A Comparative Study of 3d Media Applications in B2C E-Commerce

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Abstract: This paper presents a comparative study of the commercial usability of six B2C e-commerce websites utilizing advanced media; in particular web based 3d media (web3d). The study indicates that even though some technologies show promise in enhancing the quality of the online shopping experience, they generally disrupt the State of Flow and thereby have a counterproductive effect on the perceived quality of an e-commerce website.

1. Introduction and Motivation

One of the key factors of the success of the World Wide Web is its usability. Hyperlinks let us easily navigate between documents, surf from information to information and, if implemented properly, provide a seamless flow of context that lets us forget the world around us. It shifts our mind into a so-called State of Flow (see, e.g. [Han'00]) during which everyday issues do not matter the way the used to do. What's more, to achieve this State of Flow we do not need any particular education or background knowledge. The Web touches everybody independent of age, gender or educational status. Simply speaking, the Web is universally addictive.

The art of e-commerce focuses on utilizing this State of Flow for achieving commercial success of a website owner. Achieving a continuous State of Flow, however, requires that the website satisfies the following four minimum conditions.

1. The website needs to provide sufficient content that is capable of keeping users interested for as long as possible.
2. Web pages need to be instantly accessible. Recent studies indicate that load times greater than seven seconds are generally unacceptable.
3. Web pages need to be linked well within a website. Exit paths to other websites should be avoided. To some extend, a successful e-commerce website can be compared to a Las Vegas casino with lots of activities on the casino floor and no exit in sight.
4. The website interface needs to be highly usable to avoid any deterrence due to a high interface learning curve.

Website maintainers usually focus on the first of these conditions and tend to neglect the other three. Too much attention is paid to the content alone. This is particularly true when it comes to new technologies such as web based virtual reality (web3d). Even if the content is perceived to be cool, what does this matter when a lengthy plug-in download interrupts the State of Flow in a counterproductive way? What is the advantage of a technically sophisticated and elaborate web3d setup if navigation turns out to deter a huge number of users? To illustrate the latter, Figure 1 shows an overview of the current navigational interfaces used in web3d browsers. It is immediately apparent that only very experienced users, if at all, are capable of using such interfaces to achieve a State of Flow within a virtual environment.

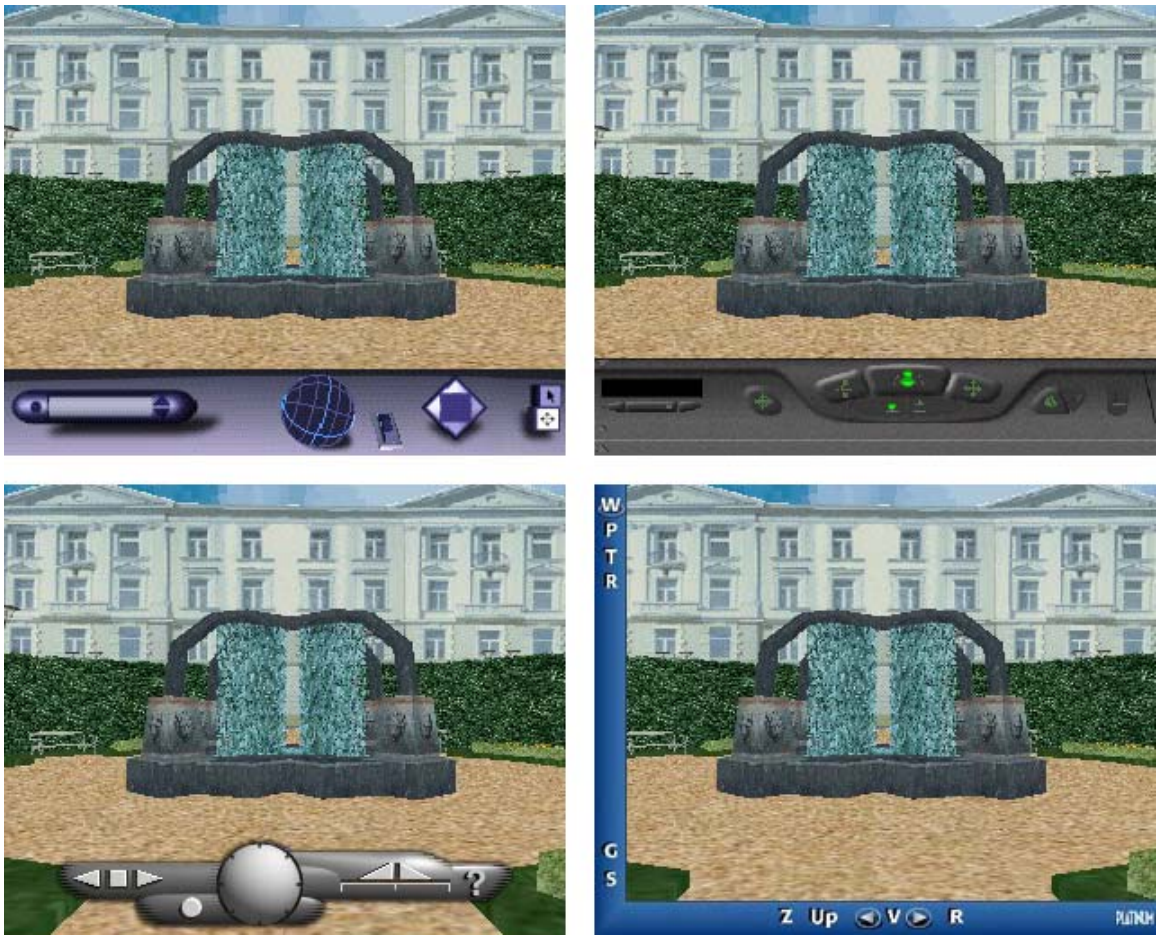

Figure 1 Sample interfaces from popular web3d browsers. From left to right, top to bottom: CosmoPlayer 1.1 (SGI), CosmoPlayer 2.1, Blaxxun Contact 4.3, Platinum WorldView 2.0

In [Wag'00] I discussed some general ideas and strategies for identifying whether or not 3d e-commerce is fact or fiction. In this paper, I present a study that makes a first attempt to clarify the true value of advanced media in e-commerce. In this study focus was given to accessibility and usability of the web content.

2. The Study

Even though there is a number of web3d technologies, all of which claim to have successful commercial applications, it is surprisingly difficult to identify professional e-commerce storefronts that utilize web3d. After careful examination I decided to include the following sites in the study.

Figure 2 Six e-commerce websites used in the pilot study; from top left to bottom right: Buy.com, Canon Powershot, Eluxury.com, Excite Extreme Holiday Shop, FAO Schwarz Virtual Playroom, VR_Mall.

1. *Canon Powershot* (http://www.powershot.com/splash.html)
   This site uses Macromedia Flash technology to approach its mainly young audience. Macromedia flash requires a plug-in that comes standard with the latest web browsers. According to the Macromedia, the Flash plug-in has a market penetration of more than 90% in the US.
2. *eLuxury.com* (http://www.eluxury.com/browse/3d.jhtml)
   Eluxury.com utilizes a technology called Viewpoint Experience Technology (VET) to deliver 3d visualizations of the products in their online catalog. This 3d technology requires a rather uncommon plug-in but delivers extremely high visual quality through an advanced streaming technology utilizing a wavelet based geometry compression algorithm.
3. *VR-Mall* (http://communityserver.swt.iao.fhg.de/commserv/vrml/custom/vr-mall/vr-mall/frames.html)
   VR-Mall is a demo installation of a virtual shopping environment within a 3d online community. It is based on the Blaxxun Virtual Reality Modeling Language (VRML) multi-user technology and is capable of providing advanced visualizations in return for a rather lengthy plug-in download.
4. *Excite Holiday Shop* (http://www.excitextreme.com/holiday/)
   The excite holiday shop was the follow up project of Macy's Fashion Show outlined in the introduction. It utilizes a java-based technology that does not require any download and is theoretically capable of being used on any computer platform available today. As a trade-off, the system is rather slow and can therefore not be used for sophisticated content.
5. *Buy.com* (http://www.us.buy.com/)
   Buy.com is a regular, well-designed e-commerce website which was used to benchmark the results in this pilot.
6. *FAO Schwarz Virtual Playroom*
   (http://www.fao.com/FAOWeb/EComm/Playroom/virtualplayroom.cfm)
   This example utilizes the Pulse3d technology, which is similar to the Viewpoint Experience Technology, but has the advantage of a more broadly used plug-in due to various very popular entertainment applications.

The subjects of this study were graduate students in Computer Science attending an e-commerce class. The students were asked to spend a minimum of 5 minutes with each site before completing a survey consisting questions primarily focused on the perceived accessibility and technical sophistication of the sites (see Table 1). The sample size was reasonably large; around 70 students produced a total of 331 responses.

1. What operating system are you using?
   a. Windows 95/98
   b. Windows ME
   c. Windows NT
   d. Windows 2000
   e. MacOS
   f. Linux
   g. Other
2. What web browser did you use to visit the site?
   a. Internet Explorer 3.x

   b. Internet Explorer 4.x
   c. Internet Explorer 5.x
   d. Netscape 3.x
   e. Netscape 4.x
   f. Netscape 6.x
   g. Other
3. Did you need to download and install a plug-in?
4. Were you able to access all of the content?
5. Please rate the following statements on a scale from 1 to 5, 1 being 'extremely agree' and 5 being 'extremely disagree'
   a. The site is easy to navigate.
   b. The site is innovative.
   c. The site has high quality.
   d. The site is unusual.
   e. The site is easy to access.
   f. The site has innovative content.
   g. The site is dynamic.
   h. The site is trustworthy.
   i. The site has advanced features.
   j. The site is better than comparable sites.
   k. The site is easy to use.
   l. The site is interesting.
   m. The site is secure.
   n. The advanced features of the site are easy to use.
6. Assuming that you are interested in the articles sold by the site, please rank the following statements on a scale from 1 to 5, 1 being 'extremely agree' and 5 being 'extremely disagree'.
   a. I would visit the site regularly.
   b. I would prefer this site to other sites selling the same items.
   c. I would buy from this site.

Table 1 Survey questions.

3. Results

Figure 3 shows the perceived website accessibility resulting from the survey data. As expected, sites that utilize a plug-in based technology are more likely to be not accessible by the user. This is in particular true for VR-Mall, the site with the most involved technical content.

An interesting issue that arises from this numbers is the fact that more than 20% of all users were under the impression that they needed to download and install a plug-in for the Excite Extreme Shop even though the site operates completely plug-in less based on a Java applet. It could be due to the fact that Computer Science students tend to overanalyze content download and therefore were more likely to interpreted the applet download as a plug-in download. This is an important issue that has to be further investigated since the installation of a plug-in constitutes a perceived interruption in the State of Flow of a website visitor thereby causing a decrease in website value.

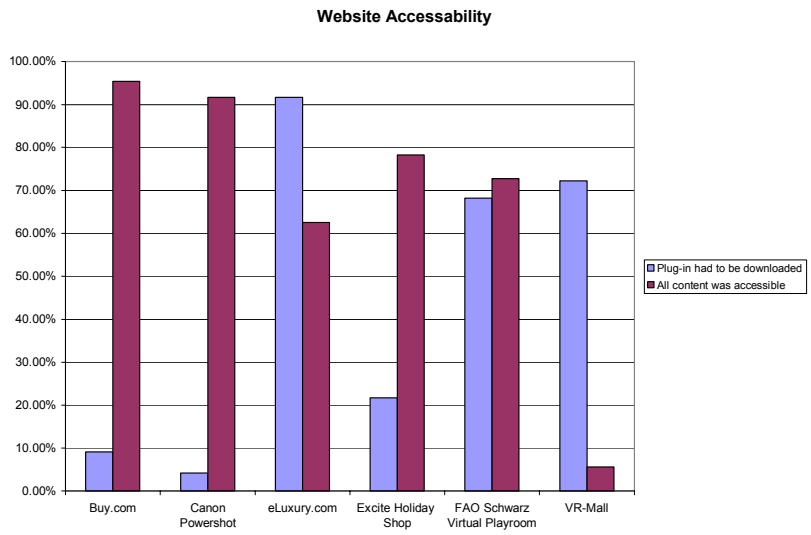

Figure 3 Website accessibility. Left columns indicate the percentage of users that had to download and install a plug-in, right columns show the percentage of users that were able to access the full content available at the site.

Figure 4 shows how well the sites score with respect to some of the measured attributes, namely ease of navigation, perceived website quality and amount of interaction. The most interesting result here is the fact that users identified VR-Mall non-interactive, even though the underlying base technology supported much higher interaction capabilities. This could be due to the fact that an increase in navigation complexity reduces the perceived interactivity, an issue that deserves further investigation.

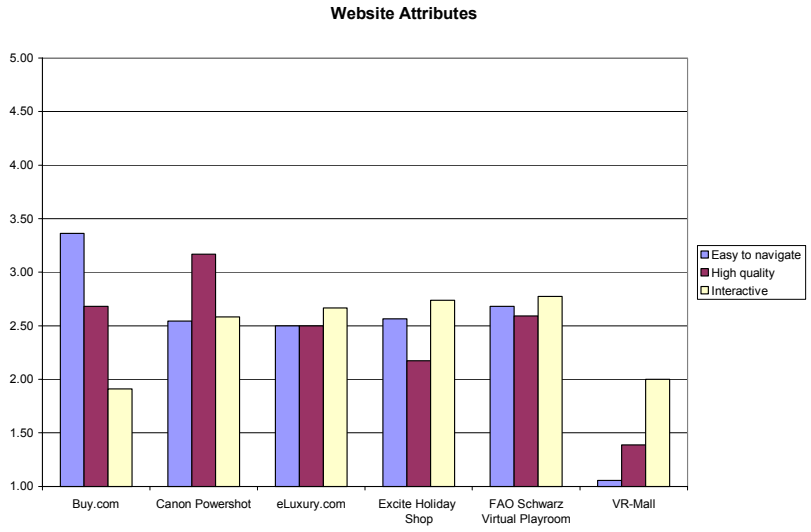

Figure 4 Website attributes on a scale from 1 to 5, 1 being extremely dissatisfactory and 5 being extremely satisfactory. The columns indicate, from left to right, ease of navigation, perceived quality and perceived amount of interaction.

Using a factor analysis on the survey data I furthermore tried to determine the main differentiating factors between the sites (see Figure 5). I was able to extract two significant factors. According to this analysis, attributes such as ease of navigation, ease of access, or willingness to purchase were heavily loaded onto the first factor. This actor described the general usability of the site. The second factor included attributes such as innovative and interactive content, dynamic website appearance and the existence of advanced features. These attributes generally refer to the 'technical sophistication' of the site.

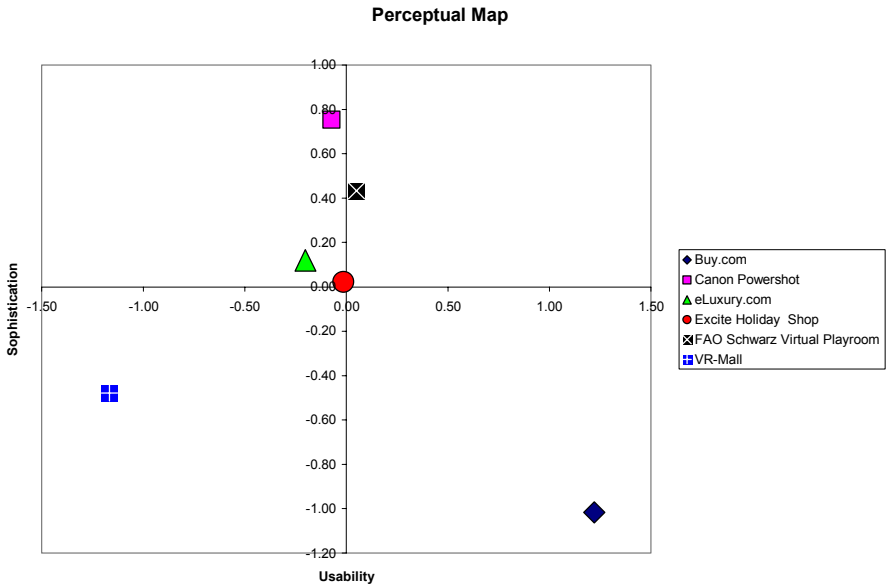

Figure 5 Perceptual Map based on the two main factors derived from the data through factor analysis.

The data shows that the willingness to purchase is strongly correlated to the usability of the site and has rather weak correlation with its technical sophistication. This seems to indicate that e-commerce applications in general cannot improve their commercial success by utilizing advanced technologies. Rather, commercial success is tied to the overall usability of a website. Looking at the perceptual map in Figure 5 we therefore immediately recognize a very fundamental dilemma. If we were to optimize the cost-benefit ratio, sites such as eLuxury.com would have to move their position within the perceptual map towards the position of buy.com. This, however, would require a strategic shift away from allocating resources for advanced media technologies towards allocating them to achieve an increase in usability instead.

Simply speaking, e-commerce developers are better off spending resources in improving navigation and website access rather than in introducing new and advanced technologies.

4. Conclusion

In conclusion, it has to be noted that the data presented in this paper was obtained through subjects with a computer science background. Other studies might find slightly

different result. Especially since the audience was computer savvy, however, the study seems to clearly indicate that e-commerce developers should give more attention to improving the use of existing, browser native technologies rather than introducing new technologies.

It also has to be noted that the study does not contradict other results that indicate that the use of 3d media has a potentially positive effect on the shopping experience. It merely states that given the current technology lock-in on the browser market, websites that require the installation of additional software or websites that are not capable of providing a user-friendly interface are bound to disrupt the State of Flow effectively destroying the overall Internet experience.

There are two important lessons to be learned.

1. Only a technology that is native to the vast majority of Web browsers should be used in an e-commerce website. This observation is independent from how well the technology scores by itself.
2. Current web3d technologies appear largely unusable due to overcomplicated interface design. More research is necessary to determine design guidelines for optimal navigational user interfaces.

References

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