Challenges of adopting Behaviour-driven Development (BDD)

Fernando Bernardino
<tony.bernardino@gmail.com>

Advance Programming SG

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Contents

- What is Behaviour-driven Development (BDD)?
- Different approaches to a problem
- Demo
- What are the costs of using BDD?
- What are the impacts of BDD?
What is Behaviour-Driven Development?

Wikipedia:

"(...) behavior-driven development (BDD) is a software development process that (...) combines the general techniques and principles of TDD with ideas from domain-driven design and object-oriented analysis and design. (...) As such it is a natural extension of TDD testing in general."
Who am I?

- Fernando (Tony) Bernardino
- Senior Java Developer at Deontics. Ltd
  - Decision Support in Health
- Main areas of interest:
  - Agile/Lean methodologies
  - Continuous Delivery
Who am I?

As a Student

"Quake" problem
Who am I?

“Quake” Problem

Given a 2D point and a closed 2D shape defined by a set of vertex, determine if the point is contained inside the shape.
Who am I? v1.0

“Quake” Solution

- 20 lines of code
- High performance
- Highly optimized
Who am I? v1.0

Problems:

- No one understood it, not even me after a while
- No use
- No value
Who am I? v2.0

Worry about readability

👍 Documentation
👍 Comments
👍 Structure
👍 Aesthetic
Who am I? v2.0

“Quake” solution

/*
Drawing an ascending vertical line starting at the point, count the number of times it intercepts the limits of the shape. Pair means it is OUT, odd means it is IN. ...
*/
Who am I? v2.0

Problems

- Over documenting
- Easy to get out-of-date
- Hard to change
- Over-engineering
- Code ownership
Who am I? v3.0

Test-driven Development (TDD)

- Test-first development
- Red, Green, Refactor
- Almost 100% code coverage
- Less bugs pass the development phase
Who am I? v3.0

“Quake” Solution

● Tests
  ○ isIn_nullArray_throwException
  ○ isIn_emptyArray_throwException
  ○ isIn_1PointArray_throwException
  ○ isIn_2PointArray_throwException
  ○ …
Who am I? v3.0

Problems

- Low level (isIn?! array?! null?!)
- Focus on little details
- Too much input checking
Who am I? v3.0

“Quake” Solution - corner case tests

[Diagram of two situations]
Who am I? v3.0

What if algorithm changes?
Who am I? v4.0

Behavior-driven Development

- Test behavior, not code
- Higher level of abstraction
- More focused on value
- Tests break less
- User friendly
Who am I? v4.0

“Quake” solution - Gherkin

Given a 2D shape When a contained point is passed Then it returns IN

Given a 2D shape When a NOT contained point is passed Then it returns OUT

Given a 2D shape When a point matching limits Then it returns LIMIT

... 

شعار .. a NORMAL user does not understand it ...
Who am I? v4.0

“Quake” solution - Gherkin revisited

Given an enemy When I fire and hit him/her Then the enemy dies

Given an enemy When I fire and miss him/her Then the enemy stays alive

Given an enemy When I fire and scrape him/her Then the enemy starts bleeding
Demo!
Problem

When a new user is registered in the system, how does the password get chosen?

Avoid passing password over email.

Ideally the user should be pick it.
Demo!

Architecture

User ➔ Standalone ➔ 3rd Party ➔ Content Management

Admin User
When a user is created, it should be possible to provide her/him a location where the password can be changed without knowing any previous password.
Demo!

In practical terms:

1. Create user with “Change Password” request
2. 3rd Party is requested to send “Change Password” email
3. 3rd Party sends email to user
Demo!

User Acceptance criteria - Gherkin

Given John in not a registered user

And John should pick his own password

When an Admin user registers John

Then the user for John gets created

And a “Change Password” email is sent to him
Demo!

Level of tests in the demo:

- User acceptance - Gherkin
- Integration (modules)
- Unit (class)
Demo!

Acceptance & Integration & Unit tests

- Cascading implementation
Demo!

Implement (User) Acceptance test (UAT):

- Create 3rd party mocks
- Implement steps (lines)
- Refactor test code
- **Test passed (?!?!?)**
- Make it fail
- 0 lines of production code
Demo!

“BDDing” Integration IT and Unit UT tests

When I create a User with a password change request

Then the user is created

And the request is sent

createUser_withChangePasswordRequest_userCreatedAndRequestIsSent IT
Demo!

Acceptance & Integration & Unit tests

- Behaviour testing overlap

\[ \text{UAT} \cap \text{IT} \cap \text{UT} \neq 0 \]
Demo!

- Refactor: createUser\_withoutChangePasswordRequest\_userIsCreated (renamed)
  - Passing!
- New: createUser\_withChangePasswordRequest\_userCreatedAndRequestIsSent
  - Failing!
  - Refactor “request”
  - Fix tests
  - Fix production code
  - Other tests passing!
createUser_validUserCreation_200OkReturned
(already exists)
Demo!

- **Controller (Spring MVC)**
  - `createUser(User)`

- **Service**
  - `createUser(User)`

**NEW:** `createUser_withChangePasswordRequest_3rdPartyRequestIsSent`

New method in 3rd Party API Interface - `postChangePasswordRequest`

**API Interface**

- `postChangePasswordRequest(email)`
Demo!

Controller (Spring MVC)
createUser(User)

Service
createUser(User)

API Interface
postChangePasswordRequest(email)

postChangePasswordRequest_emptyEmailProvided_generatesInvalidEmailError ?
postChangePasswordRequest_nullEmailProvided_generatesInvalidEmailError ?

postChangePasswordRequest_3rdPartyRespondsSuccess_returnSuccess UT

postChangePasswordRequest_validEmailProvided_returnSuccess ? Implicit
Demo!

Finished implementing first round!

Not always ...
Demo!

Second round

- **Refactor:** `createUser_withoutChangePasswordRequest_userIsCreated` *(renamed)*
- **New:** `createUser_withChangePasswordRequest_userCreatedAndRequestIsSent`
  - Passing!
- **New:** `createUser_3rdPartyChangePasswordRequestReturnsNotFound_notFoundReturned`
  - Failing!
Demo!

Done!

But wait, there is more ...
What are the costs of BDD?

Quantitative analysis of Demo:

<table>
<thead>
<tr>
<th>Code scope</th>
<th>New and changed lines</th>
<th>%</th>
</tr>
</thead>
<tbody>
<tr>
<td>Production</td>
<td>57</td>
<td>&lt;12%</td>
</tr>
<tr>
<td>Testing</td>
<td>446</td>
<td>&gt;85%</td>
</tr>
</tbody>
</table>
What are the costs of BDD?

Superficial analysis of Demo results:

- More code (80+%)
  - more time
  - more complexity
  - no added feature
  - more bugs (on development!)
What are the costs of BDD?

Management analysis of Demo results:

You told me 80% of the features (with big design first) were never used. Now you are writing 80%+ more code, code you already know will never be used?!
What are the impacts of BDD?

As a developer

Before

VS

After

customer

QA

Developer

Architect

Designer
What are the impacts of BDD?

As a company - Before
What are the impacts of BDD?

As a company - Before

- QA
- MANAGEMENT
- DEV
- SALES
- DB ADMIN
- SYS ADMIN
What are the impacts of BDD?

As a company - After

TEAM

- Developer
- QA
- UI Designer
- Stakeholder
- Scrum Master
Conclusion

What are the challenges of adopting Behaviour-driven development?

Us - People

○ Change is hard
○ Learning curve (£££)
○ Benefits hard to quantify
○ Costs easy to quantify
Related ...

- Coverage
  - 100%
  - 0%

- Unit tests
- Integration tests
- Acceptance tests

- Value
  - less
  - more

- Cost
  - less
  - more

- Fragile
  - more
  - less
Related ...

We are just covering simple coding! Some much more is out there...

What version are you?
5. "User Stories Applied: For Agile Software Development", Mike Cohn, Addison-Wesley Professional, 2004
7. “Defect-Driven Process Improvement”,
   http://www.neverletdown.net/2014/10/defect-driven-process-improvement.html