

# TECHNOLOGY CONTENT ANALYSIS OF THE FORTUNE 500 CORPORATE WEB SITES

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## ABSTRACT

*This paper presents the findings of a technology content analysis of the Fortune 500 corporate Web sites, which addressed three research questions: (a) What Internet/Web technologies do the Fortune 500 companies use most or least on their Web sites? (b) What are their objectives of using the technologies? And (c) how efficiently and effectively do the companies use the technologies on their Web sites? The primary purpose of the study is to provide IT educators with the findings they need to keep their curricula current.*

**Keywords:** Internet/Web technology, usage objective, efficiency, and effectiveness

## INTRODUCTION

The Internet and World Wide Web are fundamentally changing the way business is done, the way software applications and services are being built and delivered, and the way people work, study, and live (1, 6). Whereas the static informational Web pages are simply created with HTML, building the dynamic, interactive Web applications and services require advanced Web technologies and languages (3, 5, 7). The literature review (e.g., 5, 8, 9, 10) identified a long list of advanced Web technologies and languages such .asp, .aspx, .asmx, .cfml, .cgi, .css, .dll, .gsp, .jhtml, .jsp, .php, .shtml, .wml, .xhtml, .xml, JavaScript, Java, VBScript, Visual Basic, Visual Basic.Net, Visual C++, and C#. But no national study has been found to determine (a) which Web technologies and languages the U.S. companies use most or least for their Web sites and (b) how efficiently and effectively the companies use the technologies. This research gap indicates a need for a technology content analysis of the *Fortune 500* U.S. largest companies' Web sites since the companies represent a wide range of industries.

## PROBLEM AND PURPOSE

This study conducted a technology content analysis of the *Fortune 500* corporate Web sites to address three research questions: (a) What technologies do the *Fortune 500* companies use most or least on their Web sites? (b) What are their objectives of using the technologies? And (c) how efficiently and effectively do the companies use the technologies on their Web sites? The purpose of the study is threefold. First, the findings would be valuable for IT educators to keep their curricula current. Second, the findings could serve as benchmarks for IT professionals to improve their corporate Internet/Web strategies and practices. Third, the findings would help the Internet/Web technology vendors to compare the market acceptance levels, usage patterns, and effects of their technologies among the *Fortune 500* corporations. Therefore, the vendors are able to make appropriate decisions, such as whether to improve or to discontinue those less-effective, less-efficient, or least-used technologies.

## METHODOLOGY

Content analysis is one of the major methodologies employed in social science studies (2). This research method is ideal for making inferences by systematically and objectively recording the technology contents on the Web and then identifying the causal relationships between the Internet/Web technologies (products) and their user satisfaction (acceptance) and usage pattern/impact (infusion).

To guarantee that the sample would be within 5% variation from the true population value, Jaeger's (4) formula for determining sample size was used, which resulted in 217 out of the *Fortune 500* corporate Web sites for random sampling. An instrument was developed based on the related literature, which included four major categories: (a) usage of technologies, (b) usage objectives, (c) usage efficiency, and (d) usage effectiveness. To measure the usage efficiency, the page loading time per second was rated on the campus LAN, with a Likert scale of (1) very efficient = less than one second, (2) efficient = one to two seconds, (3) less efficient = three to four seconds, and (4) not efficient = more than four seconds.

The usage effectiveness was measured with the following Likert scale: (1) very effective, (2) effective, (3) less effective, and (4) not effective, with their respective operational definitions:

- *Very effective* means that a Web site has (a) most pages of one to two screens long, (b) well-balanced design of graphic user interface (GUI) and usability, (c) no more than three interactive pages of fill-in forms for online shopping application, and (d) no run-time error.
- *Effective* refers to a Web site that has (a) most pages of two to three screens long, (b) balanced design of GUI and usability, (c) four interactive pages of fill-in forms for online shopping application, and (d) no run-time error.
- *Less effective* means that a Web site has (a) most pages of three screens long, (b) less balanced design of GUI and usability, (c) four interactive pages of fill-in forms for online shopping application, and (d) one run-time error.
- *Not effective* refers that a web site has (a) most pages longer than three screens, (b) less balanced design of GUI and usability, (c) more than four interactive pages of fill-in forms for online shopping application, and (d) more than one run-time error.

Two research assistants majored in information systems were trained to develop (a) the common understanding of the Internet/Web technologies and Web file extensions and (b) the ability to read the source code and to record data with the instrument. The data collection started in September and completed in December 2002. Each week the research assistants turned in 20 completed questionnaires and then the researcher performed a validation crosscheck by revisiting five randomly selected web sites from the 20 completed questionnaires within the same week.

Of the 217 randomly selected companies, only one company had no corporate Web site at the time of the data collection. Therefore, data were collected from 216 corporate Web sites, which was 99.5% of the sample and ensured the valid representation of the population at a 95% confidence level. The collected data were analyzed for frequency counts, percentage distributions, and weighted averages. ANOVA analysis was used to determine any significant differences between the efficiency and effectiveness variables. Table 1 shows the demographic profile of the 216 participating companies, which represent seven major industry groups

covering a wide range of businesses.

**TABLE 1**  
**Demographic Profile of the Participating Companies (N=216)**

<b>Group</b>	<b>Types of Company Business</b>	<b>Frequency</b>	<b>Percentage</b>
Group 1	Manufacturing/Processing	59	27%
Group 2	Banking/Finance/Insurance	33	15%
Group 3	Retail/Wholesale	30	14%
Group 4	Transportation/Utilities	28	13%
Group 5	Information/Communications	25	12%
Group 6	Healthcare/Hospitality Services	22	10%
Group 7	Construction/Engineering/Mining/Oil/Gas	19	9%
	Total	216	100%

## FINDINGS

The findings of the study are reported in the sequence of (a) usage of Web technologies, (b) technology usage objectives, and (c) technology usage efficiency and effectiveness.

### Usage of Web Technologies

The content analysis identified 18 programming technologies and languages and 12 graphics and multimedia used on the 216 *Fortune 500* corporate Web sites (see Table 2). The most frequently used were JavaScript (93%), .html (81%), .css (69%), .asp (59%) and VBScript (59%). Around one third of the sites used .zhtml (37%), followed by .cfml (25%) and .jsp (21%). The remaining technologies were used by a few sites, which included the emerging .xml (3%) and .aspx (3%). By contrast, the least used was .xhtml (1%).

Regarding the usage of graphics and multimedia, most of the sites used .gif pictures (97%), .jpg pictures (89%), email (83%). Flash movie and plug-in pdf were used by 37% and 31% of the sites, respectively, followed by .gif animation (17%) and plug-in video (15%). The least used graphics and multimedia were .png pictures (1%), Web-conference (1%), and plug-in real-time TV (.5%).

The analysis further identified that 46% of the sites used a combination of five to six Web programming technologies, followed by 38% having used three to four, and 10% having used seven to eight technologies. Only 5% of the sites used just one to two technologies and 1% used nine to ten technologies.

Regarding the Web graphics and multimedia, nearly two-thirds (63%) of the sites used three to four types of graphics and multimedia, and 28% used one to two types. By contrast, only 9% of the sites used five or more types of Web graphics and multimedia.

**TABLE 2**  
**Technologies Used on the Fortune 500 Corporate Web Sites (N=216)**

<u>Technologies Used</u>	<u>Usage Frequency</u>	<u>Percentage</u>
<u>Programming</u>		
JavaScript	200	93%
.html	175	81%
.css	150	69%
.asp	128	59%
VBScript	128	59%
.zhtml	79	37%
.cfml	54	25%
.jsp	46	21%
.cgi	32	14%
.shtml	25	12%
.jhtml	11	5%
.xls	8	4%
.xml	7	3%
.aspx	6	3%
.nsf	5	2%
.doc	5	2%
.php	4	2%
.xhtml	2	1%
<u>Graphics/Multimedia</u>		
.gif picture	209	97%
.jpg picture	193	89%
email	180	83%
flash movie	80	37%
plug-in pdf	67	31%
.gif animation	36	17%
plug-in video	33	15%
plug-in audio	13	6%
.ppt slides	5	2%
Web-conference	2	1%
.png picture	2	1%
plug-in real-time TV	1	.5%

### Technology Usage Objectives

Table 3 illustrates the technologies used for home page, public and investor relations, information search, business to consumers (B2C), business to business (B2B), career, and contact-us sites. As the mean scores indicate, five programming technologies were used more frequently than others for all the above seven specific objectives, with JavaScript (62%) taking the lead, followed by .css (46%), .html (41%), .asp (27%), and VBScript (27%). In contrast, .zhtml and .cfml were used quite frequently only for the public and investor relations sites. The graphics and multimedia used most frequently for the seven objectives were .gif picture (66%),

email (66%), and .jpg picture (50%), with flash movie (11%) far after them. However, for the public and investor relations sites, the following three were used somewhat frequently: plug-in pdf (29%), plug-in video (15%), and plug-in audio (10%), although they were seldom or even not used for the other objectives.

**TABLE 3**  
**Technologies Used for Specific Corporate Web Site Objectives (N=216)**

<u>Tech Used for</u>	<u>Home P</u>	<u>PR/IR</u>	<u>Info-srch</u>	<u>B2C</u>	<u>B2B</u>	<u>Career</u>	<u>Contact</u>	<u>Mean</u>
<u>Programming</u>								
JavaScript	87%	87%	70%	58%	56%	42%	37%	62%
.css	59%	63%	50%	41%	41%	36%	32%	46%
.html	57%	67%	41%	35%	40%	29%	21%	41%
.asp	21%	40%	34%	29%	27%	21%	15%	27%
VBScript	21%	40%	34%	29%	27%	21%	15%	27%
.jsp	8%	9%	10%	11%	7%	4%	4%	8%
.cfml	2%	20%	6%	5%	5%	4%	2%	6%
.zhtml	0%	35%	2%	0%	1%	0%	2%	6%
.shtml	4%	8%	4%	5%	6%	1%	1%	4%
.jhtml	2%	4%	3%	2%	2%	1%	1%	2%
.cgi	1%	8%	7%	6%	6%	1%	1%	1%
.aspx	1%	2%	1%	2%	2%	1%	0%	1%
.php	1%	1%	1%	0%	1%	1%	0%	1%
.xhtml	1%	1%	1%	1%	1%	0%	0%	1%
.xml	0%	2%	1%	1%	1%	0%	0%	1%
.xls	0%	2%	0%	1%	1%	0%	0%	1%
.doc	0%	2%	0%	0%	0%	2%	0%	1%
.nsf	0%	1%	0%	1%	1%	0%	0%	0%
<u>Graphics/Multimedia</u>								
.gif picture	89%	93%	71%	62%	60%	46%	38%	66%
email	83%	83%	6%	62%	60%	83%	83%	66%
.jpg picture	68%	77%	46%	56%	51%	34%	16%	50%
flash movie	21%	13%	8%	13%	11%	6%	2%	11%
plug-in pdf	1%	29%	7%	1%	1%	0%	0%	6%
.gif animation	8%	6%	4%	4%	5%	2%	0%	4%
plug-in video	1%	15%	0%	0%	0%	1%	0%	2%
plug-in audio	0%	10%	0%	0%	0%	1%	0%	2%
.png picture	1%	1%	1%	1%	0%	0%	1%	1%
.ppt slides	0%	2%	0%	0%	0%	1%	0%	0%
Web-conference	1%	1%	0%	0%	0%	0%	0%	0%
Plug-in rt. TV	1%	1%	0%	0%	0%	0%	0%	0%

### Technology Usage Efficiency and Effectiveness

As Table 4 shows, 16 programming technologies and 10 graphics and multimedia were rated as being used efficiently and effectively. Microsoft .doc, .xls, and .ppt files were not listed because

they work well only on Internet Explorer browser but not on Netscape and other browsers. In general, the efficiency level of the most technologies used on the corporate Web sites was in line with their effectiveness level, except for .jsp, plug-in pdf, and flash movie. As shown in Table 4, .jsp, plug-in pdf, and flash movie files demonstrated significantly higher effectiveness than efficiency on the Web sites.

**TABLE 4**  
**Efficiency and Effectiveness of the Technologies Used by Corporate Web Sites**

<u>Technologies Used</u>	<u>Efficiency Mean</u> <sup>a</sup>	<u>Effectiveness Mean</u>	<u>Sig.</u>
<u>Programming</u>			
.xhtml	1.00	1.00	
.css	1.31	1.26	
JavaScript	1.38	1.26	
.jhtml	1.45	1.60	
.nsf	1.60	1.60	
.cgi	1.64	1.69	
.aspx	1.67	1.50	
.zhtml	1.68	1.61	
.shtml	1.71	1.45	
.xml	1.71	1.75	
.html	1.74	1.68	
.php	1.75	1.80	
.asp	1.76	1.67	
VBScript	1.76	1.67	
.jsp	1.93	1.59	*
.cfml	1.94	1.76	
<u>Graphics/Multimedia</u>			
Web-conference	1.00	1.00	
email	1.32	1.44	
.gif animation	1.33	1.26	
plug-in pdf	1.44	1.17	*
flash movie	1.44	1.27	*
.png picture	1.50	1.50	
.gif picture	1.67	1.63	
.jpg picture	1.71	1.68	
plug-in audio	1.73	1.70	
plug-in video	1.92	1.75	

<sup>a</sup> Efficiency and effectiveness were measured with 1 = very efficient/effective, 2 = efficient/effective, 3 = less efficient/effective, and 4 = not efficient/effective.

\*Differences between efficiency and effectiveness were significant;  $p < .05$ .

## SUMMARY AND CONCLUSIONS

The content analysis identified the following eight technologies most frequently used on the *Fortune 500* corporate Web sites: JavaScript, .html, .css, .asp, VBScript, .gif pictures, .jpg

pictures, and email. These eight technologies were also frequently used for specific objectives such as home page, public and investor relations, information search, B2C, B2B, career, and contact-us sites. Obviously, these eight technologies appear to be most popular for developing corporate Web sites and applications.

Second, the public and investor relations sites stood out in using additional technologies such as .cfml, .zhtml, flash movie, plug-in pdf, plug-in video, and plug-in audio. However, these additional technologies were seldom or even not used on other types of sites. This finding indicates that, to attract the public and investors and to keep them revisiting the sites, companies used a larger variety of programming technologies, graphics and multimedia for communication enhancement than they did for other types of sites. Clearly, flash movie, plug-in pdf, plug-in video, and plug-in audio are appropriate choices for the public and investor relations sites.

Third, the two new leading-edge Web technologies, .xml and .aspx, were identified on just a few sites. This low deployment rate seems to indicate that these two technologies are still at the introduction stage on their way to the market. It takes time for companies to invest in these new technologies and for IT professionals to master them and deploy .xml- and .aspx-based Web applications and services.

Finally, the 216 *Fortune 500* corporate Web sites demonstrated the efficient and effective use of Web programming technologies, graphics and multimedia. This finding suggests that the *Fortune 500* corporate Web sites could serve as models for teaching and learning Web design and development. They could also serve as benchmarks for IT professionals and Internet/Web technology vendors to make better decisions in improving corporate Internet/Web strategies and practices.

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