

Browser Compatibility Testing Using Manual Testing Methods and Test Tools

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Abstract — With new version of Internet Explorer browser launched by Microsoft® very frequently, we tried to find out what browser compatibility issues a web site faces when being rendered on the latest version of Internet Explorer. We designed a framework that helps a software tester to quickly test the web site against potential browser compatibility issues using manual testing methods as well as through automated browser compatibility tools that are open-source and available in the market free-of-cost.

Another challenge that was considered during framework design was to make sure that it supports testing of both static and dynamic pages website. The study proves that the designed framework helps quick-finding of browser compatibility issues in a website (when rendered on Internet Explorer browser) through simplified methods.

Keywords- *Browser Compatibility; Web Compatibility; Browser Compatibility manual testing methods; Browser Compatibility automated testing methods*

I. INTRODUCTION

With the launch of Internet Explorer Version 11 in the market by Microsoft® Corporation [1], organizations that are willing to upgrade from their existing Internet Explorer version are left with a critical decision as to whether upgrade their existing operating systems to Microsoft Windows® 7 or not. Since Internet Explorer Version 11 supports Microsoft Windows® 7 onwards [2] therefore any operating system below it, will not be supported by Internet Explorer version 11. E.g. Windows XP

Other-way-round, the great restriction with Windows® 7 in terms of browser is that their popular IE6 browser version is incompatible with Windows® 7 platform [3]. One needs to have IE8 or IE11 on Windows® 7 platform to have seamless browsing experience. For a large business the decision to switch to another windows® platform is not going to be an easy job. The decision needs to be taken with great care as it involves huge business impact. For Information Technology

(IT) Services organizations, there are other factors as well that needs to be considered carefully before deciding for switch-over, like support for application development & testing, IT support and so on.

Now coming back to Windows® 7, the platform is built on top of Windows® Vista kernel and is different from Win XP underlying architecture. The result is that the desktop applications once built for Windows® XP environment will no longer be good for Windows® 7 platform. Either the applications will not work on Windows® 7 platform or have major issues during migration to Windows® 7 platforms. Similarly the web applications that once developed to be rendered in IE6 browser will have rendering issues with IE11 browser.

The latest version of Internet Explorer (IE11) is completely different from previous versions of Internet Explorer internally in terms of coding and handling of features and is freshly designed. Hence the “Internet Explorer” inheritance is no longer preserved. The impact is clear; organizations will have to think in terms of hundreds of applications that needs migration to this new combination of Windows® 7 and IE11 browser. The applications could be desktop applications (thick client), Web applications (thin client) or installers.

The goal of our work in this paper is to identify common set of browser compatibility issues in different versions of Internet Explorer. Design browser compatibility framework as ready-reckoner for software testers. Finally design a browser compatibility reporting template to report web application compatibility.

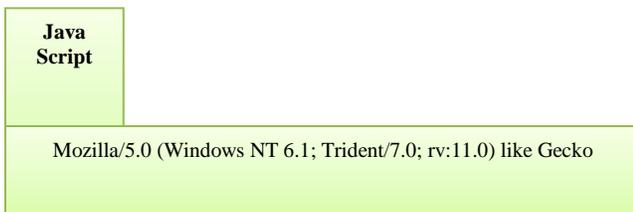
II. BROWSER COMPATIBILITY ISSUES IN INTERNET EXPLORER

Let's now talk about browser compatibility issues a web site faces when being loaded onto Internet Explorer version 11 and then move onto other general web compatibility issues faced over previous versions of Internet explorer. *When we think about web application migration to IE11 environment from legacy environment, there is a list of issues available on various blogs and also released by Microsoft®. These issues are in the form of HTML code level implementation which once valid for previous Internet Explorer versions; is now no longer be supported for IE11 browser.*

- **User-agent string changes [4]**

One of the visible updates in IE11 is user-agent string as compared to previous versions of Internet Explorer that affects websites. Example of user-agent string reported on Win 7 - IE11 system configuration is as depicted in Fig 1.

Fig 1: User-agent string for Win7 – IE11



The following differences are observed in the string when compared to the earlier versions of Internet Explorer [4]:

- The compatible ("compatible") and browser ("MSIE") tokens have been removed.
- The "like Gecko" token has been added (for consistency with other browsers).
- The version of the browser is now reported by a new revision ("rv") token.

There have been issues (web compatibility) when a user opens an IE11 on the supported operating system machine however gets a warning of unsupported browser. This user-agent string changes avoid the situation of IE11 being identified as incorrect browser or previous version of browser. The web sites that were developed keeping previous versions of internet explorer in mind may face browser compatibility issue with IE11.

- **Document mode changes [4]**

From Internet Explorer Version 8 onwards, a new feature was introduced – "Document mode". This helps transition from features supported by previous versions of Internet Explorer to those specified by modern standards. There are websites that still uses the older features implemented

during website creation. These web sites were not upgraded along with the Internet Explorer version upgrades. Starting with IE11, document modes are deprecated and will no longer be used, except on a temporary basis. The older web sites that implemented older features rendered fine in Internet Explorer versions prior to version 11 introduced. However would not work as per the expectation in IE11. Starting with IE11, edge mode is the preferred document mode; it represents the highest support for modern standards available to the browser [4]. HTML5 document type declaration to enable edge mode is to be used as shown in the below Fig 2:

Fig 2: HTML5 document type declaration



- **Legacy API additions, changes, and removals [4]**

Some websites were designed in such-a-way that they look for support of legacy (HTML4) features. Now the browser that support legacy features as well as modern standards face challenge in rendering these web sites and hence another kind of browser compatibility issue. New supported standards could be HTML5, CSS3 etc. Now as soon as this kind of website is rendered in the browser, it will automatically switch to legacy features mode and end-user will have legacy experience while navigating the website.

IE11 in-turn added, updated & removed a number of legacy features [4]:

- The **navigator.appName** property now returns "Netscape" to reflect the HTML5 standard and to match behavior of other browsers.
- The **navigator.product** property now returns "Gecko" in order to reflect the HTML5 standard and to match behavior of other browsers.
- The **XDomainRequest** object is replaced by CORS for XMLHttpRequest.
- Supported for **_proto_** has been added.
- The **dataset** property has been added.

From the above it is very clearly visible that the websites designed using legacy features will certainly have browser compatibility issues when rendered on IE11 browser.

Cascading Style Sheets (CSS) Discrepancy

As reported by one user, the CSS template is not the same in different versions of Internet Explorer. It is claimed to be working perfectly in Safari, Chrome & FireFox. Some of the observed compatibility issues are - background missing in IE9, gaps around background in IE7, page simply not there in IE6 etc. [5].

Errors during Editing Articles [6]

In Internet Explorer 11 editing of articles throws errors. The sites work fine in Google Chrome.

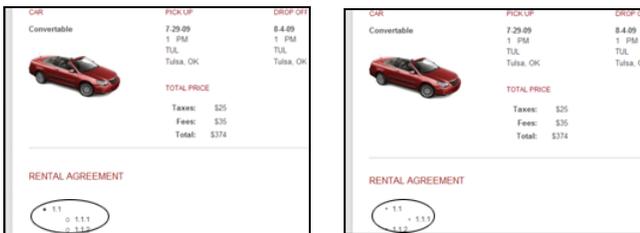
- E.g. Microsoft TechNet Wiki - fail/corrupt input, impossible to edit articles
- Microsoft Connect - not working properly
- Microsoft Visual Studio Gallery - impossible to edit gallery entries with images
- WordPress - Erratic behavior

Broken Tables & Menu items

In Internet Explorer 8, Tables & Menu items sometimes appear broken however they are rendered correctly in Internet Explorer 7.

- An unordered list is implemented in a web page of a web site. When this web site is rendered on Internet Explorer the list appears broken. It renders perfectly in Internet Explorer 7 as shown in below Fig 3.

Fig 3: IE7 list Vs IE8 List

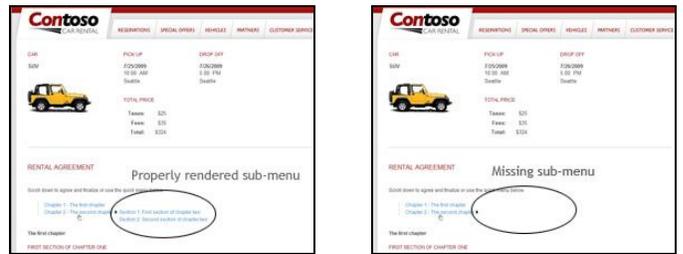


Internet Explorer 7 List displays correctly

Internet Explorer 8 List displays incorrectly

- A web page implements an ASP.net menu item. It is being used to navigate to other pages of web site. This appears broken when rendered in Internet Explorer 8. It renders perfectly in Internet Explorer 7 as shown in the below Fig 4.

Fig 4: IE7 Menu Vs IE8 Menu



Internet Explorer 7 Working Menu

Internet Explorer 8 Non-Working Menu

JavaScript issues

A dynamic web page of a website is generated based on the processing of certain items and is finally rendered. A JavaScript implemented on the web page updates the content of the page based on the user inputs. In below figure, the web page renders an image using JavaScript. This page throws JavaScript error – “null is null or not an object” in Internet Explorer 8 however works perfectly in Internet Explorer 7.

Fig 4: JavaScript Error in IE8



Internet Explorer 7 Properly Updates the Image

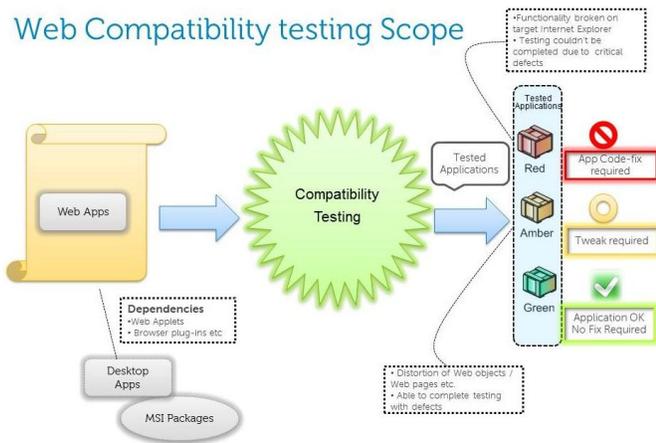
Internet Explorer 8 Displays a JavaScript Error

In this section we tried to highlight some issues which are common and are visible frequently during web surfing though the list is just a tip of iceberg. Also the readers can find many more endless internet explorer rendering issues on the internet in various blogs, and other discussion forums. In next section, we will try to formulate a framework for software testers that can help them testing a website very quickly and effectively on web compatibility front.

III. WEB COMPATIBILITY TESTING FRAMEWORK

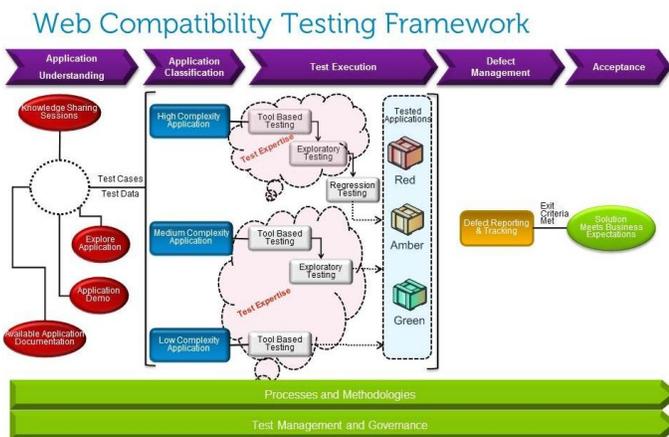
Compatibility testing of web applications starts with careful planning of testing activities and deciding upon what is essential Vs what is out of scope of compatibility testing. A compatibility tester has to keep in mind that the focus of compatibility testing is to concentrate on rendering of web pages on target Internet Explorer browser. An overview of web (Browser) compatibility testing is depicted in the figure below.

Fig 5: Web (Browser) Compatibility Testing Scope & Overview



We designed a Web Compatibility testing framework that helps software tester while testing web compatibility on an Internet Explorer browser (though this framework is independent of any browser and can be used to do web compatibility testing on multiple browsers). Let's try to understand the framework.

Fig 6: Web (Browser) Compatibility Testing Framework



- The first phase of the framework is "Application Understanding". Software tester will gain web application understanding through various methods and

in-turn compile a list of all available pages of the given web application. Next step is to detail out the method to navigate to those pages. The web pages could be 'Static web pages' or 'Dynamic web pages'. While it is easy to navigate to a static page by simply entering the URL of the page and documenting the URL for future reference, the same approach will not work for dynamic pages. One can reach dynamic pages by navigating through a scenario and providing specific inputs to the application at specific points. These business scenarios have to be documented either in the form of use cases or test cases for future reference/use along with the specific inputs.

- Based on the application flows, classify the application as High / Medium / Low complexity application. This will help deciding on the further testing techniques (E.g. Tool based testing, Exploratory testing / Regression testing etc.)
- During the Test Execution phase, based on the application complexity classification, a software tester applies respective testing types as follows:
 - High Complexity Application:** Tool based > Exploratory > Regression Testing
 - Medium Complexity Application:** Tool based > Exploratory
 - Low Complexity Application:** Tool based alone
- Testing begins by navigating to web pages on target Internet Explorer environment and verifying against legacy environment (previous Internet Explorer). Focus should be on page rendering in terms of misaligning of web objects – objects on header and footer, logos, menu items, contents implemented through web tables etc. Document issues found (as defects) and publish them in the form of ACR (application compatibility report). Based on the issues, one can classify the web applications as **Red** or **Amber** or **Green**.

- Green application** will be those that renders flawlessly on target Internet Explorer.
- Amber application** will be those that requires minor tweak in application configuration files, changing browser settings etc. Once these settings are done, these applications will also work fine on target Internet Explorer.
- However **Red applications** will be those that are altogether incompatible on target Internet Explorer. These applications require code remediation or code fix in order for them to work on target Internet Explorer.

- Some of the automated open-source web compatibility testing tools can also be employed during testing. These tools help speed up testing and prove reliable while reporting issues. Some of the tools are:

- CITRIX AppDNA® tool [7]
 - DELL ChangeBASE® tool [8]
 - Microsoft Expression Web SuperPreview® tool [9]
 - IETester tool [10]
 - BrowserStack tool [11]
 - BrowserShots tool [12] etc.
- Compatibility issues found during application testing are later tracked and managed till closure. Once these issues are fixed, we say that the solution provided meets expectation or in other words the web application renders perfectly in the target internet explorer browser.

IV. EVALUATION

The above framework was tested against a live site to evaluate the concept and deduce that the techniques visualized in the framework would work as per the expectations while performing actual world software testing of web application. The results are depicted in below Fig.

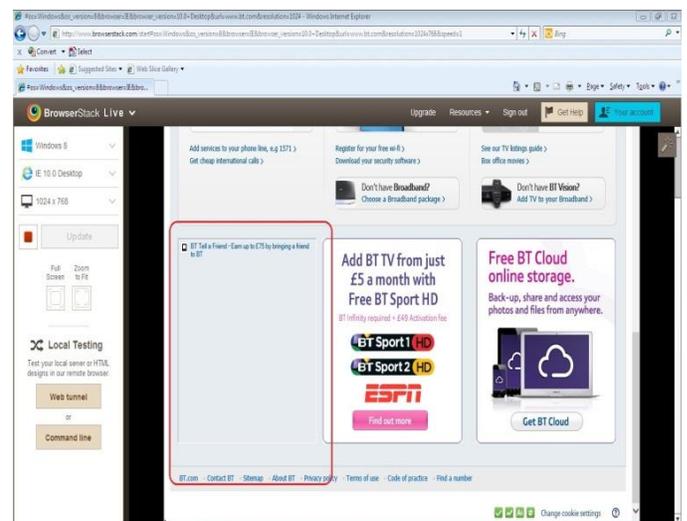
Fig 7: Web pages tracking sheet against the target browsers

Table 1: Web Objects compatibility Checklist

S. No.	Checklist Items	IE11	IE9	FF	Chrome	Safari
1	Tables, Menus, Drop Downs, Check Boxes, Radio Buttons, Images, headers & footers, Link colors on the web page render properly	√	√	√	√	√
2	Text content is aligned properly & Date format is correct	√	√	√	√	√
3	Pop-up windows are displayed properly	√	√	√	√	√
4	JavaScript works properly on web pages - without error messages	√	√	√	√	√
5	ActiveX components are handled properly	√	√			
6	Verification of IEPM (Internet Explorer Protected Mode) -	√	√			

	check for web page operations that write, alter, or destroy data on the user's computer				
7	Verify folder creation on appropriate web pages (User folders, My Documents folders, and folders with localization have changed since Windows XP. Applications with hard-coded paths may fail)	√	√	√	√
8	Look for IE11 upgrade error messages	√			
9	Check web pages using CSS style	√	√	√	√
10	Invoke and close of child windows	√	√	√	√
11	Check the tool tips of the controls and help text	√	√	√	√
12	Check the browser close buttons in child windows	√	√	√	√
13	Resizing the browser window should resize the canvas	√	√	√	√
14	Verify for Page zoom-in and zoom-out functionality	√	√	√	√
15	Verify the font size for web pages	√	√	√	√
16	Verify the flash files are rendered properly	√	√	√	
17	Verify that dynamic HTML web pages are rendered properly	√	√	√	√
18	Email links should open the mailbox	√	√	√	√
19	The application should handle 404/500 errors gracefully	√	√	√	√
20	Verify http forwarding to https secure site rendered properly for certificate based sites	√	√	√	√

Fig 8: Compatibility Issues in IE10 Vs IE8



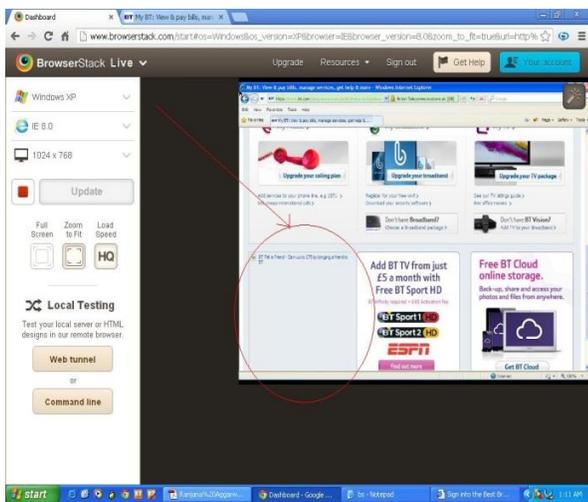


Fig 9: Application Compatibility Report Template

APPLICATION COMPATIBILITY REPORT	
APPLICATION RESULTS	
Application:	
Version:	
Vendor:	
Legacy Platform (OS + Browser):	
Target Platform (OS + Browser):	
Criticality classification	<input checked="" type="checkbox"/> CRITICAL OR <input type="checkbox"/> NON - CRITICAL
Complexity classification	<input checked="" type="checkbox"/> SIMPLE OR <input type="checkbox"/> MEDIUM OR <input type="checkbox"/> COMPLEX
ACR Status	<input type="checkbox"/> Green - Compatible <input checked="" type="checkbox"/> Amber - Application requires a fix to work on browser <input type="checkbox"/> Red - Not Compatible <input type="checkbox"/> Grey - Unable to access the application URL
PREREQUISITE OR DEPENDENCY INFO	
ACR Status for Dependencies of web application (in terms of third parties like plug-ins, applets, JavaScript)	<input checked="" type="checkbox"/> <Dependency> <Version> <input type="checkbox"/> <Dependency> <Version> <input type="checkbox"/> <Dependency> <Version> <input type="checkbox"/> <Dependency> <Version>
<p>** Consider a case where the application is non-functioning due to any of these third party dependencies. In such a case, the Web Compatibility Test Team will generate an ACR with RED/AMBER in this Dependencies. Once the dependencies/prerequisites issue is resolved, the team will proceed with application testing.</p>	

V. CONCLUSION & FUTURE SCOPE

In today's fast changing software world, one can't ignore the innovation and new technologies. Software giants are competing against each other and in a bid to be on the top, they keep on launching new operating systems and browser versions very frequently by including the latest technologies and features in it. On the other hand, it is really tough for the web designers and other organizations with websites to keep up to the pace and hence their websites falls into compatibility issues. Through this paper we tried to give directions to software testers on how quickly a website can be compatibility tested. Real time compatibility issues can

be reported back to web designers for fixing. In-turn the web site becomes compatible again with the newly launched browser within short span of software re-engineering.

Though the issues mentioned in the paper are not the only compatible issues exist in browser versions, however it a starting point for the software testers. It serves as a guideline and gives an idea as to what to look and where to look for the compatibility issues. Also, software testers can look for testing on other browsers as well like FireFox, Chrome, and Safari etc. Finally a tester can always alert the web designer on what is the status of web application by reporting it as RED / AMBER or GREEN. The compatibility status reporting of a website is an indicator that RED marked web site is indeed going to take more time and effort to be compatibility complaint as compared to AMBER marked web site.

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