COLLEGE CAMPUS VIRTUAL TOURS

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To the Graduate Council:

I am submitting herewith a thesis written by Jason Elin entitled "College Campus Virtual Tours." I have examined the final copy of this thesis for form and content and recommend that it be accepted in partial fulfillment of the requirements for the degree of Master of Arts, with a Major in Communication Arts, with a specialization in Corporate Communications.

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We have read this thesis and recommend its acceptance.

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COLLEGE CAMPUS VIRTUAL TOURS

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ABSTRACT

This paper discusses the importance of college campus virtual tours in comparison to the general importance of on campus college tours. Specifically, this paper analyzes four categories, as they relate to the size of a college. Web programming practices, download times, use of newer Web-technologies, and school ranking in a scale devised to categorize college campus virtual tours are presented as the means of scrutiny. Analysis yielded mixed results, with slight relationship between college size and virtual tour aspects such as design integration and download speed. While most colleges followed prescribed methods of Web site display/design, a few sample colleges exhibited problems with image pixelation and page alignment when screen resolution was to 800x600, and download times for narrowband were longer than what is acceptable by most. Additionally, data showed a positive correlation between college size and new Web-technology, but no clear correlation between college size and CVI Scale ranking. Since school size is not indicative of funding for specific departments, augmentation and improvement of a future study must gather data concerning the groups responsible for creating and maintaining each virtual tour.

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CHAPTER I

College Campus Virtual Tours

Choosing which college to attend may be one of the most important decisions in a young person's life (Rowh, 2003). A future collegian must determine his or her favorite schools realistically, weighing such factors as acceptance percentages, test and GPA requirements, other entry requirements, and an assortment of personal preferences. Recent information (Fitzgerald, 2003) states happiness, or the college in which the student can foresee the greatest happiness, may be the most important factor when choosing a college.

With future expectations, career plans, and success being supported by the foundation of college, the final decision of which college to attend is daunting. The decision is so important to so many that computer programs have been specifically designed to assist confused or ambivalent students (Ahl, 1985). In fact, the decision is so taxing for some students that the various programs contain nearly every deciding factor available for adjustment, allowing for ultimate flexibility and unique preference. Even with sophisticated programs, however, many suggest that a college campus visit is the most important facet of the entire college selection process.

How can a potential student really know all there is to know about a college, its sundry programs, and its surroundings if he or she doesn't actually view the campus? Robaina (2003) notes, that forming a complete view of a college is not possible without participation in an on-campus tour. Without a tour, it is nearly impossible to hear the opinions and thoughts of students and professors on campus. While providing the college information denouement, a memorable tour/experience while visiting a campus may be the added weight that tips the scales in favor of a specific college. Despite the benefits of a campus tour, often times, proximity or lack thereof, does not allow for an actual campus tour. Therefore, a virtual campus tour may be the next best alternative to an actual tour.

CampusTours.com (2004) states that a virtual tour is a very worthwhile alternative, but cannot be viewed as a suitable replacement for an actual visit or tour. Robaina (2003) notes various actual tour essentialities that are deficiencies of virtual tours: the ability to speak directly with admissions, an admission counselor, financial aid, career services, students, and alumni. Rowh (2003) supports the idea by suggesting that an actual college tour is irreplaceable, and simply reading about a college's facts is insufficient. Further, Rowh (2003) lists residential life, academics, extracurricular activities, the admission process, and a perspective of the surrounding community as necessities of a college tour that cannot be satisfied in a virtual tour. Other deficiencies of virtual tours, or areas in which information can not be sufficiently obtained, are as follows: dorm-room assignment, food on campus, spiritual life, everyday campus atmosphere, accessibility of professors, and whether or not graduate assistants teach more than actual professors (Lueck, 2002; Fitzgerald, 2003). As Keizer (1998) claims, virtual tours are poor imitations of actual tours. Despite many problems, virtual tours can still be very informative and beneficial.

Strictly informational possibilities of a virtual tour that don't necessarily need to be viewed in person are vast: academic majors/programs of study, athletic programs' success, availability of extracurricular activities, cost, location (urban to rural), school size, student-to-teacher ratio, and classroom size (Campus, 2003). Other advantages of a virtual tour are its inexpensive and rapid nature as compared to an actual campus visit

(Keizer, 1998). Additionally, studies measuring Web surfing (Dyrli, 2000) indicate that between 64 and 78 percent of high school seniors use the Web to gather information and assist in choosing a college. With such large numbers utilizing the Web for purposes relating to the collection of college data, it is absolutely essential that a college not only have a Web presence, but also a virtual tour. According to Chris Carson, president of campustours.com, the need for a virtual tour is still growing, as the Web grows and the standard printed view book becomes obsolete (Goldin, 1999). With a persuasive, user-friendly, and efficient Web presence, presented through the possibilities of a virtual tour, students have the opportunity to virtually visit schools that were previously impossible to visit.

Through my research and investigation I have determined that there has been no previous research analyzing various college virtual tours (VT). Indeed, there have been numerous studies of virtual reality and its multitude of effects and some research has even explored the concept of a virtual tour, but no comprehensive data has been gathered or analyzed, delving into the effectiveness of college VTs. My study will attempt to analyze and interpret the following research questions:

RQ1: To what extent does a VT's successful use of industry standard display/design techniques correlate with the size of the college?

RQ2: To what extent does a VT's download time correlate with the size of the college?

RQ3: To what extent does a VT's use of newer Web-technology correlate with the size of the college?

RQ4: To what extent does a VT's ranking, in terms of the CVI scale – which will be discussed and deconstructed later in this paper – correlate with the size of the college?

CHAPTER II

Literature Review

Evaluation of a Web site, or VT, is highly subjective. What appears to be of the utmost importance to one could be inconsequential to another. There are, however, a few categories in which to narrow Web site critiques for the purposes of this study: display/design issues, which cover overall aesthetics, monitor settings, and browser appropriateness; download speed and user perceptions of download speed; the use of newer Web-technology, with emphasis on 360-degree imaging programs prevalent in VTs; and finally, the CVI scale, a unique scale designed specifically for this study.

Display/Design Settings

A Web site's visual appeal, or aesthetic quality, is probably the most important initial aspect of Web page design. In fact, Alexander (1999) lists the visual appeal of a Web site as one of the top two criteria on which a site should be judged; the other being functional design. Without an attention-getting page, a viewer can quickly become disengaged; therefore, design effectiveness is crucial to VT effectiveness.

The primary display/design concern for Web programmers is whether or not their design is even seen as they intend it to be seen. Consequently, consideration must be given to the type of browser a viewer may be using, and design should follow accordingly. If a site is designed without using the majority standards, the probability of inoperable programming could make portions, or the entire page, unviewable.

As many experts state, designing a Web page for both Internet Explorer (IE) and Netscape Navigator (NN) is an absolute must (Callihan, 1999; Eccher, 2002; Niederst, 2001). However, according to recent statistics (Browser, 2004) (See Table 1), IE has accounted for over 82 percent of browser usage since the beginning of 2003, with IE 6 making up over 70 percent of the overall total. With recent data in mind, evaluation of a Web site's display/design attributes should be based upon the site's appearance within an Internet Explorer Web browser. While over 10 percent of Web surfers do not use IE, the industry standard, or majority, should be to what a designer caters. Additionally, various other Web browsers are available; WebTV, Lynx, Safari, and Mosaic, and they are usually compliant with the larger browsers' Web standards.

Table 1

Browser Statistics Month by Month

2004	IE 6	IE 5	O 7	Moz	NN 3	NN 4	NN 7
March	71.8%	11.2%	2.1%	9.6%	0.4%	0.4%	1.4%
February	71.5%	11.5%	2.2%	9.0%	0.4%	0.4%	1.5%
January	71.3%	12.8%	2.1%	8.2%	0.4%	0.5%	1.5%
2003	IE 6	IE 5	O 7	Moz	NN 3	NN 4	NN 7
November	71.2%	13.7%	1.9%	7.2%	0.5%	0.5%	1.6%
September	69.7%	16.9%	1.8%	6.2%	0.6%	0.6%	1.5%
July	66.9%	20.3%	1.7%	5.7%	0.6%	0.6%	1.5%
May	65.0%	22.7%	1.4%	4.6%	1.0%	0.9%	1.4%
March	63.4%	24.6%	1.2%	4.2%	0.9%	1.1%	1.4%
January	55.3%	29.3%		4.0%	1.2%	1.7%	1.1%
IE	Internet Explorer						
AOL	America Online						
Moz	Mozilla						
O	Opera						
NN	Netscape						

Source: Browser Statistics. (2004, April). Retrieved March 5, 2004, from http://www.w3schools.com/browsers/browsers_stats.asp

In addition to the importance of the type of browser for which a site is designed, the screen resolution at which a site is viewed is also very important. Niederst (2001) suggests that designing for multiple monitor resolutions is paramount in the ability to view a site. In fact, recent screen resolution statistics (Resolution, 2003) indicate the two most popular resolution settings are nearly equal in usage; 800x600 with 44 percent, and 1024x768 with 42 percent (See Table 2).

Table 2

Resolution Stats

Screen Resolution	Number of Users	Percentage
800x600	14,702,904	44
1024x768	13,992,243	42
1280x1024	1,636,875	4
1152x864	1,027,458	3
640x480	764,664	2
Unknown	463,074	1
1600x1200	228,132	0

Source: Resolution Stats. (2003, May 1). Retrieved March 5, 2004, from http://www.thecounter.com/stats/2003/November/res.php

While IE obviously has the browser advantage, there is no large preference gap for screen resolution. With this in mind, effective Web design should accommodate users in each of the largest categories. If each of the categories is not considered, the design implications could be great. For instance, a site designed with a 1024x768 user in mind, desiring a very large logo to be centered on the screen, when viewed by a user viewing at 800x600, could very possibly display a page that has a truncated image, and almost definitely a page that is not centered vertically and horizontally. Conversely, if a site is specifically designed for the resolution 800x600, when viewed at 1024x768, an image or text could be so small that it is impossible to discern. In addition to hardware concerns, aesthetical appeal is also an important part of Web page design.

There is no absolute guarantee as to what criteria or techniques an effective Web site must employ; as Alexander (1999) states, judgment for such ideas is relatively arbitrary. There are, however, industry standards that dictate a few ideas or rules should be followed.

One of the most agreed upon standards when creating an effective Web site is consistency. Dornfest (1999) and Lopuck (2001) call for a consistent feel, look, theme, or design to a Web site. Dornfest (1999) continues; overall consistency should be incorporated into the design aspects covering bullets, navigation bars, and every other controllable variable. Additionally, Eccher (2002) lists consistency as one of the most important aspects of Web design. Eccher (2002) expands, stating that not only should the overall feel or design of a Web site remain consistent, but the use of graphics, font style, and Web jargon should remain consistent throughout an entire Web site as well. Whatever the specifics are, Web design experts generally agree that the feel of a page must remain consistent from the introductory splash page or home page, to the most remote internal page or obscure internal hyperlink (See Appendix A).

In addition to preparing or designing with the smallest of hyperlink details in mind, the control of hyperlinks within design should also be a very important consideration. With recent design ideas and techniques favoring the use of HTML tables, frames have become almost obsolete. Lopuck (2001) explains that the use of frames should rarely, if ever happen; instead, the use of HTML tables should be used whenever possible. By using HTML tables instead of frames, a Web site viewer is less susceptible to control problems like broken hyperlinks and/or nested hyperlinks (See Appendix A). Additionally, the use of HTML tables, if used properly, can duplicate the abilities and benefits of frames, further minimizing their use. Besides HTML tables, the use of the design abilities of Cascading Style Sheets (CSS) has made frames even more infrequent (See Appendix A). There are, however, some holdovers to old technology and design. Eccher (2002) states that despite any inclination to use frames, avoiding frames if at all possible is a necessity.

While the avoidance of frames can control some of the logical flow within a site, there is more to consider than simply an alternative to frames. In order to assist a viewer in a Web experience, Dornfest (1999) and Lopuck (2001) agree that a Web design's hierarchical layout is very important. Callihan (1999) concurs, and augments the idea by stating that a Web site's layout should not only be hierarchical, but should also follow a very strict outline format. To assist in the control aspect of design that a frame avoidance and hierarchical layout provides, ease of navigability is a broad area of concern for competent Web site designers.

The ability to successfully and efficiently navigate a Web site has many facets. In general, a Web site's navigability should be intuitive, requiring very little reasoning or deduction (Eccher, 2002). Eccher (2002) continues on by stating that a Web site's usability, or the speed with which a viewer can find and process information, is the primary means by which a site maximizes navigability. Perhaps the most widely used, and highly regarded, technique to facilitate intuitive navigability is a site map (See Appendix A). Callihan (1999) and Alexander (1999) claim that the use of a site map is essential. With a site map, a user can easily navigate to the initial home page, or any of the various sub-pages. Additionally, logically named browser titles, page titles, and Uniform Resource Locators (URLs) (See Appendix A) can greatly improve a user's ability to navigate intuitively.

Beyond the simple idea of intuitive navigability, a little design simplicity can further assist in the goal of efficient navigability. Dornfest (1999) suggests that a background should not impede the readability of the text. Very often when designing Web sites, designers and programmers do not account for the simplest of problems, and the use of identical or similar colors for both font and background cause at best an eyesore, and at worst, text that blends into the background, creating text that is either illegible or hidden. Additionally, a Web designer must consider the idea of misperceiving buttons on a Web page. Lopuck (2001) notes that buttons must appear clickable, and not concealed, indiscernible, disguised as images, or adjacent to cluttered design. Lopuck (2001) adds; a Web site should have no more than five to seven main categories on the home page, as any more than that is aesthetically distracting. While design flaws can hinder navigability, technology flaws can also hinder or halt navigability.

Dornfest (1999) indicates that attention should be paid to the technology behind the creation of 2-D spatial relationships on a Web site. Both a design and programming problem, the lack of proper 2-D spatial relationships can negatively affect a site's navigability. While very simple, and easy to incorporate, the need to use spacing tools (i.e. HTML tags
 and <hr>) cannot be overstated (See Appendix A).

The overuse of technology can also negatively impact a Web site's navigability. Eccher (2002) notes that overusing technology, specifically newer Web-technologies, can limit a viewer's ability to see and navigate a site. With the ubiquitous nature of various scumware, spyware, malware, and adware technologies on the Internet, viewers of a Web site may often have security settings at a level that does not allow for the newest bells and whistles to be seen (See Appendix A). As a final warning, Eccher (2002) suggests that a check of all programming functionality can go a long way in assisting in the navigability of an efficient and effective Web site. Along with the ideas such as ease of navigability, hierarchical layout, and HTML table usage, designing the site with a specific purpose and specific user in mind is very important.

Dornfest (1999) posits that a Web site should tell a story about the person, people, or organization it represents. Pence (2001) and Lopuck (1999) agree, noting that when defining a site's purpose or concept, and telling the organization's story, a message of expectation is sent to the viewer. Therefore, a Web site should adequately and accurately convey a message about the organization it represents. In addition to a site's story, knowing the audience for which the site is designed is imperative to success.

Niederst (2001) and Pence (2001) state that considering who the audience is, and knowing what they desire, is an important concept of Web site design. For instance, if a site is designed for children, there should be more bright colors, interactivity, and larger fonts. Eccher (2002) notes that sometimes designing effectively means sacrificing. When designing a Web site for a specific audience, complex technology and extravagant design ideas often times must be resisted in order to reach the largest possible audience. In other words, a Web site designed for narrowband modem users should probably not contain large images or complex technology that takes a long time to load (See Appendix A).

Various aspects of Web design can be considered important. In fact, the idea of 'most important' is almost totally subjective in Web design. There are, however, standards and guidelines that experts agree upon. Site consistency, hyperlink control, frame avoidance, hierarchical layout, navigability, design simplicity, site focus, and audience consideration are clearly among the most important factors of Web design to many expert Web designers.

Download Speed

User impatience is a very practical aspect to consider when designing Web pages or VTs. With the average user spending in excess of 4.8 hours per month waiting for Web pages to download, design efficiency built specifically to decrease download time is of the utmost importance (Computerworld, 1998). What's more, on average, users spend upwards of 200 million hours of waiting time, per month, in the U.S. alone (Computerworld, 1998). Gone are the days when a user had to wait an entire day, or weekend, for a large file download; nevertheless, download speed, contingent upon the type of modem used, is vital to a Web page's effectiveness.

With long delays in mind, Gellman (1996) states that the quality of time a user spends on the Internet is directly related to the speed of that user's modem. Stats from WebSiteOptimization.com (2004) show that as of June 2003, 51.4 percent of home Internet connections are connecting via a 56Kbps (56K) modem; and roughly 36 percent connect via broadband connections (See Appendix A). Further, statistics indicate that broadband usage, which is currently over 22 million users (Greenspan, 2003), is steadily on the rise; Argaez (2003) notes a 49 percent increase between May 2002 and May 2003. Additionally, Argaez (2003) shows that the projected broadband usage in 2008 will be over 61 percent of U.S. users. Indeed, statistics from Jupiter Research (Greenspan, 2003) point to the fact that broadband penetration will be over 45 percent in 2007.

Contrary to broadband usage, narrowband usage (56K and slower) is steadily declining, showing a more than 12 percent drop between May 2002 and May 2003 (Argaez, 2003). It should be noted, however, that while trends show an increase in broadband usage and a decrease in narrowband usage, some statistics (Pastore, 2001) indicate that nearly 75 percent of narrowband users are content with their service. The apparent narrowband satisfaction could indicate a slowdown in current trends. Regardless of connection type, there are various techniques to optimize Web design and improve download speed.

Various simple techniques can be used to speed up download time. Eccher (2002) notes that image compression can create faster download times; Gellman (1996) recommends turning off the auto image load options available in various browsers; and Maney (1998) suggests that all pages should be kept under 30Kb so they will load quickly. It should be noted, however, that the computer industry's exponential growth during the past six years has made the 30Kb limit suggested by Maney quite restricting, and quite unnecessary. Additionally, Methvin (1998) suggests a variety of very useful and effective tips for speeding up download time:

- Recycling graphics – Graphics loaded once are stored in cache memory, and are displayed subsequent times at a much faster rate (See Appendix A).
- Using width and height attributes within HTML image tags – The use of width and height attributes allow the browser to allocate the correct on

screen size for the graphic, thus freeing up resources for other parts of the page to load.

- Differentiation between .jpg and .gif images – Often times a .jpg image is best suited because of better compression, but .gif files work best when images are small and simplistic. Each type of file should be tried for each image so that the size and quality can be observed, and then the proper selection can be made (See Appendix A).
- Using thumbnails – When displaying images, usually those with very large file sizes, it is wise to display smaller thumbnail versions first. This technique allows an image to be seen, and usually, a hyperlink to the actual size image is available (See Appendix A).
- Using the HTML lowsrc attribute within an HTML image tag – Allowing an image to preload does not necessarily speed up actual download time, but the perception of time for a viewer is improved (See Appendix A).

Interestingly enough, studies by Jarad Spool, as noted by Sevcik (2003), indicate that a user's perceived speed satisfaction level is not correlated to actual download time; instead, perceived speed is correlated to successful task completion. Similarly, Bhatti, et al, concluded that a user's tolerance level increased when associated with task completion. Despite the various methods of increasing the download time of a Web page, there is still a boundary at which both effectiveness and users' tolerance are lost.

While opinions vary slightly as to what constitutes a long download time, and how long a user will wait, various studies and opinions have weighed in on the subject. According to Gellman (1996), waiting ten seconds for a page to load is a long time. This concept is consistent with studies done by IBM's Robert Miller in 1968, when it was determined that response time needed to be less than one second for users to be fully engaged, and any wait more than ten seconds caused users to become disengaged and counterproductive (Sevcik, 2002). Additional research by Bhatti, et al, corroborates the idea, stating that perception becomes negative once the threshold of 10 seconds is reached (Sevcik, 2002). Further, Zona Research has established 8 seconds as the point at which users become disinterested; and a Gomez survey conducted in 2001 concluded that less than 10 to 12 seconds is the preferred download time of most people (Sevcik, 2002). Beyond a static number of seconds signifying acceptance or tolerance, Sevcik (2002) has established that there are actually stages at which a user goes through different feelings.

A provocative study by Sevcik (2002) indicates that there are three zones representing how a user feels, based upon the duration of time a user is willing to spend waiting for a download, while browsing the Web: satisfied, tolerant, and frustrated. Based upon previous research, it has been accepted that the average user is satisfied with a download speed of 10 seconds or less. The second zone, the tolerance zone, is a long, semi-undefined period of time between the satisfaction and frustration zones. The tolerance zone's time is one that exceeds satisfaction, and the user becomes annoyed. It should be noted, however, that at this stage the user is still willing to wait without quitting, thus being tolerant. The third zone, frustration, or understanding what it takes to reach this zone, is possibly the most important in the scope of this study. According to Ramsey, et al, as noted by Sevcik (2002), at 41 seconds or longer, users' interest turned to frustration; Bhatti, et al, noted the time as being 39 seconds; and Paula Selvidge indicated that and time equal to or greater than 30 seconds was the frustration threshold.

Regardless of the actual amount of time in which a user prefers a Web page to load, or the actual amount of time in which a user becomes frustrated, a successful, efficient Web site must be load swiftly. For the purposes of this study, download times for initial splash screens and/or homepages will be recorded. Any recorded download time that approaches or surpasses the boundaries of what the literature declares unacceptable will be viewed negatively.

New Web-Technology

One last aspect of VT design that needs to be considered for this study is the use of new Web-technology. This study will concentrate on the new Web-technology that is used in the VTs viewed, and not on all of the new Web-technology that is prevalent on the Web today.

The primary means of extending the ability of a VT to go beyond simple pictures and text is the 360-degree panoramic photo technology. Sometimes called fish-eye pictures because of the lens the pictures are taken through, and originally called a PhotoBubble by Interactive Pictures Corporations (iPIX), the 360-degree photos are probably the most important transition from 2D static Web experiences, to 3D interactive Web experiences. The various technologies that were used in VTs are as follows:

- IPIX
- QuickTime Viewer
- Hot Media
- Total View
- Surround Video
- Live Picture

- IMG Zoom Viewer
- 3D Vista Viewer (See Appendix A)

Each panoramic technology is slightly different from the other. Some have zooming options while others do not. Additionally, some panoramic technologies have a greater availability of scrolling, both vertical and horizontal, like the 3D Vista Viewer's equirectangular images, while others have very limited scrolling. Another worthwhile aspect of certain panoramic technology is the presence of various interactive components. A typical component may provide a pop-up text box that describes a building or historical site on campus. However, possibly the most beneficial component is the "hotspot." The "hotspot" links to other areas of the tour that can connect to other campus areas of interest. With interconnected use of "hotspots," a Web programmer can provide a realistic, 3D tour of an entire campus, with jumps from one landmark to another eliciting the feeling of actually walking on campus. Finally, a few of the panoramic options are created using Java based applications that allow for the incorporation of rich media. The use of Java however, is not limited to providing a method of 360-degree panoramic imaging.

Java, and a few other new Web-technologies, is also used in various ways to improve a few of the VTs. From scrolling messages to drop down menus, Java can be used as a way to allow for quite a bit of user interaction. In addition to Java, the use of Shockwave/Flash technologies is utilized in many VT. Shockwave and Flash allow for most of the same options as Java, but with Shockwave and Flash there seems to be a greater ability to create animations and graphics that are effective on the Web. Finally, the use of streaming media, both audio and video, can make the experience of viewing

VTs quite interesting and interactive. One of the most important and influential uses of streaming media is the ability of a college to tell a story, and provide a VT that is as similar to a real tour as possible.

CVI Scale

An instrument used to measure a VT is the CVI scale. To facilitate the understanding and differentiation of the VT types, the CVI scale has as its three main components: Conventional Virtual Tours (CVT), Virtual Reality Tours (VRT), and Innovative Virtual Tours (IVT) (Campustours, 2004). Each component of the CVI scale is named and defined according to the extent to which appropriate Web design techniques and use of Web technology is utilized to make the VT resemble, as close as possible, an in-person visit to a college campus.

Typically, a CVT (see Figure 1) is the most rudimentary of virtual tours. The CVT, much like the Web page of a novice, usually relies on nothing more than simple HTML, text, and pictures to convey a message. Further, a CVT may include an interactive campus map, and hyperlinks to campus activities and offices. While the CVT is not inherently insufficient, or incapable of positive message conveyance, there are, nevertheless, options that provide more flexibility and greater possibilities.

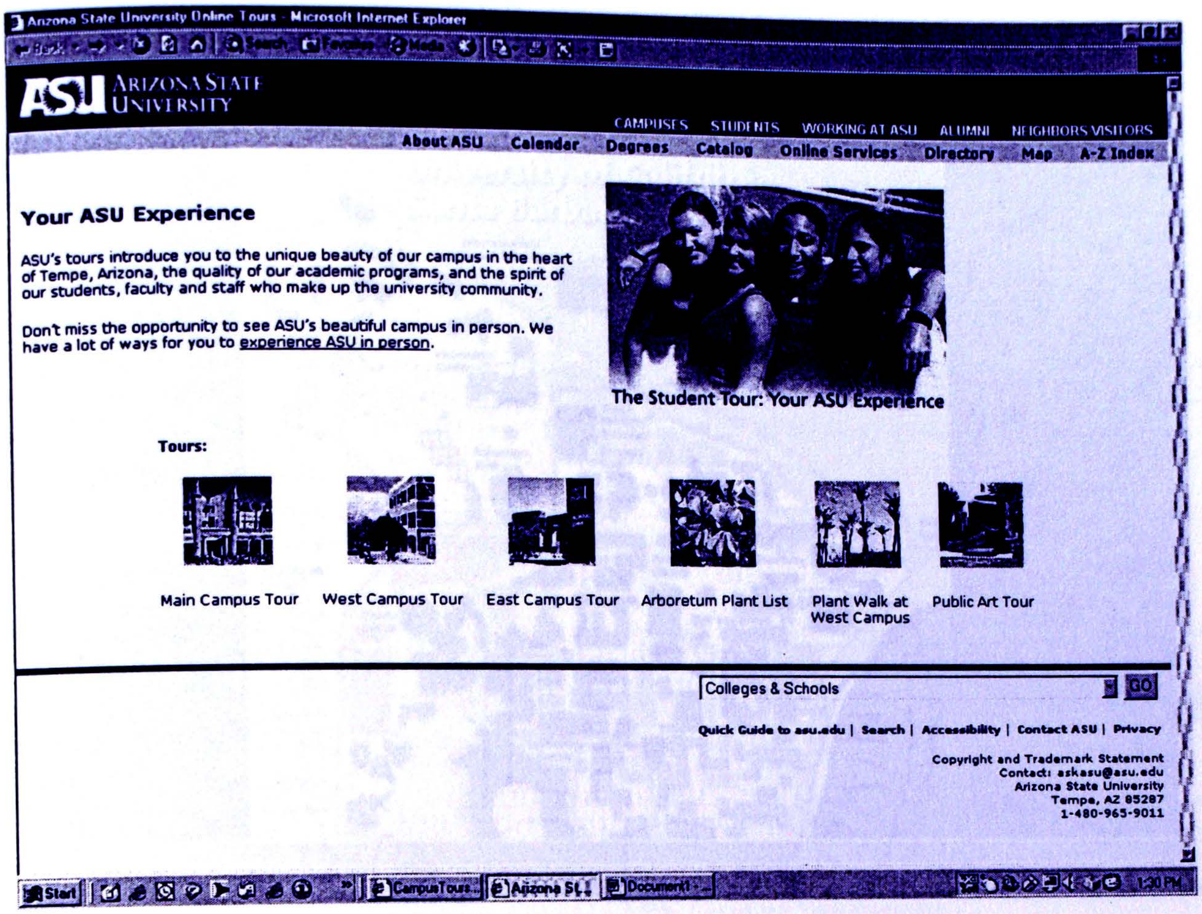

Figure 1: Example CVT from Arizona State University with simple HTML

Source: Your ASU Experience. (n.d.). Retrieved March 13, 2004, from http://www.asu.edu/tour

One such option that takes advantage of the greater flexibility and numerous possibilities is the VRT. The VRT (See Figure 2) is a virtual tour that begins to utilize the vast possibilities of newer Web-technology, and the aforementioned characteristics and advantages of advanced Web design. While a VRT is intrinsically a CVT, the added use of technology makes the VRT much more powerful, and much more similar to an in-person college campus tour.

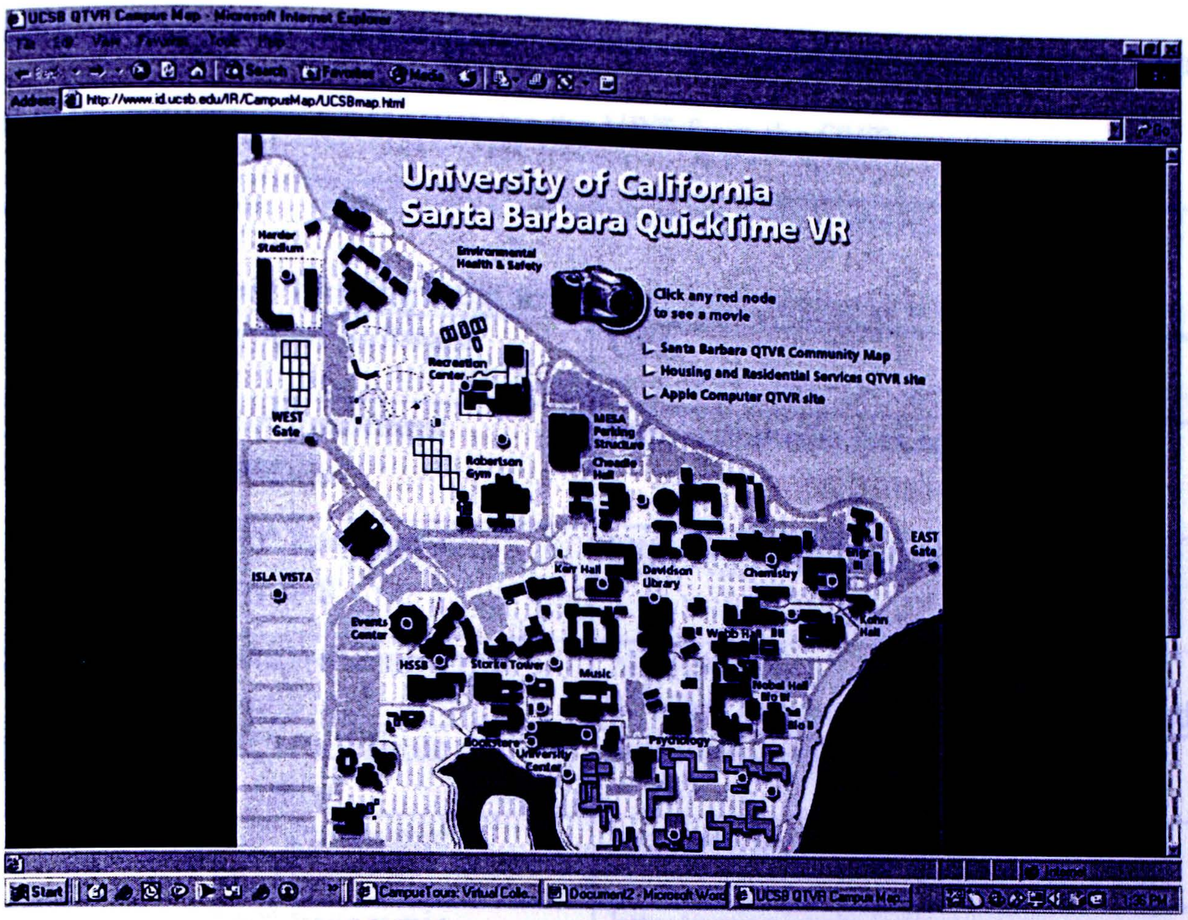

Figure 2: Example VRT from University of California Santa Barbara with 360-degree imaging

Source: University of California Santa Barbara QuickTime VR. (n.d.). Retrieved March 13, 2004, from http://www.id.ucsb.edu/IR/CampusMap/UCSBmap.html

One of the technologies that separate a VRT from a CVT is panoramic imaging. Panoramic imaging is a way in which multiple photographs are "stitched" together to form a 360-degree picture. Additionally, a 360-degree imaging program (See Table 3), of which there are many, can add various interactive methods for the Web surfer to experience the picture. A viewer is capable of many visual changes within the panoramic photo: zooming in, zooming out, scrolling horizontally, and scrolling vertically. Further, in some cases, users are able to make use of "hotspots," locations on the image that serve as a link to other points of interest on campus. Often times, these image "hotspots" are used as a way to link to other panoramic 360-images, thus providing an extensive tour of the entire campus. The large assortment of interconnected panoramic 360-images is not, however the only attribute that separates the VRT from the CVT.

Table 3

360-Degree Panoramic Imaging Programs

Program Name	Type of Software	URL
IPIX	360° Panoramic Imaging	http://infomedia.ipix.com/
QuickTime VR	360° Panoramic Imaging	http://www.apple.com/quicktime/qtvr/
Hot Media	Comprehensive rich media tool	http://www-306.ibm.com/software/awdtools/hotmedia/
Be Here - TotalView	360° Panoramic Imaging	http://www.behere.com
Live Picture	360° Panoramic Imaging	http://www.roxio.com
IMG Zoom Viewer	360° Panoramic Imaging	http://www.roxio.com
3D Vista Viewer	360° Panoramic Imaging software package inclusion	http://www.3dvista.com/
Surround Video – Black Diamond	360° Panoramic Imaging	NA

In addition to the 360-images, the VRT utilizes various programming and newer Web-technologies to improve upon the CVT. Programming languages such as Java allow virtual tour designers to design and implement applets that increase efficiency by providing more site interactivity. Additionally, the advent of complex scripting languages such as JavaScript and VBScript that create pages ASP and PHP have provided for the possibility of various complexities within a VRT. Alongside database applications and languages such as SQL and ColdFusion, a user can perform a variety of data manipulation functions within a VRT (See Appendix A). Despite the fact that a

VRT makes use of most, if not all technology available to programmers, the VRT is not the most advanced virtual tour.

Just as the technology in a CVT is inherent in a VRT, the same can be said of the relationship between a VRT and an IVT. An IVT (See Figure 3) is the collaboration of all the technology included in a VRT; in addition, it contains aspects that give the feel of an actual in-person visit.

Figure 3: Example IVT from Brandeis University showing student-led tour options

Source: Brandeis University Admissions TOUR. (n.d.). Retrieved March 13, 2004, from http://www.brandeis.edu/tour/tour.html

Much like an on campus tour, an IVT is a led tour. While an option to randomly experience the tour in a user-specific manner is often available, the benefit of an IVT is that it has the preferred option of a tour that is led by someone, or in some cases, something such as an animated character. IVTs exhibit boundless possibilities when technology is used in a linear fashion with a cyber-tour guide providing information about every aspect of a specific college, thus creating a virtual tour that is very much like a real tour.

CHAPTER III

Method

Prior to any type of Web page analysis, the type of computer to be used and its various specifications must be determined. Regardless of the Web-programming knowledge, technology used, or computing power controlling the distribution of a message (or Web site), the receiver of the message, the home computer, is the ultimate decision-maker of a Web page's efficiency and effectiveness. Therefore, the specifications of the computer used in this analysis are as follows:

1. Intel® Pentium® 4 CPU 2.0 GHz (See Appendix A)
2. 512 KB of L2 cache (See Appendix A)
3. 512 MB of DDR SDRAM (See Appendix A)
4. 400 MHz Bus (See Appendix A)
5. Realtek RTL8139 Family PCI Fast Ethernet NIC (See Appendix A)
6. hp pavilion mx75 monitor
7. Intel® 82845G/GL Graphics Controller
8. Microsoft XP Home Edition

According to Niederst (2001), design consideration should be given to the various monitor color settings, with the three major groups being 24 bit and above (17 million colors), 16 bit (65,000 colors), and 8 bit (256 colors). However, to avoid possible problems related to dithering (See Appendix A), the video card/monitor was set to use 32 bit True Color for the course of analysis.

School Selection

To determine which schools to analyze, the entire population of 665 schools from campustours.com (captured Feb 1, 2004) was numbered from 1 to 665 respectively. The numbering was done alphabetically by state, with each state's schools in alphabetical order.

After numbering, random numbers were generated to select colleges representing each of three categories: small, less than 2501 students; regional, from 2501 to 10000 students; and major, greater than 10000 students (See Appendix B). A simple random sample without replacement was drawn until there were 15 colleges from each category. See Table 4 below.

Table 4

Colleges with Enrollment Numbers and CVI Scale Grade

Major Colleges					
College	Full	Part	Grad	Total	CVI Scale Grade
Arizona State University, AZ	26403	7545	10267	44215	CVT
Texas A&M University, TX	33758	2324		36082	CVT
San Diego State University, CA	19720	6053	5680	31453	VRT
George Mason University, VA	13949		9890	23839	IVT
University of California: Davis, CA				22444	CVT
Southwest Texas State University, TX	14642	3838	2997	21477	CVT
University of Delaware, DE	16000		3000	19000	VRT
University of California: Santa Barbara, CA	18822			18822	VRT
Miami University: Oxford Campus, OH	14382	906	1287	16575	VRT
Northwestern University, IL	9719	42	6385	16146	VRT
Youngstown State University, OH	8670	2355	1197	12222	VRT
Stephen F. Austin State University, TX	9753	2166		11919	CVT
Duke University, NC	6085	59	5208	11352	VRT
University of Wyoming, WY	8550	2574		11124	CVT
Fashion Institute of Technology, NY	6593	4060	112	10765	CVT

Regional Colleges					
College	Full	Part	Grad	Total	CVI Scale Grade
University of Wisconsin-La Crosse, WI	7946	688	682	9316	CVT
The College of New Jersey, NJ	5025	779	997	6801	VRT
Duquesne University, PA	4994	519		5513	VRT
State University of New York College at Geneseo, NY	4956			4956	CVT
University of Wisconsin-Platteville, WI	4714		240	4954	CVT
Arkansas Tech University, AR	3534	1222	196	4952	IVT
Mesa State College, CO	3719	1129		4848	CVT
Fashion Institute of Design and Merchandising, CA				4500	VRT
Brandeis University, MA	3083	58	1264	4405	IVT
Mary Washington College, VA	3233	732	35	4000	VRT
Oklahoma City University, OK	1497	603	1535	3635	VRT
Oral Roberts University, OK	3351			3351	CVT
Northern State University, SD				3100	VRT
Milwaukee School of Engineering, WI	1721	916	420	3057	CVT
Oberlin College, OH	2843		15	2858	CVT

Small Colleges					
College	Full	Part	Grad	Total	CVI Scale Grade
New Mexico Highlands University, NM				2500	CVT
Lafayette College, PA	2203	141		2344	CVT
Hardin-Simmons University, TX	1736	471	128	2335	CVT
Barnard College, NY	2250	68		2318	VRT
DePauw University, IN	2174	42		2216	VRT
Gallaudet University, DC	2175			2175	CVT
Oklahoma Baptist University, OK	1665	483	23	2171	CVT
Dickinson College, PA	2032	35		2067	VRT
Ohio Wesleyan University, OH	1897	33		1930	VRT
Moravian College, PA	1745	19		1764	VRT
Elizabethtown College, PA	1600	125		1725	CVT
St. Mary's College of Maryland, MD	1353	212		1565	CVT
Bridgewater College, VA	1112			1112	CVT
Emory & Henry College, VA	890			890	VRT
Alaska Pacific University, AK	307		218	525	VRT

Based upon the Central Limit Theorem (CLT), a sample size selection of 30 sufficiently covers a large population such as the one used (Anderson, 1999). Accordingly, the random selection of 15 schools from each category established (small, regional, and major) more than satisfies the requirements of the CLT. A major drawback to the selection process is that it was not immediately representative, as the required 10 or 15 schools from each category was not drawn from the population until nearly 60 random numbers were generated. Further limitations of the sample are that two colleges, Herkimer County Community College, NY, and Tiffin University, OH, had to be disregarded because the college was devoid of a VT; there were 31 schools without VTs; a virtual tour could not be found, or population statistics for the college could not be obtained. Finally, during the selection of 45 representative colleges, 12 colleges (See Table 5) were discarded from the study because 15 colleges representing two of the three categories (small and regional) were already represented.

Table 5

Colleges Discarded During Simple Random Sample

Designated Number	Representative College
356	Hartwick College, NY
617	Mary Baldwin College, VA
44	Mills College, CA
199	Transylvania University, KY
333	Rutgers The State University of New Jersey: University College Newark, NJ
353	Daemen College, NY
387	State University of New York College of Technology at Canton, NY
312	Chadron State College, NE
518	University of Scranton, PA
417	Wingate University, NC
31	California State University: Monterey Bay, CA
70	Vanguard University of Southern California, CA

Modem and Download Issues

Based upon aforementioned network connection statistics, the download analysis portion of this study was conducted using both a 56K dial-up modem and a 2Mbps (See Appendix A) cable modem.

To ensure that each download time was based on an initial page-viewing, prior to beginning the 45 downloads with the cable modem, all cookies, temporary Internet files, and offline content stored on the computer was deleted (See Appendix A). Additionally, the same procedure was conducted prior to the same 45 downloads using the 56K modem.

After clearing all contents that could affect the download time, each page was viewed while noting the time elapsed between the mouse-click beginning the download, and page completion. For the purposes of this study, page completion was determined by noting the word 'Done' in the status bar; or in the case of pages with audio and/or video media, page completion was recorded when the streaming media (See Appendix A) began to play.

It must be noted, however, that limitations to the download time data are quite varying. Download speeds of each modem type can be negatively affected by a wide variety of problems, like line noise, Internet congestion, and crosstalk (See Appendix A). Additionally, as previously mentioned, download speeds are greatly affected by Web design practices. Poor Web design practices such as the placement of too many images or the extensive use of new Web-technologies can dramatically decrease download speed. Therefore, a Web page's download speed and/or grade on the CVI scale may not necessarily be indicative of a deficiency in one specific area. Instead, the possible variables that can hinder download speed performance can be from a variety of sources.

CHAPTER IV

Results

The first research question posed by this study concerned the relationship between the size of a college and the use of industry standard display/design techniques. As noted previously, the criteria for aesthetic Web page analysis is subjective. As such, any results or conclusions from this study specifically relating to Web page design can only be measured by the standards agreed upon by experts.

The analysis of display/design techniques showed very interesting results. It appears as if all colleges reviewed follow most recommended techniques for Web programming with no deprecated tags or noticeable deficiencies, which include improper display in an IE browser, site inconsistency, lack of hyperlink control, use of frames, lack of hierarchical content, no display story and/or audience consideration, and improper display with a 1028x768 screen resolution. There are, however, areas in which deficiencies were noted: ease of navigability, use of technology, and display with an 800x600 screen resolution.

Ease of navigability was only a problem with one college, Youngstown State University of Ohio (YSU). While using Flash is often times an improvement upon a site's design, YSU's use of technology eliminated the ability to navigate by providing no means of interaction with other college activities and internal pages.

In addition to problems with tours designed similarly to the YSU tour, there were quite a few discrepancies between what is displayed with 1028x768 resolution, and what is displayed with an 800x600 resolution. When viewed at 800x600, some sampled colleges' VTs showed two specific problems: pixelation problems and unintentional, non-centered design. College VTs that exhibited image pixelation problems (See Table 6) fell into two categories: static image pixelation, and iPIX, or other comparable software, pixelation.

Table 6

Colleges with Pixelation Problems

College	Type of Pixelation Problem	College Size
San Diego State University	Static Image	Major
Duke University	iPIX	Major
George Mason University	Static Image	Major
Southwest Texas State University	Static Image	Major

In addition to pixelation problems, the results of using an 800x600 screen resolution caused obvious design flaws, such as horizontally off-centered pages, within a few colleges' VTs. See Table 7 below.

Table 7

Colleges with 800x600 Resolution Design Problems

College	Design Problem	College Size
Bridgewater College	Horizontally off-centered	Small
University of Wisconsin-La Crosse	Horizontally off-centered	Regional
Milwaukee School of Engineering	Horizontally off-centered	Regional
Southwest Texas State University	Horizontally off-centered	Major

The second research question dealt with download times accumulated for each of the colleges in the random sample (See Appendix C). Results with a broadband modem showed only two colleges, YSU and Fashion Institute of Technology in New York with download times over the 10-second standard of acceptability; download times were 15.53 seconds and 10.28 seconds respectively, far higher than the 4.07 second average among all broadband times. The use of a narrowband 56K modem yielded much different results.

Out of the 45 colleges studied, 26 colleges had download times at or over the frustration zone's 30-second barrier (See Table 8), with the VT from YSU having the maximum elapsed time of 183.35 seconds. Results of download times over the frustration zone appear to negatively correlate to the size of college, with times increasing as college group size decreases. Average download time for narrowband downloads was 44.78 seconds.

Table 8

Colleges with Download Times At or Over the Frustration Zone with 56K Connectivity

College	Download Time in Seconds	College Size
Alaska Pacific University, AK	30.11	Small
Mesa State College, CO	30.88	Regional
University of Wisconsin-La Crosse, WI	31.02	Regional
Stephen F. Austin State University, TX	31.25	Major
Oklahoma Baptist University, OK	31.49	Small
Southwest Texas State University, TX	33.31	Major
Milwaukee School of Engineering, WI	35.16	Regional
University of Wisconsin-Platteville, WI	41.68	Regional
Ohio Wesleyan University, OH	43.13	Small
Emory & Henry College, VA	44.19	Small
Moravian College, PA	44.87	Small
Northern State University, SD	45.73	Regional
Elizabethtown College, PA	47.08	Small
DePauw University, IN	47.53	Small
Dickinson College, PA	49.76	Small
Lafayette College, PA	66.79	Small
San Diego State University, CA	68.15	Major
Mary Washington College, VA	69.6	Regional
State University of New York College at Geneseo, NY	72.54	Regional
Gallaudet University, DC	75.46	Small
Bridgewater College, VA	76.97	Small
Fashion Institute of Design and Merchandising, CA	77.64	Regional
George Mason University, VA	92.18	Major
Arkansas Tech University, AR	121.49	Regional
Fashion Institute of Technology, NY	144.83	Major
Youngstown State University, OH	183.35	Major

The third research question in this study is the relationship between college size and the use of new Web-technology. Panoramic technology was non-sequential according to college size, with major, regional, and small schools utilizing eight, three, and six instances respectively. The use of other new Web-technologies appears to have no positive correlation with college size. In the case of Flash technology, there were two instances for major, four instances for regional, and one instance for small colleges (See Table 9). Results of streaming media use only showed one instance from major colleges and three regional colleges utilizing such technology.

Table 9

Use of Flash Technology Related to College Size

College	College Size
Youngstown State University, OH	Major
Northwestern University, IL	Major
Mary Washington College, VA	Regional
The College of New Jersey, NJ	Regional
Duquesne University, PA	Regional
University of Wisconsin-Platteville, WI	Regional
Moravian College, PA	Small

The final research question of this study was an analysis of the CVI Scale, or the disparity between low-end VTs and high-end VTs, and their subsequent relationship with college size. See Table 10 below.

Table 10

CVI Scale Totals Related to College Size

	College Size		
CVI Scale	Major	Regional	Small
CVT	6	6	9
VRT	8	7	6
IVT	1	2	0

While CVTs and VRTs follow trends that would indicate the larger colleges possess better VTs, according to the CVI Scale, IVTs do not necessarily follow such a trend.

CHAPTER V

Discussion

Choosing and conducting this study was initially intended to be an analysis of VTs. After much analysis, however, correlation between VTs and college size was considered to formulate the four research questions. This study was to determine whether design practices, download times, use of new-Web technologies, or CVI scale rankings have any correlation to college size.

The first purpose of this study was to determine the correlation, if any, between college size, in terms of enrollment, and the use of recommended display/design techniques on the Web. It appears that the major colleges have more deficiencies than either regional or small colleges, with significant pixelation issues occurring in only major college VTs, and navigation problems occurring in only the VT of YSU, a major college. Results could very well be an indication of the connection between design simplicity and functionality, with larger colleges implementing more in their respective VTs, and devoting less attention to what they deem minor design issues.

Download times, with broadband and narrowband connections, were analyzed for the second research question of this study. While there were only two colleges, both of which were major colleges that had broadband download times over 10 seconds, slower downloads had more to do with poor Web-design than slow connection speed. Both YSU and Fashion Institute of Technology, NY, used graphic or Flash-heavy home page designs, deciding to have the majority, if not all, content on the initial page.

Narrowband problems, however, yielded results that indicate larger colleges generally have faster download times. The 26 colleges with a greater than 30 second download time probably suffer from either inadequate training/expertise or lack of IT department funding. In addition, the combination of an extensive amount of information colleges wish to put on their VTs and the rising popularity of broadband connectivity have caused the creation of Web pages and VTs that aren't specifically designed for narrowband users.

The third research question was designed with the purpose of determining the correlation, if any, between the use of new Web-technology and the size of college using said technology. It appears that there is a positive correlation between college size and use of new Web-technology, as there were 11, 10, and seven instances of usage among major, regional, and small colleges respectively. Possibilities for the positive correlation are the same as those found in the previous two research question conclusions; larger colleges tend to use more advanced technology and boast VTs designed for the high-end Web surfer utilizing broadband connectivity.

Lastly, the purpose of this study was to determine the connection between college size and CVI Scale ranking. Results for this research question were largely inconclusive. While small colleges had more CVTs and fewer VRTs, indicating a lower level of VT design, not all data supported a positive relationship between college size and CVI Scale ranking. The lack of correlation may be a result of many possibilities: a college may have intended to design their VT a specific way without consideration for the similarity to an on-campus tour, a college may simply lack the funding or expertise to design and maintain an advanced VT, or a college may have devoted more attention to their Web-presence than another.

Given that so many future collegians obtain much of their information from the Web, implications of this research are broad. One, colleges should devote more attention and resources to the development and maintenance of their VTs. Two, design of a VT should follow widely agreed upon standards, but design should be focused on simplicity and inclusiveness of both narrowband and broadband users. Further, VT design should be more informative, having the feel of an on-campus tour, so that future students receive a true representation of life on a college campus represented by a VT.

Future research considerations for this study should narrow the gap in understanding the various correlations between VTs and college size. As previously alluded to, an important factor that was not considered for this research is funding, or resources received by the various departments responsible for VT creation and maintenance. While enrollment size is important in defining the overall size of a college, so to, is funding. Additionally, the type of college should be considered when conducting future research. A college considered to be a leader in information technology or computer science, may garner more attention for VT design, whereas, a school known for a strong liberal arts core may not.

Future research may also attempt to develop an actual definition of a VT, and which colleges' present VTs contain sufficient technology to remain defined as such. The researcher should strive to ensure that whatever definition created or given, that such a definition allows for inclusion of all criteria-fitting VTs, exclusion of criteria-deficient VTs, and much like the CVI Scale, the categorization of various levels of VTs.

As the study of college campus VTs is at its relative genesis, much can be learned about VTs and the messages they convey. Future researchers' challenges will be to grow along with technological innovations as they are created and as they occur, and to adjust research accordingly.

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APPENDIX

Active Server Page (ASP)	A dynamically created Web page with an .ASP extension that utilizes a scripting language like VBScript or JavaScript.
Adware	Scumware (2003) states, "Adware is advertising supported software. It…carries…links that attempt to create revenue for the company. It usually installs components on your computer that transmit marketing information to central servers which…is then used to tailor the advertising presented for increased effectiveness."
Applet	A program, usually created with Java, designed to be executed from within another application.
Broadband	A type of data transmission in which a single medium can carry several channels at once. In the case of connection speed, the several channels allow for a much greater transmission speed than that of narrowband transmission.
 	An HTML tag that forces a line break within text.
Bus	Wires through which data is transmitted from one part of a computer to another.
Cache memory	A portion of memory that stores frequently used data, facilitating the accessing capacity of the computer.
Cascading Style Sheets (CSS)	An HTML feature that allows the creation of style sheets which define how different elements on a Web page appear.
Coldfusion	A product designed to integrate databases and Web pages.
Congestion	A condition when many computers are using a network at the same time, thus creating slow-downs in transmission speed.
Cookies	A message given to a Web browser from a server that identifies users and possibly prepares customized Web pages for them.
Crosstalk	A disturbance, which is caused by electromagnetic interference along a circuit or a cable pair.
Double Data Rate-Synchronous DRAM (DDR SDRAM)	A type of SDRAM that supports data transfers on both edges of each clock cycle (the rising and falling edges), effectively doubling the memory chip's data throughput.
Dithering	Creating the illusion of new colors and shades by varying the pattern of dots.
Flash	A vector-graphic animation technology that is often used to improve Web page design.
Gigahertz (GHz)	One GHz represents 1 billion cycles per second.
Graphics Interchange Format (.gif)	An image file type that is often used on the Internet for images with a few distinct colors, such as line drawings.
<hr>	An HTML tag that creates a line that serves as a page division.
HyperText Markup Language (HTML)	The authoring language used to create documents on the Web.
Hyperlink, Broken	A hyperlink that fails to connect to the page to which it is supposed to link.

Hyperlink, Internal	A hyperlink that loads a Web page within the same domain as the home page.
Hyperlink, Nested	A hyperlink that loads a Web page within a frame and not in the entire page.
Internal page	A Web page within the same domain as the home page.
Java	A high-level programming language that is often used to create Web page enhancing applications.
JavaScript	A scripting language which incorporates many aspects of Java, allowing Web programmers to create dynamic Web pages that interact with HTML source code.
Joint Photographic Experts Group (.jpg)	An image file type that is often used on the Internet for photographs and complex graphics.
Level 2 (L2) cache	Cache memory that is external to the microprocessor.
Line noise	Interference (static) that destroys the integrity of signals on a line.
Lowsrc	An attribute for the <img> tag in HTML that is used to download a quickly-loading smaller image prior to a slowly-loading larger image.
Malware	Scumware (2003) states, "This term has been shortened from 'malicious software' and is usually applied to cover a wide range of 'hostile' software such as Viruses, Trojan Horses and Worms. It is software that is designed specifically to damage or disrupt a system, files or its components."
Megabits per second (Mbps)	A rate of data transfer speed often used to measure network transmissions.
Narrowband	Modem transmission speeds equal to or less than 56K.
Network Interface Car (NIC)	A board inserted into a computer that allows for network communication.
Offline content	Content viewed in a Web browser that is not on the Internet.
PHP: Hypertext Preprocessor (PHP)	A scripting language often used to because of its broad database compatibility, which allows Web programmers to create dynamic Web pages that interact with HTML source code.
Scumware	Scumware (2003) states, "Software, scripts or programs that are specifically designed to circumvent or steal revenue and traffic from legitimate web sites."
Site map	A visual representation of a Web site's structure.
Spyware	Scumware (2003) states, "Software components that are usually downloaded for free from the internet and installed with products that send information from the user's computer without their knowledge or consent."
Structured Query Language (SQL)	A standardized query language for requesting information from a database.
Streaming media	Audio and video files transmitted on the Internet in a

	continuous fashion.
Temporary Internet Files	Files that are stored on a computer by an Internet browser in order to speed up the loading of frequently visited Web sites.
Thumbnail	A miniature display of a larger page or image.
Uniform Resource Locator (URL)	The global address of documents and other resources on the World Wide Web.

Appendix B

Major Colleges	
College	URL
Arizona State University, AZ	http://www.asu.edu/tour/
University of California: Santa Barbara, CA	http://www.id.ucsb.edu/IR/CampusMap/UCSBmap.html
Stephen F. Austin State University, TX	http://www.sfasu.edu/campus_tour/
University of California: Davis, CA	http://vtour.ucdavis.edu
University of Delaware, DE	http://www.udel.edu/main/tour/
University of Wyoming, WY	http://uwadmnweb.uwyo.edu/tour/
San Diego State University, CA	http://www-rohan.sdsu.edu/~sdsutour/
Duke University, NC	http://www.duke.edu/web/duketour/
Texas A&M University, TX	http://www.tamu.edu/map/
Miami University: Oxford Campus, OH	http://www.miami.muohio.edu/about_miami/virtual_tour/walkingtour/
Youngstown State University, OH	http://www.ysu.edu/ysu_flash/ysu_flash.html
Fashion Institute of Technology, NY	http://www.fitnyc.suny.edu/aspx/content.aspx?menu= Future:AboutFit:Campus:VirtualTour
George Mason University, VA	http://www.virginia.edu/dorms/
Northwestern University, IL	http://www.ugadm.northwestern.edu/tour/
Southwest Texas State University, TX	http://www.admission.swt.edu/_visits/selfguidetour.htm

Regional Colleges	
College	URL
Oklahoma City University, OK	http://www.youatocu.com/tour/
Mesa State College, CO	http://www.mesastate.edu/main/tours/building/index.htm
Northern State University, SD	http://www.northern.edu/about/campus.html
Mary Washington College, VA	http://www.mwc.edu/vtour/default.htm
Brandeis University, MA	http://www.brandeis.edu/tour/tour.html
Oberlin College, OH	http://www.oberlin.edu/colrelat/welcome/octour/stourstart.html
Fashion Institute of Design and Merchandising, CA	http://www.fidm.com/Features/IPIX/campuses.html
The College of New Jersey, NJ	http://www.tcnj.edu/prospective/tour/flash/index2.html
Milwaukee School of Engineering, WI	http://www.msoe.edu/campus/map/
Oral Roberts University, OK	http://oru.edu/university/campus/campus.html
Duquesne University, PA	http://www.duq.edu/campusmap/indexf.html
Arkansas Tech University, AR	http://admissions.atu.edu/virtual.htm
University of Wisconsin-Platteville, WI	http://www.uwplatt.edu/university/vtour/
State University of New York College at Geneseo, NY	http://visitors.geneseo.edu/campus_map/index.html
University of Wisconsin-La Crosse, WI	http://www.uwlax.edu/map/

Small Colleges	
College	URL
Ohio Wesleyan University, OH	http://admission.owu.edu/map.html
Barnard College, NY	http://www.barnard.edu/tour/
St. Mary's College of Maryland, MD	http://www.smcm.edu/About/Map1/smcmap.map
Hardin-Simmons University, TX	http://www.hsutx.edu/admissions/visit/map.html
DePauw University, IN	http://www.depauw.edu/visitors/tour/
New Mexico Highlands University, NM	http://www.nmhu.edu/vtour/
Moravian College, PA	http://www.moravian.edu/admission/tour.htm
Gallaudet University, DC	http://pr.gallaudet.edu/visitorscenter/campusmap/
Bridgewater College, VA	http://www.bridgewater.edu/campus_map/Campus_Map.html
Alaska Pacific University, AK	http://www.alaskapacific.edu/qtvr/qtvr-content.html

...ayette College, PA	http://www.lafayette.edu/admissions/campus_tour/index.html
...ckinson College, PA	http://www.dickinson.edu/tour/
...nory & Henry College, VA	http://www.ehc.edu/about/campustour.html
...klahoma Baptist University, OK	http://www.okbu.edu/map_tour/
...lizabethtown College, PA	http://www.etown.edu/campustour/

Appendix C

College	Broadband	56K
Arizona State University, AZ	1.15	11.21
University of California: Santa Barbara, CA	1.88	15.76
Stephen F. Austin State University, TX	4.38	31.25
University of California: Davis, CA	2.16	26.49
University of Delaware, DE	1.78	11.45
University of Wyoming, WY	1.85	13.48
San Diego State University, CA	6.63	68.15
Duke University, NC	2.75	20.98
Texas A&M University, TX	1.5	10.05
Miami University: Oxford Campus, OH	2.69	22.48
Youngstown State University, OH	15.53	183.35
Fashion Institute of Technology, NY	10.28	144.83
George Mason University, VA	7.03	92.18
Northwestern University, IL	2.5	28.35
Southwest Texas State University, TX	3.15	33.31
Oklahoma City University, OK	2.56	22.1
Mesa State College, CO	3.09	30.88
Northern State University, SD	4.69	45.73
Mary Washington College, VA	5.68	69.6
Brandeis University, MA	2.44	24.31
Oberlin College, OH	2.09	28.7
Fashion Institute of Design and Merchandising, CA	6.5	77.64
The College of New Jersey, NJ	1.87	20.38
Milwaukee School of Engineering, WI	4.19	35.16
Oral Roberts University, OK	1.56	11.34
Duquesne University, PA	2.87	19.55
Arkansas Tech University, AR	9.47	121.49
University of Wisconsin-Platteville, WI	5.34	41.68
State University of New York College at Geneseo, NY	6.43	72.54
University of Wisconsin-La Crosse, WI	3.32	31.02
Ohio Wesleyan University, OH	3.94	43.13
Barnard College, NY	1.97	15.12
St. Mary's College of Maryland, MD	2.28	18.46
Hardin-Simmons University, TX	3.94	29.13
DePauw University, IN	4.91	47.53
New Mexico Highlands University, NM	3.44	29.74
Moravian College, PA	4.18	44.87
Gallaudet University, DC	5.71	75.46
Bridgewater College, VA	5.66	76.97
Alaska Pacific University, AK	2.75	30.11

Lafayette College, PA	5.66	66.79
Dickinson College, PA	3.09	49.76
Emory & Henry College, VA	3.65	44.19
Oklahoma Baptist University, OK	1.85	31.49
Elizabethtown College, PA	3.16	47.08