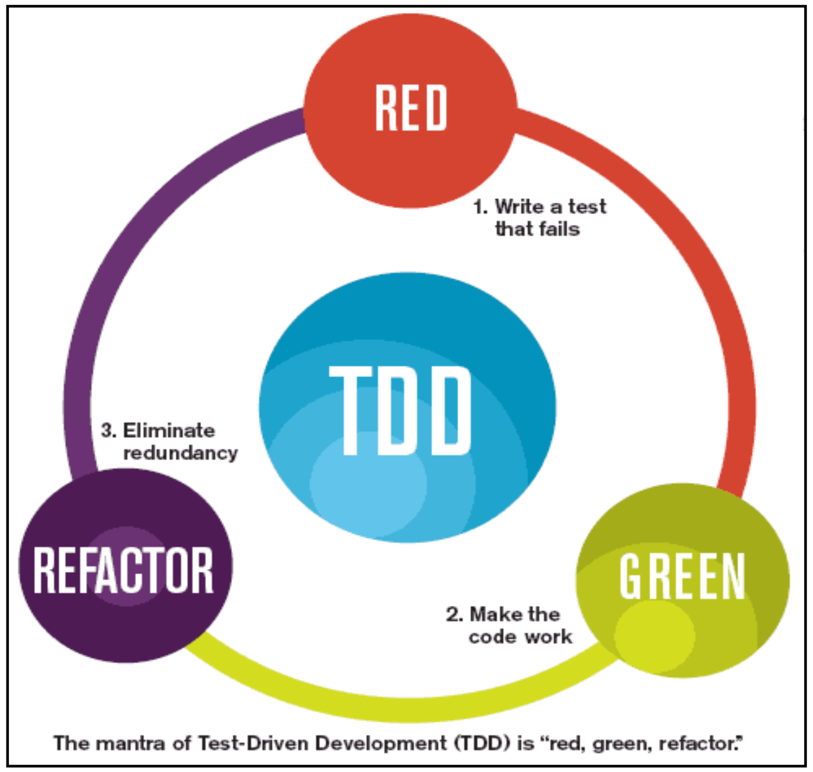
The mantra of Test-Driven Development (TDD) is "red, green, refactor."


Start
RED
Write a test that fails
Run the test and **watch it fail**
Check it in!
TDD Cycle
GREEN
Implement enough to make it pass
Run the test and **watch it pass**
REFACTOR
Refactor for clarity
Run the test and **watch it pass**

TDD – Definition

Test-driven development (TDD) refers to a style of programming in which three activities are tightly interwoven:

- coding,
- testing (in the form of writing unit tests) and
- design (in the form of refactoring).



The mantra of Test-Driven Development (TDD) is "red, green, refactor."

https://www.agilealliance.org/glossary/tdd/

What is Unit Testing?

- A unit test is a piece of code written by a developer that exercises a very small, specific area of functionality of the code being tested.
    - Usually a unit test exercises some particular method in a particular context
- Unit tests are performed to prove that a piece of code does what the developer thinks it should do.
- The question remains open as to whether that's the right thing to do according to the customer or end-user:
    - that is acceptance testing (Acceptance Test Driven Development, Behaviour Driven Development)

What is Regression Testing?

- New code and changes to old code can affect the rest of the code base.
  - ‘Affect’ sometimes means ‘break’.
- We need to rerun tests on the old code, to verify it still works – this is regression testing.
- Regression testing is required for a stable, maintainable code base.
- Unit tests retain their value over time and allows others to prove the software still works (as tested).

What does Unit Testing Accomplish ?

- *Does the **code** do what was expected?*
  - i.e. is the code fulfilling the intent of the developer?
- *Does the **code** do what was expected all the time*?
  - exceptions get thrown, disks get full, network lines drop, buffers overflow - is the code still performing as expected?
- *Can the **code** be depended upon?*
  - Need to know for certain both its strengths and its limitations.
- *Does the **test** document the developers intent?*
  - An important side-effect of unit testing is that it helps communicate the code's intended use.

TDD – General

- An iterative technique to develop software.
- Tests are written before the code itself.
- As much (or more) about design as testing.
  - – Encourages design from user's point of view.
  - – Encourages testing classes/units in isolation – Unit testing.
- A test framework is used so that automated testing can be done after every small change to the code.
    - This may be as often as every 5 or 10 minutes.
- Axiom:
  - – 'Code that isn't tested doesn't work'
  - – 'Code that isn't regression tested suffers from code rot (breaks eventually)'

TDD – General (Contd.)

- As much (or more) about documentation as testing.
  - The tests are the documentation of what the code does.
- Must be learned and practiced.
- Consequences:
  - Fewer bugs;
  - More maintainable code - loosely-coupled, highly-cohesive systems.
  - During development, the program always works—it may not do everything required, but what it does, it does right.
  - Breaks the cycle of **more pressure == fewer tests** (the fewer tests you write, the less productive you are and the less stable your code becomes).

How is Unit Testing carried out?

- **Step 1**: Decide how to test the method in question before writing the code itself
- **Step 2**: Write the test code itself, either before or concurrently with the implementation code.
- **Step 3**: Run the test itself, and probably all the other tests in that part of the system.
- *Key Feature of executing unit tests:*
  - *You need to be able to determine at a glance whether all tests are succeeding/failing. The JUnit Framework will do this for us!*

Why bother with TDD?

TDD – Why bother with TDD/Unit Testing

- Significant reductions in defect rates, at the cost of a moderate increase in initial development effort:

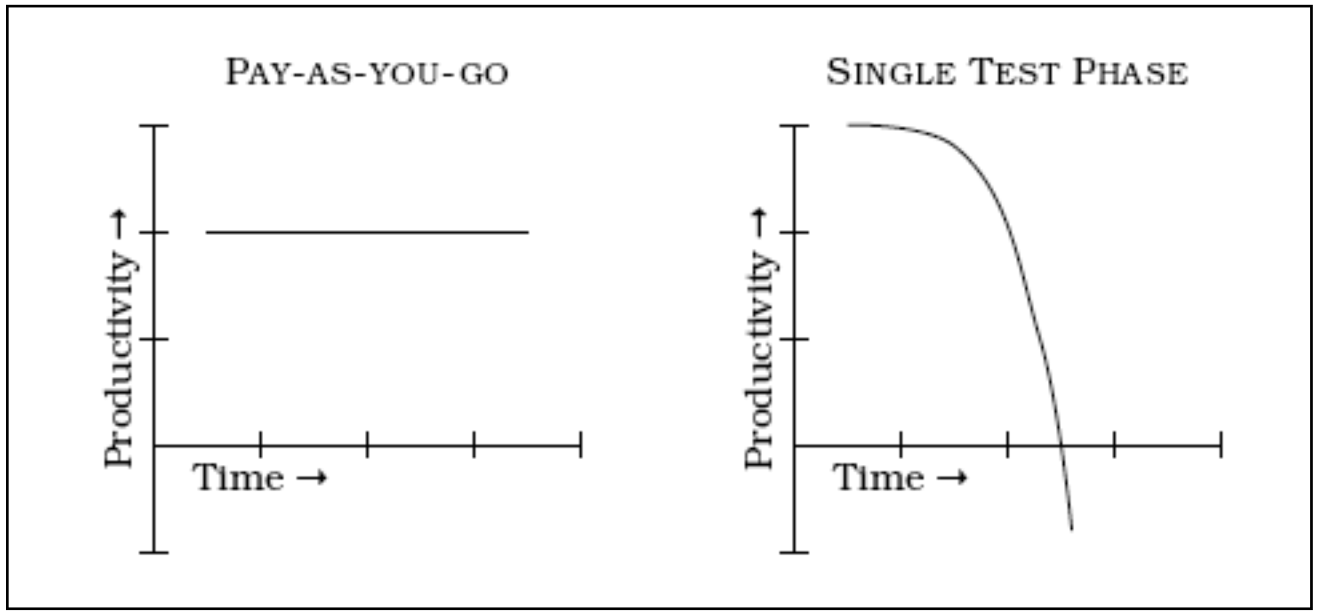
    generally these overheads are more than offset by a reduction in effort in projects' final phases.

- Anecdotal evidence suggests that TDD leads to improved design qualities in the code, and more generally a higher degree of technical quality.

https://www.agilealliance.org/glossary/tdd/

Excuses for not engaging in TDD

Excuse #1



“It takes too much time to write the tests"

– The trade-off is not “test now” versus “test later”

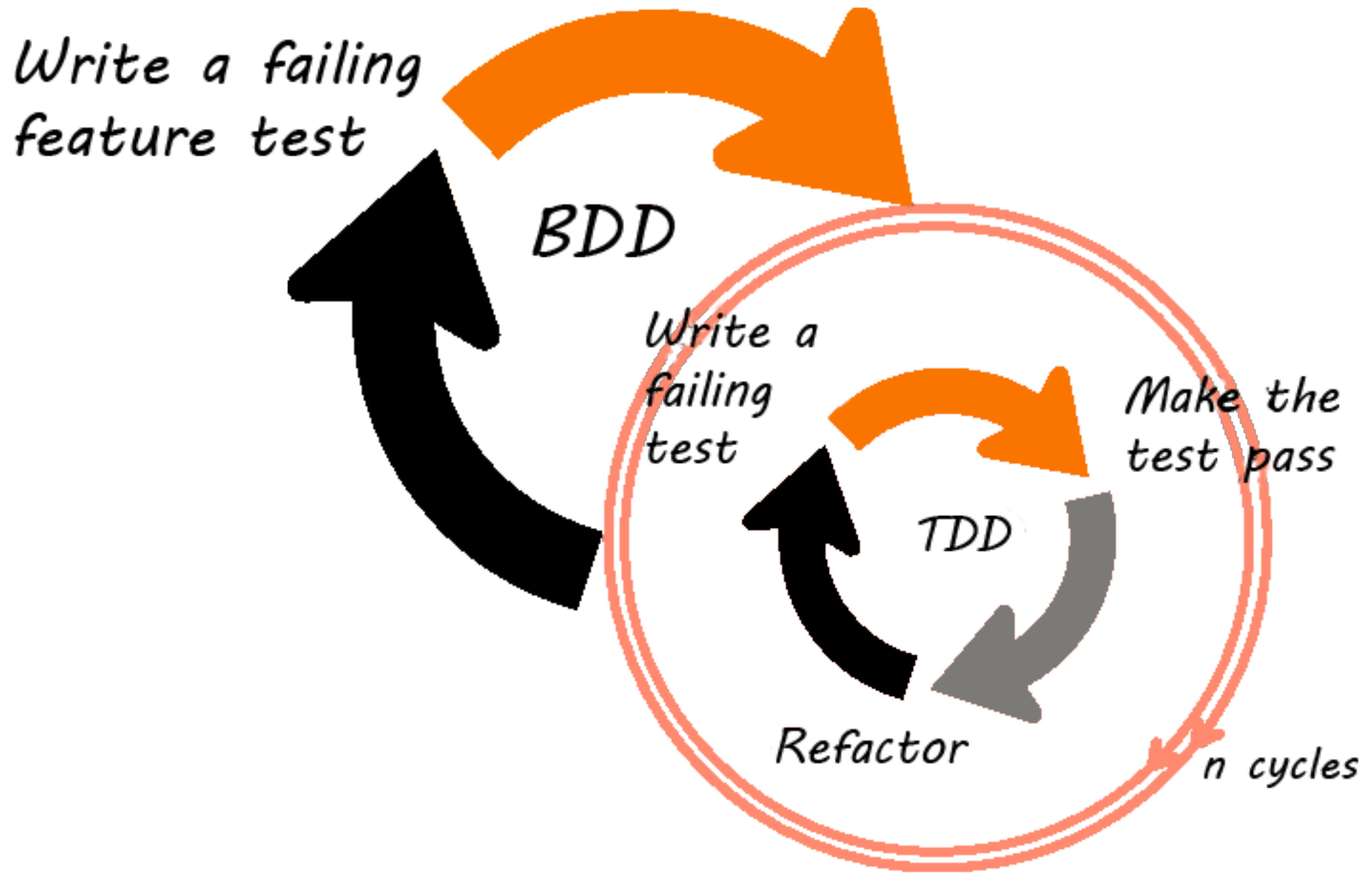
– It's linear work now versus exponential work and complexity trying to fix and rework at the end.

Excuse #2

NO, I DIDN'T GET THE TESTING DONE. THE REQUIREMENTS WERE AMBIGUOUS.
STILL IN BETA

https://www.ca.com/us/products/excuse-free-testing.html

Excuse #2 (contd.)



http://wiki.expertiza.ncsu.edu/index.php/CSC/ECE_517_Fall_2014/ch1b_28_cg

Excuse #3

“It takes too long to run the tests”

Excuse #3

“It takes too long to run the tests”

- Separate out the longer-running tests from the short ones.
- Only run the long tests once a day, or once every few days as appropriate, and run the shorter tests constantly.
- **Your code isn’t finished until you have verified it works!**

Excuse #4

“It's not developers job to test his/her code”

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- Integral part of developer job is to create working code.

Excuse #5

“But it compiles!"

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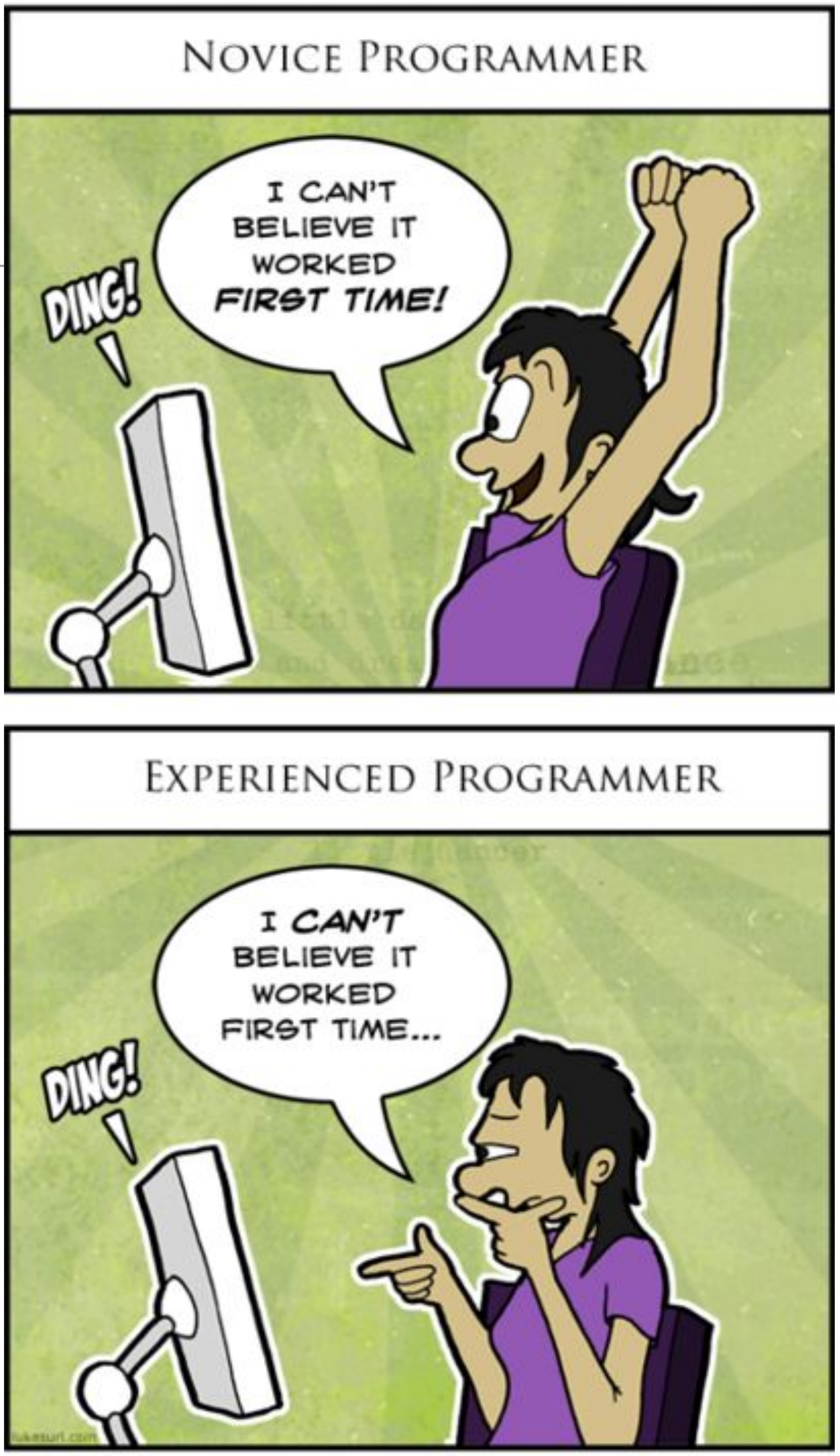
"But it compiles!"

- A compiler's blessing is a pretty shallow compliment.


NOVICE PROGRAMMER
DING!
I CAN'T BELIEVE IT WORKED FIRST TIME!
EXPERIENCED PROGRAMMER
DING!
I CAN'T BELIEVE IT WORKED FIRST TIME...

Excuse #6

“We refactor our code so frequently, that the time we invest in tests just isn't worth it - they are going to change and be irrelevant anyhow"

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“We refactor our code so frequently, that the time we invest in tests just isn't worth it - they are going to change and be irrelevant anyhow“

- How can you be certain you didn’t break anything when refactoring your code?
- Regression testing is one of the number one reasons for doing TDD…good regression tests will, almost immediately, show up un-intended side effects of your code change.
    - A good rule is…NEVER refactor without tests!

http://codesheriff.blogspot.ie/2011/11/excuse-5-frequent-refactoring-excuse.html

Excuse #7

“We are such talented programmers, we don’t need tests"

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Excuse #7

“We are such talented programmers, we don’t need tests“

- *Everyone has bugs in their code…we are human after all!*
- *Ok, even if you are a “bug-free coder”, what about Regression testing in the future by you and other programmers?*

http://codesheriff.blogspot.ie/2011/11/excuse-5-frequent-refactoring-excuse.html