

How Specification by Example and Test-Driven-Development Help to Avoid Technical Debt

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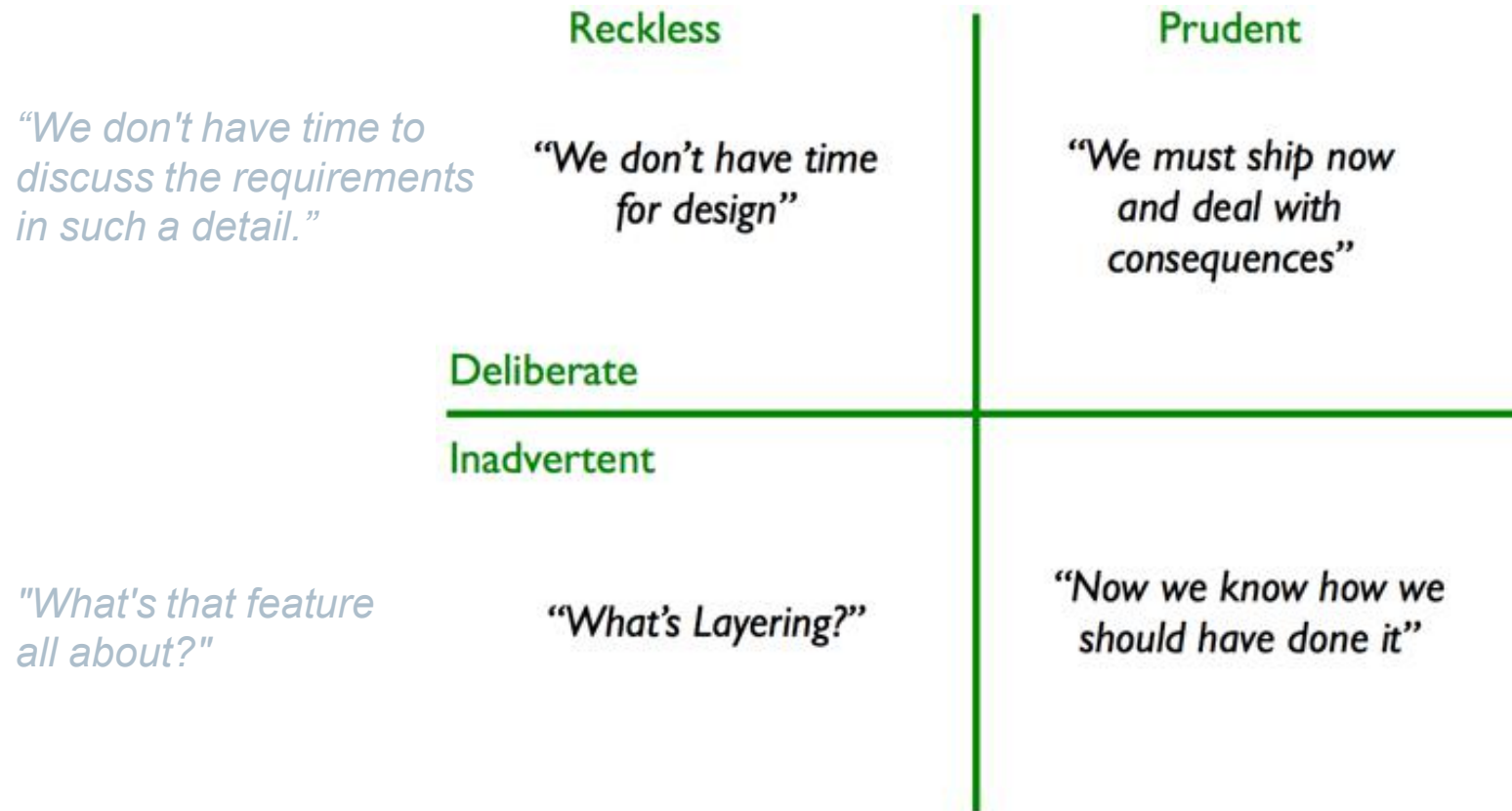
Can we avoid Technical Debt?

NO!

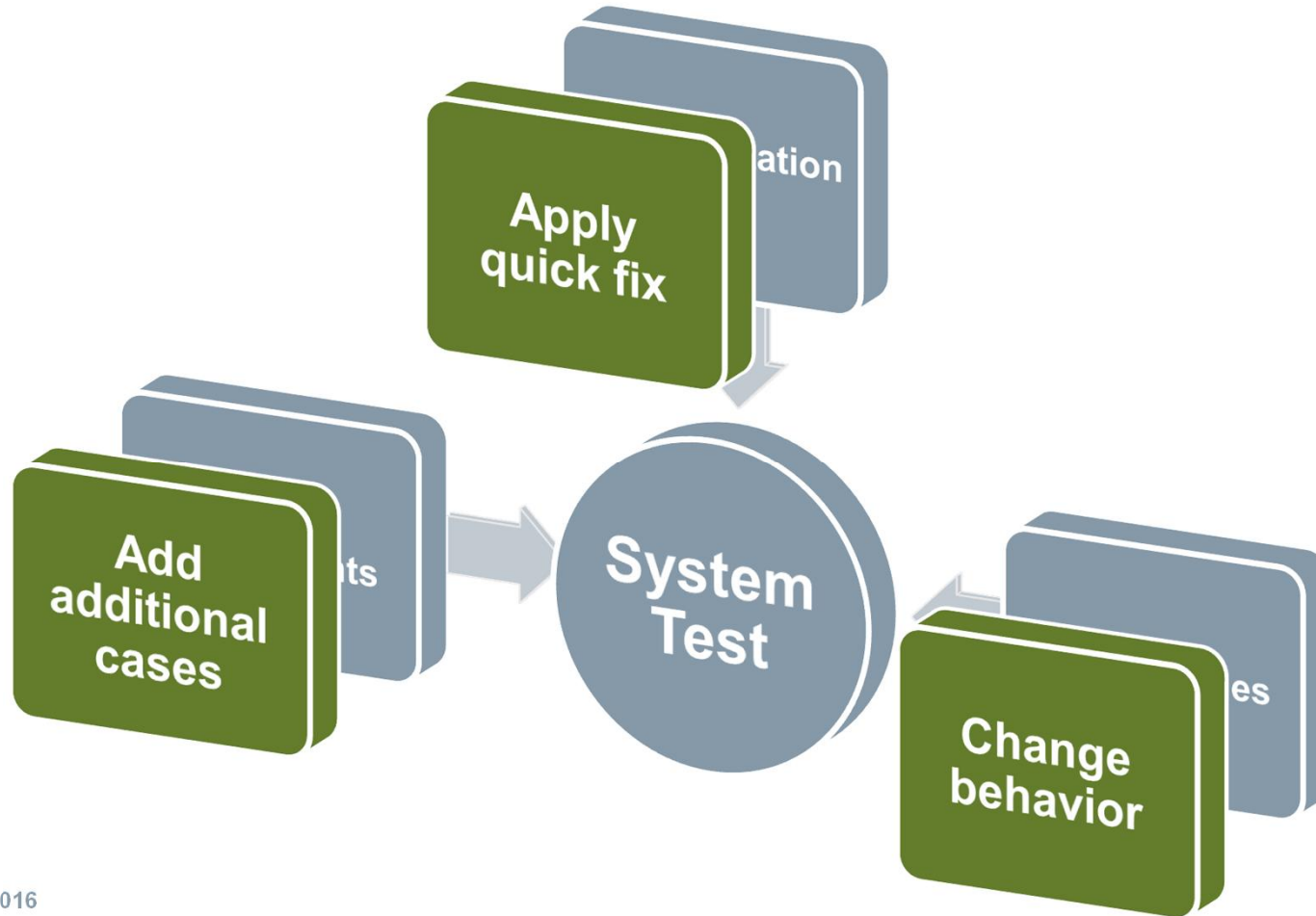
Do we want to avoid Technical Debt?

It depends!

Quadrants of Technical Debt by Martin Fowler



How technical debt is introduced

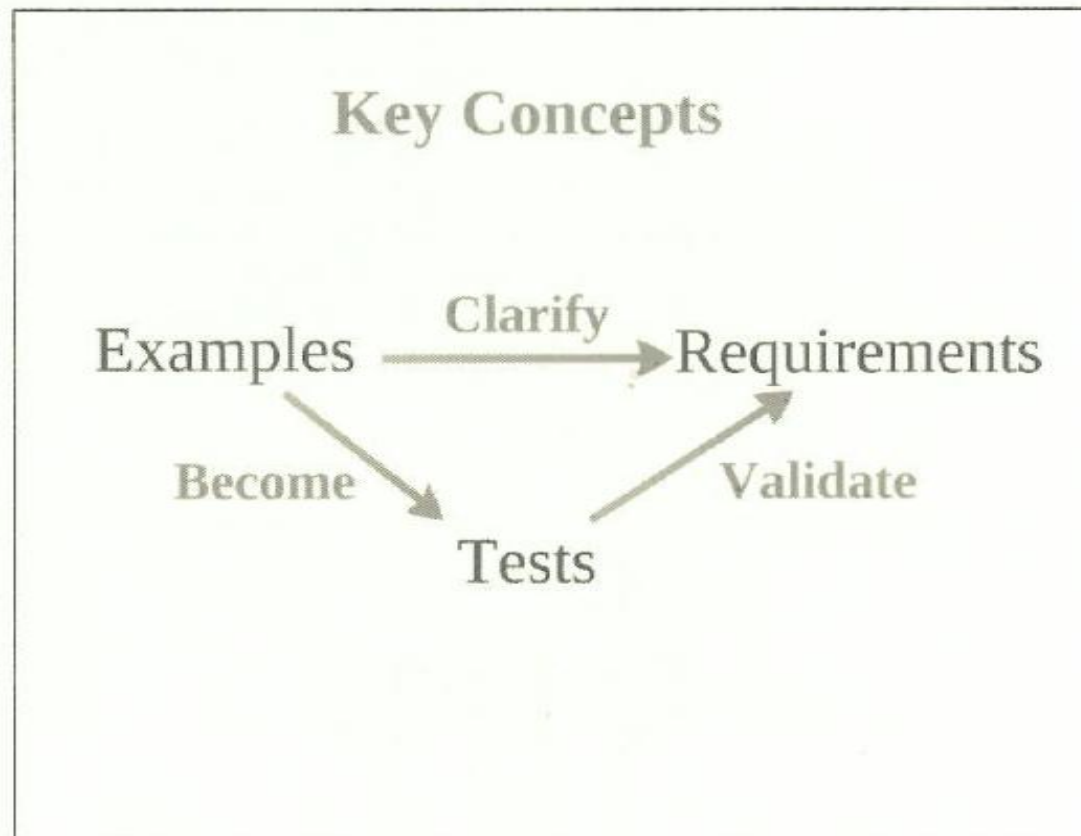


Specification by Example

Acceptance Tests

Unit Tests

Specification by Example



Specification by Example

ENCODING DIRECTIONS IN PATIENT SPACE

A CORONAL S.G. (IN THE SAME VIEW ORIENTATION, UNROTATED)
 SHOWS READOUT IN PATIENT'S RIGHT TO LEFT, PHASE IN PATIENT'S FEET → HEAD.
 THE OTHER ORIENTATIONS CHANGE ACCORDINGLY, SEE TABLE BELOW.

S. G. ORIENTATION	READOUT ENCODING DIRECTION	PHASE ENCODING DIRECTION
CORONAL	RIGHT → LEFT	FEET → HEAD
SAGITTAL	ANTERIOR → POSTERIOR	FEET → HEAD
TRANSVERSE	RIGHT → LEFT	POST → ANT

CORONAL

SAGITTAL

TRANSVERSE

Acceptance Testing with Cucumber

Feature: AddIn wants to load images to the planning and stamp segments

During a scan workflow an AddIn may want to load multiple images to planning or stamp segments. The AddIn can specify a list of images - segment combinations to be loaded into the GSP.

In contrast to the regular image loading functionality, where images are shown as soon as they are loaded, the images requested by the AddIn should all be shown at the same time after all images have been loaded.

To load an image to planning segment (left, middle, right, all) the AddIn has to specify the sopInstanceId and the frame number of the image. When multiple images are to be loaded in the same planning segment the last one defined is actually shown.

To load an image to a stamp segment the seriesUid and the position in the stamp segment has to be defined by the AddIn. The position starts with 0 to load the series as the top most. Position 1 is after the first series. Position -1 appends the series at the end.

Remark:

The default image loading handling into empty segments is specified else where.

Scenario: Add in wants to load images in different segments

Given a GSP with images in *sag,cor,tra* displayed

When the AddIn wants to load the following images

frameset	image index	planning segment
first	1	left
second	2	middle
third	1	right

Then the *left* planning segment shows image 1 of the *first* frameset

And the *middle* planning segment shows image 2 of the *second* frameset

And the *right* planning segment shows image 1 of the *third* frameset

Unit Testing

```
[Test]
public void Handle_ShouldCallApplyChanges()
{
    // Arrange

    // Act
    m_ParameterCardSync.Handle(new ApplyParameterCardEvent());

    // Assert
    m_ApplyCheck.Verify(m => m.ApplyChanges());
}

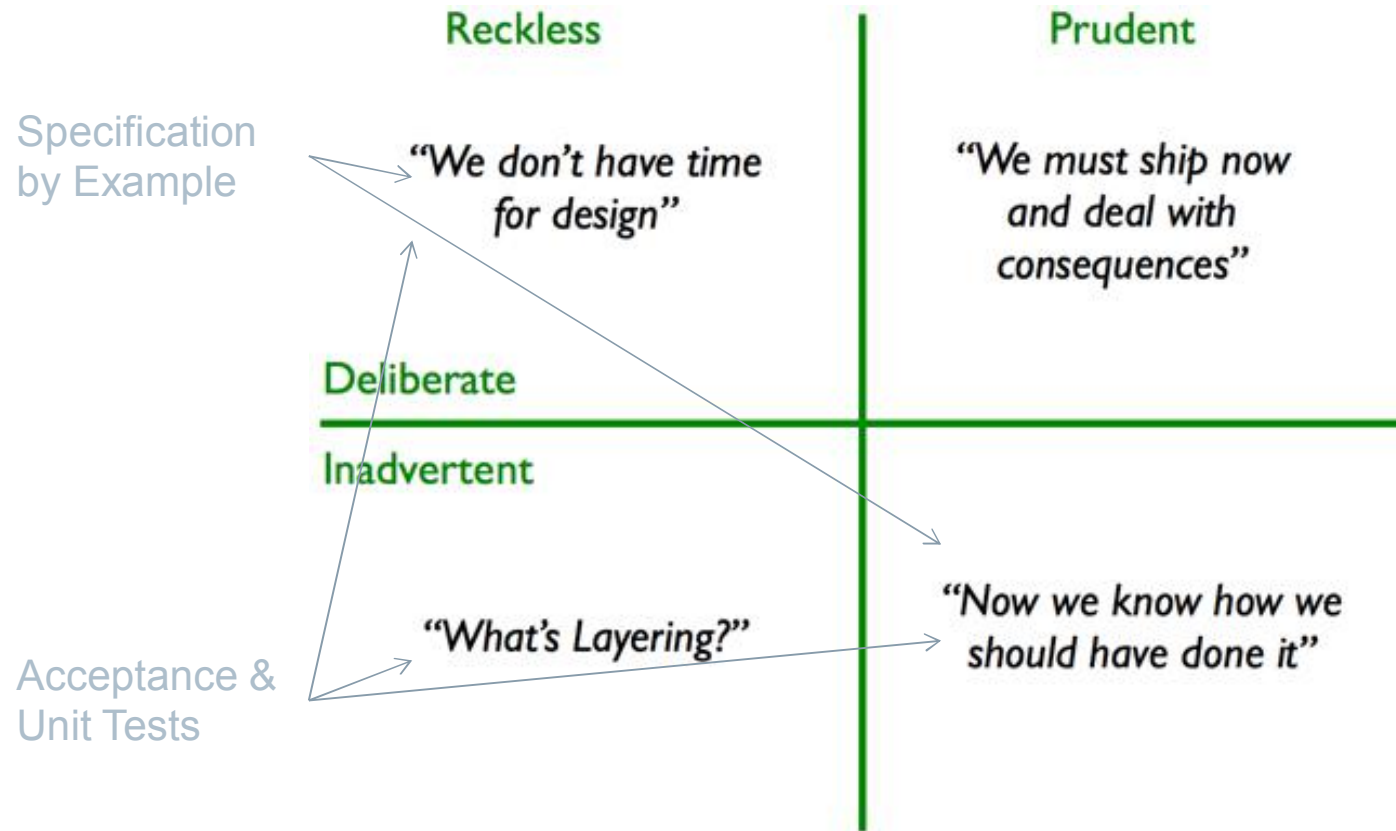
[Test]
public void Handle_ShouldNotCallApplyChanges_WhenApplyFuncIsNull()
{
    // Arrange
    m_ParameterCardSync = new ParameterCardSync(m_EventAggregator.Object, () => null);

    // Act
    m_ParameterCardSync.Handle(new ApplyParameterCardEvent());

    // Assert
    m_ApplyCheck.Verify(m => m.ApplyChanges(), Times.Never);
}
```

15969	✓ 15954	✗ 8	↻ 7	?	0
▶ ✓	📁 AddIn (41 tests)				[0:01.561] Success
▶ ✗	📁 Application (28 tests)				[0:01.425] Failed
▶ ✓	📁 Contract (4203 tests)				[0:13.304] Success
▶ ✓	📁 Implementation (7182 tests)				[2:15.511] Success
▶ ✓	📁 Infrastructure (2283 tests)				[0:17.781] Success
▶ ✓	📁 _Features (2232 tests)				[13:32.638] Success

Addressing the Quadrants of Technical Debt



Defect Rate

Defects / 1k Lines of Code

	In-house Testing	Released Product
Industry Average	15 - 50	
Microsoft Applications	10 – 20	0.5
Cleanroom development	3	0.1

<http://www.mayerdan.com/ruby/2012/11/11/bugs-per-line-of-code-ratio>

In-house testing (not completed yet)

- All reported: 7.42
- Related to our component: 4.64

Up-front
Design



Design

Refactor



Summary

We applied

- Specification by Example
 - Acceptance and extensive Unit Testing
- to avoid technical debt in late phases of the project

Used Defect Rate as performance indicator

Methodology mix worked well for us (very low Defect Rate)

Planning to roll-out on broader scale

Thank you!

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Thank you