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Agile Testing Challenges

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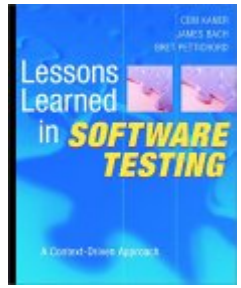
Agenda

- What is Agile Development?
- Challenges for Testers
- Strategies for Dealing with Them
- Agile Testing Tools

Context-Driven Testing Principles

- The value of a practice **depends on context.**
- Practices may be good in context, but there are **no best practices.**
- **People**, working together, are the most important part of any project's context.
- Projects unfold are **often not predictable.**
- The product is a solution. If the problem isn't solved, the product doesn't work.
- Good software testing is a **challenging intellectual process.**
- Only through **judgment and skill**, exercised cooperatively throughout the entire project, are we able to do the right things at the right times to effectively test our products.



*Context-driven testing is biased towards **rapid feedback and adaptability***

www.context-driven-testing.com

What is Agile Development?

- Incremental, Iterative, Adaptive
  - Incremental
    - *Build a system gradually*
    - *See the system grow*
    - *Demonstrating progress*
  - Iterative
    - *Multiple releases or check points during a project, each closer to the target*
    - *Iterations include requirements development and testing*
    - *Typical iterations are two weeks long*
    - *Plan as you go*
  - Adaptive
    - *Goals change based on lessons from prior iterations, feedback and business opportunities*

What is Agile Development?

- Regularly delivers business value
  - Work broken down into “stories”
    - *Sometimes called features or use-cases*
  - Consists of multiple tasks, often assigned to different programmers
  - Has defined acceptance criteria
  - Not done until the unit *and* acceptance tests pass

What is Agile Development?

- Collaborative
  - Pairing, with changing pairs
  - Avoids specialized knowledge
  - Team code ownership (optimistic locking)
- No Backsliding
  - Continuous Integration
  - Unit Testing (usually using test-driven development)
  - Constant regression testing

The Old Strategies Won't Work

- Detailed test planning
  - Not enough time
  - Too many changes
- Dedicating a phase for testing
  - You don't get to define entry and exit criteria
  - Iterations will move on without you
- Change control
  - Changes are now commonplace
- Being in a position of authority
  - You need to learn how to express concerns without really being able to judge software correctness authoritatively

What are Testers Good for Anyway?

- In business, any worthwhile function either provides products or services.
- What product or service does testing provide?
- “Tested, Debugged Software” – Wrong Answer

Testing provides
information about
the status of software under development
to inform decisions.

Challenge: Are Testers Obsolete?

- **With developers doing unit testing, do we still need to have "QA" testers?**
- Some teams have fired testers when adopting agile. They have then regretted this.
- Testing may be done by people who aren't called "QA" or "Tester": e.g. Business Analysts.
- Some teams are using developers for acceptance testing.
- Dedicated testers bring two benefits:
  - Focus on customer usage over technical implementation
  - Focus on uncovering flaws over confirming completeness

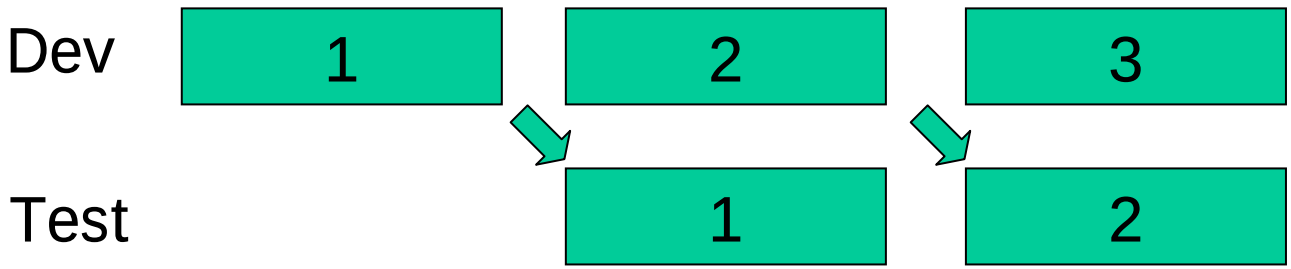
Challenge: Testing Half-Baked Code

- **With frequent iterations delivered to testing, how can testers test incomplete code?**
- Stories must be defined in terms of business value.
- Stories should not span iterations.
- Good story definition is difficult to do.
- Clumsy story definition often impacts testers more than developers.
- Testers may need to help with story definition (i.e. become analysts).
  - Don’t “test” the stories, just help get them right.
- There will always be gaps.
  - Testers need to learn and adapt as they find them.

Challenge: Aren't Story Acceptance Tests Simplistic?

- **How can it be good testing if your acceptance tests are only verifying that a story is complete? Isn't this happy-path testing?**
- Each iteration requires additional tests other than those that simply focus on accepting completion of a story.

Iteration Testing



At the end of an iteration, promote code for further testing:

- Exploratory Testing
  - Learn, plan and execute at once
  - Look for bugs, missing features and opportunities for improvement
- Combination/Interaction Testing
  - Focus on interactions between features
- Scenario Testing
  - Use real-world scenarios that exercise multiple stories
- Endurance Testing
  - Execute software over long periods of time
- Business Cycle Testing
  - Execute scenarios based on end-of-day, end-of-month, end-of-quarter and other business cycles
- Load Testing
  - Replicate a full load on the system

Challenge: Getting Testers to be Part of the Team

- **How can we get testers to be part of a team? Doesn't this force them to sacrifice their integrity?**
- Testers have been an oppressed group and have often stuck together to provide mutual support.
- It's time to let go of this.
- Testers should co-locate with developers and analysts.
- Agile only works when there is lots of both formal and informal communication within a team.

Challenge: When is Testing Done?

- **Without the time devoted to complete testing, how do we know when testing is done?**
- Useful testing addresses important product risks.
- Agile testers need to be able to justify tests in terms of risk.
- What risks would these tests inform?
- Ultimately testing must be prioritized just like stories.
- Bug metrics also provide an indicator of completeness.
- A good tester is never done.

Pairing Testers with Developers

- Why?
  - Developers gain insight into potential errors
  - Testers gain insight into constraints and opportunities
  - Together can succeed with automated testing
- Automate Acceptance Testing
  - Write acceptance tests using the same programming environment used for development
  - Reuse unit testing frameworks
  - Make the software more testable
- Facilitate Grey Box Testing
  - Understand relationships between parts of the system
  - Analyze impact of changes
    - *What needs retesting?*
    - *What can be left alone?*
  - Understand bugs
    - *What were the root causes?*
    - *Where did the problems surface?*
  - Understand risk
    - *Develop test strategy that targets risk*
    - *Justify and articulate testing objectives*
- Learn to diagnose bugs
  - Identify source of errors

Pairing Testers with Analysts

- Why?
  - Testers need to understand the business
  - There are always hidden requirements
  - Analysts need to understand how to test their requirements
  - Involve testers earlier
- Defining requirements is difficult
  - Often harder to specify requirements than design
  - Easy to become out of date
- Specify by Example
  - Defining them by example is incremental, easier and more concrete
- Acceptance tests...
  - Ground concepts
  - Define goals and expectations
  - Demonstrate progress
  - Drive development
- Good acceptance tests are:
  - Clear – so any one can understand
  - Specific – so it can be executed

Challenge: Don't We Need Bug Tracking?

- **Some have declared that agile teams shouldn't track bugs and just fix them as soon as they are found.**
- This works well when you are testing in Dev.
- When you are testing a completed iteration in a Test environment, you'll need to track bugs because you won't see fixes for a while (even if they are fixed right away).
- Ideally, bugs will be fixed right away, but some may be deferred.
- Ultimately, bugs can be prioritized with stories.

Challenge: Collecting Useful Metrics

- **What are useful quality metrics for agile projects?**
- One of the best quality metrics is the number of bugs that escape development and are found after deployment. Unfortunately, this is a trailing indicator.
- Counting “escapes” by iteration can give a leading indicator of how good the code is.
- We can also learn from bugs in other ways:
  - Are there unit tests to catch the kinds of problems that are being found by acceptance tests? Add them.
  - Can we make bugs easier to find and diagnose?
  - Can we make it so that programmers are less likely to make common mistakes?

Challenge: Regression Testing

- **With frequent iterations, we need to retest often. And unit tests aren't enough. How do we get effective user-level regression tests?**
- You don't necessarily need to do a full regression test with each iteration. You may run parts in each iteration cycling through.
- But you'll still need some level of automated user-level regression tests.

Challenge: Regression Test Tools

- Most commercial test tools work poorly in an agile environment. Most have these flaws:
  - Vendor-specific languages (vendorscripts)
  - Poor integration with source control
  - Hard to use with continuous integration
  - Impractical to install on every workstation
- These problems make them impractical for use by the team as a whole.
- Agile teams are building their own test tools and releasing many of them as open-source…

Problems with Commercial Test Tools

- Proprietary Scripting Languages
  - *Winrunner (TSL), SilkTest (4test), Robot (Test Basic)*
  - *http://www.stickyminds.com/se/S2326.asp*
  - But newer tools are now using standard languages
    - *Astra QuickTest (VB Script), XDE Tester (Java),*
- Incompatibility with Source Control
  - Temporary files and directories (WinRunner)
    - *http://paulhammant.com/blog/000245.html*
  - Key information stored in repositories (Rational)
- Lack of External Calling API's
  - They refuse to allow themselves to be used as a library.
  - Generally, you can only launch complete scripts with limited access to results information.
  - Therefore difficult to integrate with Continuous Integration
  - Some new low-cost and shareware tools are exceptions
    - *E.g. TestComplete*
- Restrictive and Expensive Licensing
  - Developers can't run test suites.

These "features" encourage vendor-lock and frustrate serious programming

- Open-Source Tools almost always avoid these shortcomings.

Open-Source Tools for Acceptance Testing

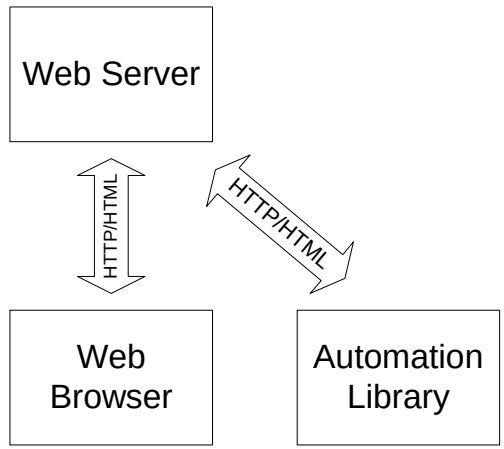
- Many tools for Windows, Java and Web GUIs
- Today we'll focus on the Web
  - HttpUnit and Other Protocol Drivers
  - WTR and other COM/DOM Drivers

Web Protocol Drivers for Functional Testing

	Tool	Tests
HttpUnit, popular http://www.httpunit.org/	Java	Java
jWebUnit, extends HttpUnit and Fit, http://jwebunit.sourceforge.net	Java	Java & HTML
Canoo WebTest, extends HttpUnit http://webtest.canoo.com	Java	XML
HtmlUnit, similar to HttpUnit http://htmlunit.sourceforge.net/	Java	Java
libwww-perl, general tool, e.g. spiders http://ftp.ics.uci.edu/pub/websoft/libwww-perl/	Perl	Perl
WebUnit, based on HttpUnit http://www.xpenguin.biz/download/webunit/index-en.html	Ruby	Ruby
Puffin http://www.puffinhome.org/	Python	XML
WebInject http://www.webinject.org/index.html	Perl	XML

Web Protocol Drivers

- A very popular category
- Some use parsers to support data-driven test formats
  - XML, HTML
- Some support embedded scripting languages
  - Namely embedding Jython in Java
- Focus varies between functional and load testing
  - Functional tools tend to offer better browser simulation
  - Load tools tend to offer better support for concurrent testing
  - But most can do some of either
- Some support many protocols
  - Including ones not supported by browsers
  - E.g. SOAP



HttpUnit Example

```
public void testLoginSuccess() throws Exception {
    WebConversation conversation = new WebConversation();
    String url = "http://localhost:8080/shopping/shop“;
    WebResponse response = conversation.getResponse(url);
    assertEquals(“Login”, response.getTitle());

    WebForm form = response.getFormWithName("loginForm");
    WebRequest loginRequest = form.getRequest();
    loginRequest.setParameter("user", “mike”);
    loginRequest.setParameter("pass", “abracadabra”);
    response = conversation.getResponse(loginRequest);
    assertEquals(“Product Catalog”, response.getTitle());
}
```

Example Courtesy of Mike Clark

Canoo WebTest Example

```
<project name=“ShoppingCartTests" default=“main”>
   <target name="main">
      <testSpec name=“loginSuccessTest">
         <config host="localhost“ port=“8080“
            protocol="http“ basepath=“shopping” />
         <steps>
            <invoke url=“shop" />
            <verifytitle text="Login" />
            <setinputfield name="user“ value="mike" />
            <setinputfield name="pass“ value=“abracadabra" />
            <clickbutton label="Login" />
            <verifytitle text=“Product Catalog" />
         </steps>
      </testSpec>
   </target>
</project>
```

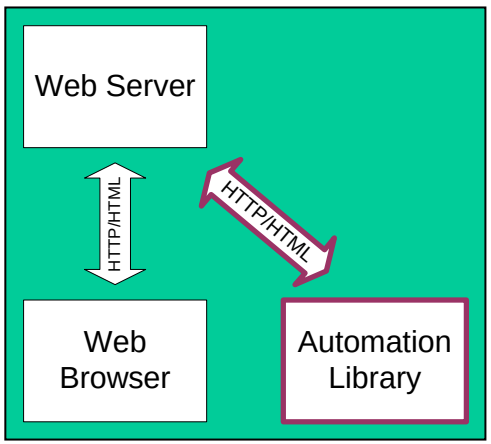
Example Courtesy of Mike Clark

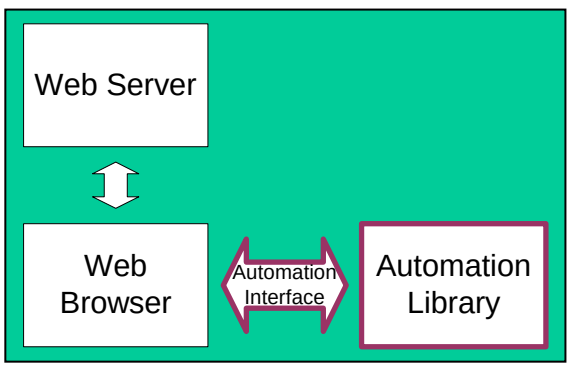
Load Testing Tools (Protocol Drivers)

- JMeter
  - Java-based tool.
  - Supports HTTP, HTTPS, SOAP, XML-RPC, JDBC, LDAP
  - Allows multiple machines to generate load.
  - http://jakarta.apache.org/jmeter/
- Grinder
  - Java-based tool. New version supports Python test scripts.
  - Supports HTTP, HTTPS, SOAP, XML-RPC, JDBC, IIOP, RMI/IIOP, RMI/JRMP, JMS, POP3, SMTP, FTP, LDAP
  - Allows multiple machines to generate load.
  - http://grinder.sourceforge.net/
- TestMaker
  - Python test scripts, Java-based tool.
  - Supports HTTP, HTTPS, SOAP, XML-RPC, SMTP, POP3, IMAP
  - Only one machine can be used to generate load.
  - http://pushtotest.com
- OpenSTA
  - C++/Corba based tool. Tests are in SCL, a vendorscript!
  - Supports HTTP, HTTPS
  - http://opensta.org/

All of these include recorders!

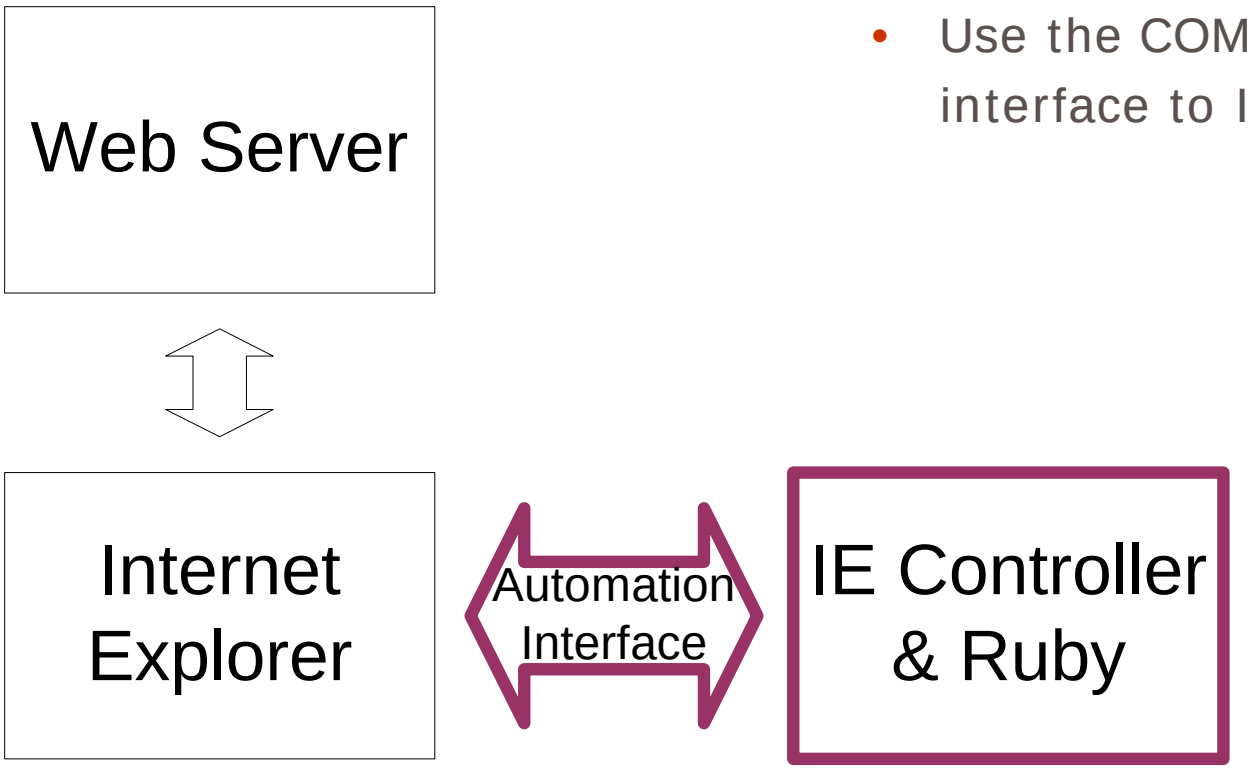
Web Interface Drivers





- How do your tests access the product server?
  - Simulation (Protocol Drivers)
    - *Access the server in the same way as a browser would.*
  - Automation (Browser Drivers)
    - *Drive the browser using automation interfaces.*

Browser Automation



- Use the COM Automation interface to Internet Explorer

Tests drive the browser

DOM

- “Document Object Model”
- A non-proprietary standard for representing elements of a web page.
- Often used by client-side JavaScript.
- Supported by IE and Netscape and other browsers.
- IE provides access to the DOM via COM Automation.

Web Testing with Ruby

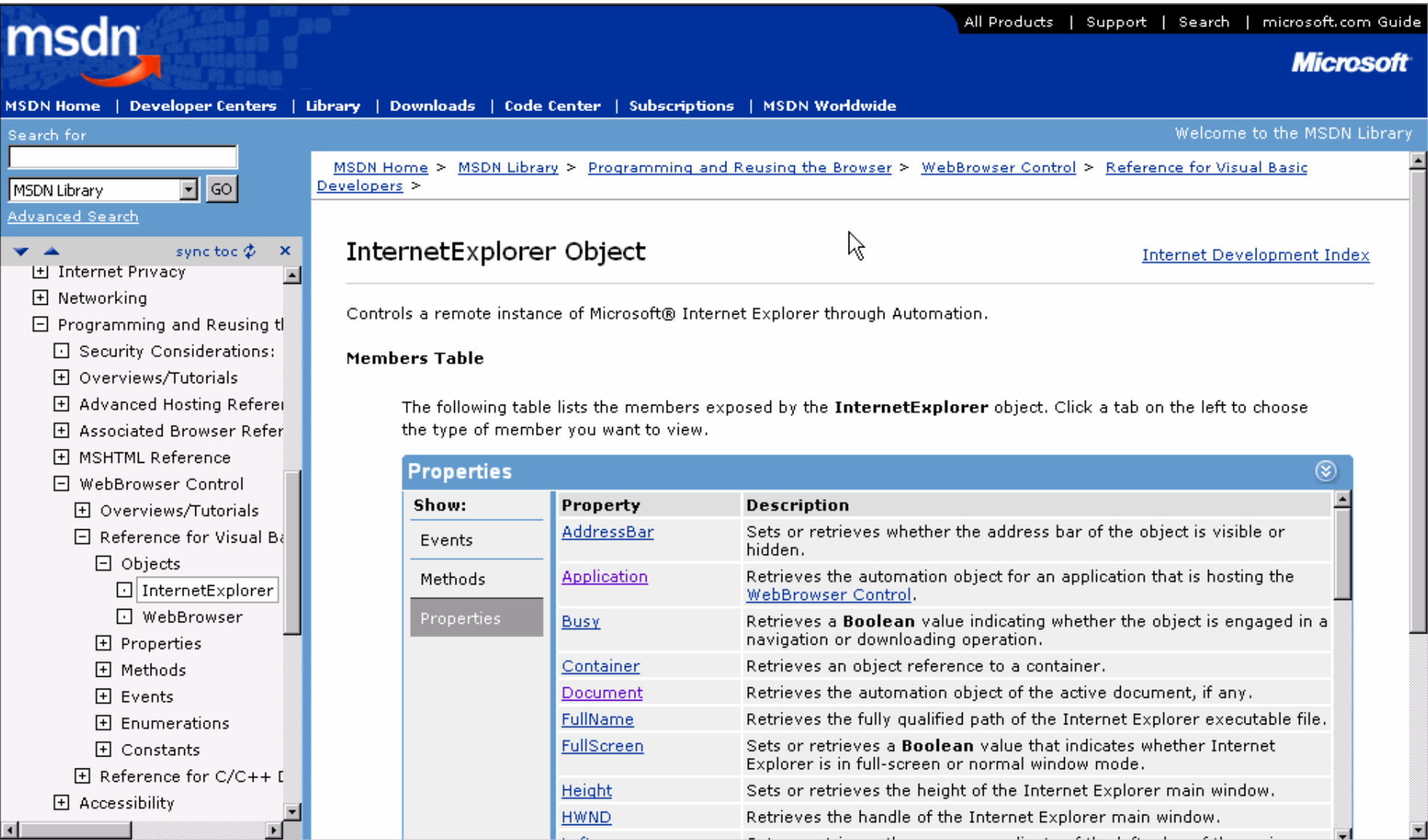
- Three related implementations of Ruby-based libraries that drive IE's COM/DOM interface.
  - Chris Morris – original
  - Bret Pettichord – modifies Chris's
  - Paul Rogers – more different
- WATIR is a sub-project that aims to get the best of each
  - Bret Pettichord & Paul Rogers
- Wiki
  - http://www.clabs.org/wtr/
- Mailing List
  - http://rubyforge.org/projects/wtr/

COM/DOM Automation

- Any decent language can call Internet Explorer's COM Automation interface.
- Numerous people have built project-specific test tools to drive the COM/DOM interface.
  - Visual Basic
  - Python
  - Perl (See samie.sf.net)
  - C#

IE Automation Reference

http://msdn.microsoft.com/workshop/browser/webbrowser/reference/Objects/InternetExplorer.asp



Open-Source Test Tools from ThoughtWorks

Dashboard
http://dashboard.sourceforge.net/
hloader
http://hloader.sourceforge.net/
jfcUnit
http://jfcunit.sourceforge.net/
MockMaker
http://mockmaker.sourceforge.net/
NMock
http://opensource.thoughtworks.com/projects/nmock.jsp
Marathon
http://marathonman.sourceforge.net/
Marathon.NET
http://marathonnet.sourceforge.net/
PyUnit
http://opensource.thoughtworks.com/projects/pyunit.jsp
SelfEsteem
http://selfesteem.sourceforge.net/
XMLUnit
http://xmlunit.sourceforge.net/

Test Automation in the Silo

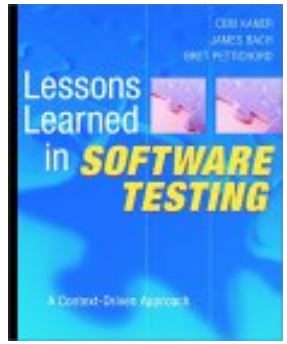
- Traditionally test automators have worked in a separate space from developers
  - The code is separate
  - The teams are separate
  - *Ex post facto* GUI automation
- Reasons for change
  - Tool/application compatibility (testability)
  - Maintenance when GUI changes
  - Testing needs to be everyone's concern

You can change whether you are are using Agile or not!

Further Study

Context-Driven Testing

- *Lessons Learned in Software Testing: A Context-Driven Approach*
  - Cem Kaner, James Bach & Bret Pettichord
- Mailing List
  - http://groups.yahoo.com/group/software-testing/
- Wiki
  - http://www.context-driven-testing.com/wiki/



Agile Testing

- Agile Testing Papers
  - http://www.testing.com/agile
- "Where are the Testers in XP?"
  - http://www.stickyminds.com/s.asp?F=S6217_COL_2
- Mailing List
  - http://groups.yahoo.com/group/agile-testing/

Open Source Test Tools

- Home Brew Test Automation
  - http://www.io.com/~wazmo/papers/homebrew_test_automation_200311.pdf