

Comparison of Content Management Systems (CMS) with regard to the W3C standard compliance, and examination of the standard's sustainability

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This paper focuses on the comparison and evaluation of the three widely-used CMS products—Joomla, Drupal, and WordPress with regard to W3C standard. We implemented W3C standard based test suite for the above products and investigated how the absence of the W3C conformance affects user's experience. Three separate websites were built using each tool, and capabilities of the extensions were analyzed. We found violations of the designated W3C standards by all CMS using a validator and gained understanding of how each website violates the standards. Consequently, we modified the code to eliminate the violations as well as revealed the standard's sustainability by testing the standard through implementation of a video player extension, which works within the website, but violates the W3C standard. Based on the analysis, we have provided basic guidelines for choosing the right CMS system in specific situations and have concluded that Joomla is the most standard compliant, followed by WordPress and Drupal.

Keywords: *W3C Standard, Validator, Joomla, Drupal, WordPress, CMS*

I. INTRODUCTION

Recently, Content Management Systems (CMS) have become increasingly popular. CMS provide a variety of extensions with different functionality and utility for website builders. For enterprises especially, CMS offer unprecedented opportunities and challenges to assist in the development of business websites. Each of these three open source CMS products is developed and maintained by a massive community of users and developers. However, Joomla, Drupal, and WordPress pursue different goals, and thus, are not always fully compliant with modern web standards. In this project, we test the compliance of CMS with the W3C standards. W3C stands for World Wide Web Consortium. It defines an Open Web Platform for application development. By utilizing the W3C standard measurement practices, we created the website with these three CMS tools and evaluated it by finding, understanding and correcting the violation errors. As a result, based on our experience, we provide beginners guidelines for choosing the right CMS system.

Joomla [1] is an open source content management system (CMS), which enables one to build Web sites and powerful online applications. Many aspects, including its ease-of-use and extensibility, have made Joomla the most popular Web site building software available. Drupal [2] is an open source

content management platform powering millions of websites and applications. It is developed, used, and supported by an active and diverse community of people around the world. WordPress [3] is a free and open source blogging tool. This CMS is based on PHP and MySQL. Its features include complex plugin architecture and a template system.

The main purpose of the CMS, as mentioned in the *Content Management Bible* [4], is to empower the user with the ability to provide content without serious effort as well as to keep the content organized and easily accessible. CMS allow users to use familiar editing tools for designing complex creative webpages without web programming expertise [5], thus CMS aids users in the management of their site in order that their site might grow and change rapidly while maintaining high quality standards [4]. The World Wide Web has changed the perception of our life and changed the way people do business [6]. In modern times, it is less feasible to run a business without some form of online media source such as a website. It is likely that in the foreseen future everyone will have some form of web presence, and CMS tools may help to fill that need.

Different features of CMS were investigated previously. Cheng and Wang [7] explored the features of CMS and developed the website for a real project under the WAMP (Windows, Apache, Mysql, PHP) development environment. Patel et al. [8] compared the Drupal, Joomla and WordPress Google page rank, as well as their documentation support, their popularity, and installation ease. The authors have additionally tried to prove statistically which CMS tool is the best by comparing page performance criteria. Upon further investigation, they have created various webpages in three CMSs to evaluate their page performance [9]. Interesting additional information has been provided by Douglass [10] and Kennedy and Musciano [11] about building online communities with Drupal and how the HTML & XHTML are defined.

II. STANDARD APPLIED

We created our local database and built three websites separately for Joomla, WordPress and Drupal, using Bitnami Stack [12] for Drupal, Joomla Demo server [13] for Joomla and XAMPP [14] for WordPress. Bitnami is an open source project that produces open source installers or software packages for web applications. XAMPP is a cross-platform

open source web server stack package, which consists of the Apache Server, MySQL database.

The three websites are based on the same framework, presented in Table 1. They have similarly structured webpages.

	Home	About	Contact	Module	Video
CMS page	Plain Text	Pictures and Plain Text	Online Contact Form	SlideShow Module	Embedded Video Player Module

Table 1. Basic Website Elements

In order to imitate a typical website, basic text articles are positioned on the Home page. The About page consists of pictures and text articles. The Contact page provides an online contact form which allows a visitor to register and send online emails to us. In the Module page, a slideshow module was inserted. Lastly, the Video page contains an embedded YouTube video.

By validating the three websites we built, we have learned how the W3C standard corresponded to the following three aspects of a web-based document: Structure, Presentation and Behavior. Structure is the webpage arrangement and the elements contained within. Presentation is the overall look of the elements on the webpage, and the location of those elements. Behavior describes the way the elements respond and interact.

A. Home Page: Plain Text Validation

The Home Page which contained the plain text articles (e.g., see Figure 1) was validated first. The DocType of each CMS tool was automatically identified, and the websites in turn were validated according to their specific DocType. Once the violations were found, they were categorized by error type and occurrence.

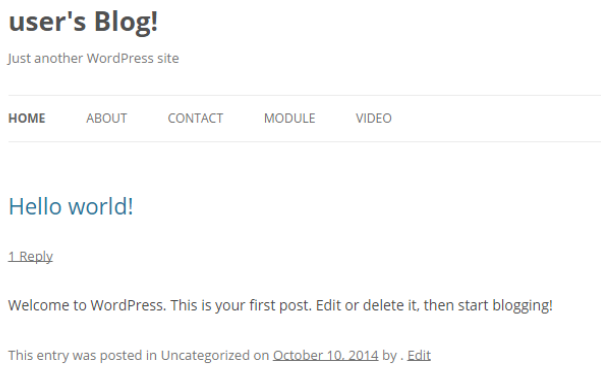


Figure 1. Sample WordPress Home Page

Once the violations of the W3C standard were identified, we attempted to correct the source code so that it was compliant with the standard. Some errors could be corrected simply by adding missing elements such as slash symbol. Other errors are related to obsolete markup structures that should be removed, or replaced by CSS code. Several false

alarm errors were ignored. Joomla was fully standard compliant. Drupal and WordPress, errors mainly occurred as a result of missing or obsolete HTML elements. Joomla exhibited the least number of errors and warnings (see Table 2).

CMS Tools	Joomla	Drupal	WordPress
DocType	HTML5	XHTML+ RDFa	HTML5
Errors	0 Errors, 1 Warning	18 Errors 0 Warnings	3 Errors, 2 Warnings

Table 2. Home Page DocType and Error Type

Below are sample errors from the CMS tools produced by the W3C Validator.

1) Drupal Error Reports:

Line 3, Column 1045: end tag for "meta" omitted, but OMITTAG NO was specified

```
<meta http-equiv="Content-Type" content=...
...e" content="text/html; charset=UTF-8"><style
type="text/css"></style><!--start...
```

Line 5, Column 107: end tag for "link" omitted, but OMITTAG NO was specified

```
<link rel="shortcut icon"
href="http://localhost/drupal/misc/favicon.ico"
type="image/vnd.microsoft.icon">
```

In both errors, no closing element was found for the given element.

2) WordPress Error Reports

Line 24, Column 106: Bad value Open Sans-css for attribute id on element link: An ID must not contain whitespace.

```
...Open Sans-css"
href="/WordPressHome_files/css(2)"
type="text/css" media="all">
```

An ID consists of at least one character but must not contain any whitespace.

Line 48, Column 10: The hgroup element is obsolete.

```
<hgroup>
```

To mark up subheadings, the subheading could be put into a p element after the h1-h6 element containing the main heading, or else put the subheading directly within the h1-h6 element containing the main heading, but separated from the main heading by punctuation and/or within, for example, a span class="subheading" element with differentiated styling. To group headings and subheadings, alternative titles, or taglines, one should consider using the header or div elements.

The above error is because the incorrect use of '<hgroup>', in conjunction with the '<header>'

B. About Page: Plain Text with Image Validation

After analyzing violation errors in the plain text page, the JPEG picture was added on the About page while keeping the rest of the content the same. Figure 2 shows an example page

of the Joomla website. The results are similar to those of the Home page validations, but new violation has been introduced.

Joomla!

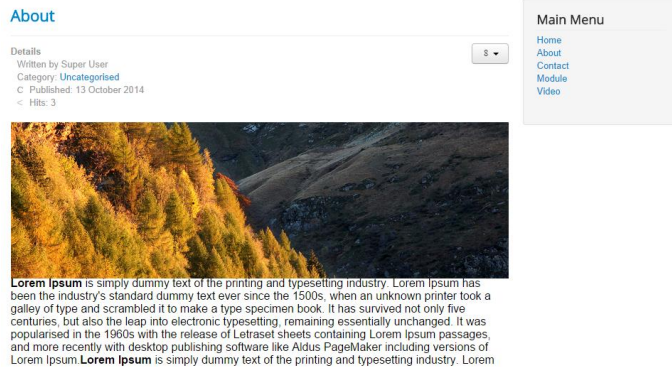


Figure 2. Sample Joomla About Page

For Drupal, one new error was introduced due to a missing end tag for an 'img' file. Joomla was still standard compliant and WordPress left with three errors.

C. Contact Page with Online form and Online email Validation

An online form allows visitors to register, leave messages, and give suggestions directly on the webpage. Thus, online forms allow for convenient, user-friendly interaction between visitors and the website owner. In our Contact page, we inserted a Wufoo [15] Online form; this form uses JavaScript embedded code and automatically builds the necessary database and backend. Figure 3 shows an example of the contact form on the Joomla website.

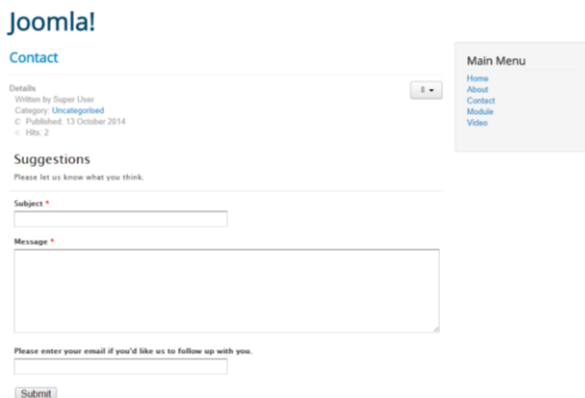


Figure 3. Online Wufoo Contact Form

To compare the violations without the influence of other factors, the plain text and picture were removed from the website, leaving the online contact form alone. The Wufoo Form is written in JavaScript and is compatible for all CMSs; it only requires direct insertion into the source. Table 3 shows the results of error count due to the Wufoo contact form.

Table 3 shows that Joomla has the lowest error rate compared to other CMS.

CMS Tools	Joomla	Drupal	WordPress
Errors	3 Errors 1 Warning	4 Errors 0 Warnings	6 Errors, 2 Warnings

Table 3. Contact Page and Wufoo Contact Form

The new errors that were introduced are related to obsolete header grouping and obsolete attributes in `iframe`. For example:

Line 110, Column 328: The `allowtransparency` attribute on the `iframe` element is obsolete. Use CSS instead.

Line 110, Column 328: The `frameborder` attribute on the `iframe` element is obsolete. Use CSS instead.

```
<iframe id=... allowtransparency="true"
frameborder="0"... F'ill out my Wufoo
form!&lt;/a&gt;</iframe>
```

D. Video Page with Embedded YouTube Video

The YouTube video player is one of the most popular extensions in web design. In order to see the compatibility of different CMS tools with YouTube, we created a Video page for each individual website (e.g., see Figure 4), embedded a YouTube video into those pages, and validated the pages.

We embedded into the 640*360 `iframe` YouTube player code. Table 4 summarizes the validation results.

CMS Tools	Joomla	Drupal	WordPress
Errors	1 Errors, 1Warning	25 Errors	4 Errors, 2Warnings

Table 4. Video Page and Embedded YouTube

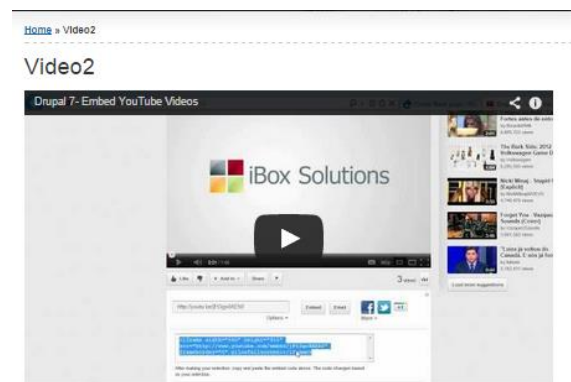


Figure 4. Drupal Video Page with Embedded YouTube

For the Video page, Drupal produced more errors of the same type (missing end tag). Joomla and WordPress produced a few errors as described above. Some example errors are given below:

Line 142, Column 209: there is no attribute "width"

Line 142, Column 222: there is no attribute "height"

Line 142, Column 232: there is no attribute "src"

Line 142, Column 294: there is no attribute "frameborder"

```
<iframe width="640" height="360" src="./Video2
Zheng'sWebsite_files/wZeeIYerCyA.htm"
frameborder="0" allowfullscreen=""></iframe>
```

III. DISCUSSION

In this section, the typical standard compliance errors and possible solutions using source file modifications are discussed.

1) Omitted markup

This error is particularly frequent in Drupal CMS. For example:

Line 5, Column 93: end tag for "meta" omitted, but OMITTAG NO was specified

```
<meta about="/drupal/node/4"
property="sioc:num_replies" content="0"
datatype="xsd:integer">
```

Error description: You may have neglected to close an element, or perhaps you meant to "self-close" an element, that is, ending it with ">" instead of ">".

The appropriate correction of this error is by adding the end tag or to self-close the element, i.e.,

```
<meta about="/drupal/node/4"
property="sioc:num_replies" content="0"
datatype="xsd:integer"/>
```

2) Obsolete attributes

This error is typical for all systems when the `iframe` is invoked. One example is given below:

Line 110, Column 112: The `frameborder` attribute on the `iframe` element is obsolete. Use CSS instead.

```
<div itemprop="articleBody">
  <iframe width="640" height="360"
src="/Video_files/DeQqe0oj5Ls.htm"
frameborder="0" allowfullscreen=""></iframe>
</div>
```

To correct the code, we need to remove the obsolete attribute, such as `frameborder`, and use alternative coding instead:

```
<div itemprop="articleBody">
  <iframe width="640" height="360"
src="/Video_files/DeQqe0oj5Ls.htm"
style="border:none" allowfullscreen=""></iframe>
</div>
```

A second example is seen with our video page, where the embedded Youtube video is wrapped with the 'iframe' framework. However, the XHTML strict Doctype does not support this framework and causes the obsolete attribute error. To solve this error, we need to use '<object>' instead of '<iframe>'

Line 142, Column 209: there is no attribute "width"

Line 142, Column 222: there is no attribute "height"

Line 142, Column 232: there is no attribute "src"

Line 142, Column 294: there is no attribute "frameborder"

```
<iframe width="640" height="360" src="/Video2
Zheng'sWebsite_files/wZeeIYerCyA.htm"
frameborder="0" allowfullscreen=""></iframe>
```

The correction of the code:

```
<object data="/Video2
Zheng'sWebsite_files/wZeeIYerCyA.htm"
width:640; height:360;></object>
```

3) Obsolete elements

A few errors and warnings occur due to the former way of grouping the headers with the `<hgroup>` markup. To fix this error, we can replace '`<hgroup></hgroup>`' with '`<div></div>`' and pass validation check.

For example,

Line 48, Column 10: Element `hgroup` not allowed as child of element header in this context. (Suppressing further errors from this subtree.)

Line 48, Column 10: The `hgroup` element is obsolete. To mark up subheadings, consider either just putting the subheading into a `p` element after the `h1-h6` element containing the main heading, or else putting the subheading directly within the `h1-h6` element containing the main heading, but separated from the main heading by punctuation and/or within, for example, a `span class="subheading"` element with differentiated styling. To group headings and subheadings, alternative titles, or taglines, consider using the header or `div` elements.

```
<hgroup>
<h1 class="site-title"><a
href="/WordPressHome_files/WordPressHome.htm" title="user's Blog!" rel="home">user's
Blog!</a></h1>
<h2 class="site-description">Just another
WordPress site</h2>
</hgroup>
```

The correction of the codes:

```
<div>
<h1 class="site-title"><a
href="/WordPressHome_files/WordPressHome.htm" title="user's
Blog!" rel="home">user's
Blog!</a></h1>
<h2 class="site-description">Just another
WordPress site</h2>
</div>
```

IV. CONCLUSION

From the standpoint of CMS, Joomla is the most compatible with the W3C standard among all three CMS tools, followed by WordPress and Drupal.

From the W3C standpoint, the omitted markups should be added. It is unclear why such a simple error still exists in CMS. The obsolete element and attribute errors need to be fixed according to the W3C standard as well.

For the users, WordPress is ideal for fairly simple websites, such as blogging and news sites. Drupal needs the longest process to create the website, while WordPress has the shortest process. Joomla and Drupal provide the user more convenience options while posting a picture or video. Joomla allows one to build a site with more flexibility in content and structure than WordPress, but it is still fairly easy to use. It supports E-

commerce and social networking. Drupal provides complex, advanced set of tools for building websites, making this CMS more appropriate for business websites such as online stores that require complex data organization and community platform with multiple users.

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