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Perceptions of Business Students' Feature Requirements in Educational Web Sites

Sunil Hazari and Barbara Johnson
Richards College of Business, University of West Georgia, Carrollton, GA 30118,
e-mail: shazari@westga.edu

ABSTRACT

There is paucity of original research that explains phenomena related to content organization and site design of educational Web sites. Educational Web sites are often used to provide Web-based instruction, which itself is a relatively recent phenomenon for business schools, and additional research is needed in this area. Educational Web sites are designed with a different set of criteria as compared with other sites, such as those having an e-commerce or marketing focus. More research is needed to build a theoretical foundation for feature requirements in educational Web sites. As in any new approach to teaching and learning, critical issues need to be examined before Web-based instruction is fully integrated into teaching processes. When developing educational Web sites, features that support pedagogy should be given primary consideration. It is therefore important to identify key elements that will have maximum impact on learning. Using Q-sort analysis (a type of Factor Analysis), this study investigated feature requirements of educational Web sites as perceived by business students. Based on the analysis of user requirements in relation to several variables that were identified from a review of literature, group characteristics emerged from students' responses. Similarities and differences between groups were investigated, and implications of these results for development of educational Web sites are presented in this study.

INTRODUCTION

The evolution of Web technology has changed the way users interact with this relatively new medium. Because of advances in technology and user familiarity with a ubiquitous interface, business and education Web sites have evolved from s*tatic* (mostly used for reading and printing) to *interactive* sites (that involve user interaction based on input). Interactivity in Web sites offers advantages such as engaging the user with Web content, supporting different learning styles, providing feedback, improving learning, and retention (McIntyre & Wolff, 1998).

The Web-based environment provides users rich opportunities for research and learning. Business schools are using Web-based education in supplemental as well as standalone courses. The online environment has become a powerful interactive medium for promoting higher order thinking skills in students (Bonk & Reynolds, 1997). This environment uses a Web-based interface in which students interact with course materials, other students, and the instructor. Usability of the Web site plays an important part in meeting learning objectives specified in course material being delivered online (Hazari, 2004). Educational Web sites have unique

feature requirements that are different from commercial Web sites. For educational Web sites, research has shown that the Web should support course pedagogy and must be developed using appropriate instructional design components (McGregor & Yiping, 2004).

Although there exists much literature on traditional teaching and learning, use of the Web for education is a relatively recent phenomenon and additional research is needed in this area to better understand Web pedagogy. Bonk and Dennen (2002) call most Web materials "pedagogically negligent." Janicki and Liegle (2001) report that Web-based educational materials are generally poor in educational content as authors of Web-based material have never had a course in learning theory, and therefore the Web content they develop may lack foundations of learning theory. On the other hand, professionals such as teachers and professors who have knowledge of learning theories may lack the technical skills to develop educational materials for the Web (Murray, 1996). Educational Web site development is not an exact science, and these sites are built with a different set of criteria as compared to other sites, such as those having an e-commerce or marketing focus.

The purpose of this empirical research study was to explore perceptions of graduate business students' feature requirements in educational Web sites which would provide a theoretical foundation for educational Web site design and Web-based instruction. For the purpose of this study, educational Web sites are considered to be those sites that provide information-based content and interactivity for the purpose of learning in business education areas such as marketing, finance, accounting, information systems, management, and so on. Nine elements that are critical to educational Web site development (under three general categories of "Usability," "Learnability," and "Technical Feature Requirements") were selected from a review of literature for this study. A review of research on educational Web sites is presented first along with extraction of variables from the literature that determine key features needed in effective educational Web sites. Self-referent perceptions of business students are presented next, and use of Q-sort analysis to investigate key factors in educational Web sites is explained. Data analysis and results of the study are then presented, followed by discussion and applications to practice. This study should benefit administrators, Web developers, teachers, and students interested in Web design, development, usability, human computer interface, and Web-based education.

Educational Web Sites

As in any new approach to teaching and learning, critical issues need to be examined before Web-based instruction becomes effective in supporting teaching/learning processes. According to Nielsen (2000), the overall design of a Web site involves five different levels that include feature design, information architecture (structure design), interaction design, appearance design (visual design), and content design. These levels impact the usability of a Web site. Research on usability exists (Palmer, 2002), but many Web sites do not apply these principles, thereby making them difficult to use. When developing educational Web sites, features that support course pedagogy should be given primary consideration. Due to the availability

of a wide variety of pedagogical, organizational, and technical features that can be included in Web sites, it is important to identify key elements that will have maximum impact on learning.

Previous research has attempted to describe important factors to consider when evaluating Web sites (Keevil, 1998; Scharl & Bauer, 1999). While examining commercial Web sites, categories such as information content, cognitive outcomes, enjoyment, privacy, user empowerment, visual appearance, technical support, navigation, organization of information content, credibility, and impartiality were studied. In a study of different domain areas (such as Financial, Entertainment, Education, Government, and Medical), researchers found certain features to be equally important among different domains, but other features were found to be extremely important for one domain, but unimportant for another domain. For example, financial domains placed high on requirements of the Web site to be up to date and accurate. Entertainment domains placed high requirements on visual appeal, multimedia, and site responsiveness. Search tool was considered important for education, government, medical, and e-commerce domains. Medical and education domains shared comprehensiveness and accuracy of information as top requirements. Requirements such as ease of use were common for all domains (Zhang & Von Dran, 2001).

For educational Web sites, there is a lack of empirical studies that synthesize information to provide adequate guidelines for planning and implementing Web sites. Day (1997) stated that many Internet users were still "finding their way for the first time" on the World Wide Web. If Web sites are being designed without proper usability standards, users have to relearn how to navigate each Web site they visit. To facilitate navigation through the sites, Web designers need to take steps to understand factors that go toward building effective Web sites. Nevertheless, additional research can help point to certain factors that emerge to help us better pinpoint specific guidelines during the planning and development stage of effective Web site development.

Corporate business owners, executive directors of organizations, and key decision makers within an educational entity have realized the importance of having a Web presence. For business Web sites, an organization that has not made an effort to have a Web site is not taken seriously as a major player in its industry. Businesses are at a technological disadvantage to their competitors and may have challenges communicating information about their organization both internally and externally. Burke (2002) explained a parallel between designing a Web site and constructing a building by suggesting that, while we may not think of the Internet as having parks and streets, the same planning and rationale that is used in developing a building and its landscaping should also be applied during the planning and construction of Web sites. Burke further stated that often organizations do not realize how their sites interact and impact other communication channels, spaces, networks, and devices.

Educational organizations can learn from businesses regarding Web site objectives and goals. An organization may decide to create a Web site for many reasons: as a recruiting tool, informational platform, or a site that enhances credibility of an organization and its mission. Whatever the rationale for creating a site, certain critical elements should be present in an organization's site. These

elements include mission and objectives, information about the organization, additional relevant information for staff, contact information, and an opportunity for visitors to provide feedback (Peek & Roxas, 2002). Once it is decided that a Web site should be created, a strategic planning approach should be put in place during Web creation, development, and maintenance. Personnel/skills, time, money and physical resources, facilities, software tools, and equipment are resources that may be needed during this process (Clyde, 2002). Of these four types of resources, personnel/skills are considered the most important. Design of educational Web sites can follow similar principles to make the sites effective for the purpose of providing instruction and to facilitate learning. Diverse experiences exist among Web users, and these can be categorized by age group and activities of Web users. According to Warlick (2005), the top five daily activities of Internet users are: (1) getting the news, (2) researching as part of their job, (3) looking for information on a hobby or interest, (4) answering a question, and (5) researching a product or service for purchase. There are elements of learning and interaction in these activities that students carry over when visiting educational Web sites.

Criteria for Web Site Development

Before developing a Web site, planning for success of the Web site should be considered. In a study involving the evaluation of corporate Web sites, Palmer (2002) determined that a Web site's success is a "first-order construct" and is associated with the following categories: (1) speed of access and display rate within the site (download delay); (2) organization, arrangement, layout, and sequencing of pages on the site (navigation); (3) amount and variety of product information on the site (content); (4) customization and interactivity within the site; and (5) feedback and options and frequently asked questions (responsiveness). Based on further research in this area (Bernard, 2001; Krug, 2000; Miah, 2004), three key factors emerged as being crucial to developing effective educational Web sites. These factors are classified according in general categories of usability, learnability, and technical functionality. Each of these factors is explained below:

Usability

Usability can be defined as how a user can use the functionality of a system in relation to: (1) how easy it is to learn, (2) how efficient it is to use, (3) how easy it is to remember, (4) how it can be used with few errors, and (5) how pleasant it is to use (Lu & Yeung, 1998). The criteria considered in determining how one creates effective educational Web sites have many items in common with Web sites of other organizations or corporations. Research supports that ease of navigation through the Web site, visual appeal of Web pages, and overall consistency throughout sites are essential in making it easier for visitors to effectively use educational Web sites (Janicki & Liegle, 2001; Krug, 2005; Tillmans, 2005). Palmer (2002) stressed that developing sites that are responsive to user needs is critical for all site designers and managers, and successful Web sites should seek to enhance Web usability along with other design criteria.

When looking at the history of Web page design, in some organizations, the Web sites gave visitors the ability to locate general information about the

organization, its products and services. In order to advance these accepted usability standards, many companies conduct usability testing on their sites, which generally involves testing and feedback from both users and staff. For example, a usability study for the Hunter College Libraries made use of two types of Web page usability. First, the facilitators of this study surveyed users to see if they understood the purpose of a particular Web site. Second, users were observed as they actually conducted tasks (Cobus, Dent, & Ondrusek, 2005). The results of this study helped researchers better understand how the site must change to accommodate current user needs. When constantly updating and modifying a site's design, items that affect a site's consistency direct the manner in which changes are made. As a result, the changes made to the site in the Hunter College Libraries project were limited to the top levels of the site—affecting the site's visual appeal and ease of navigation. Being consistent in the font, location of text, icons, and link colors also helps a site maintain its consistency, which repeatedly lures visitors to the site thereby making that location a "sticky site" (Barnd & Yu, 2002).

Learnability

When developing Web sites, one of the first issues an organization should consider is the purpose of creating the site. To a business, the goal may be to sell more products or services. To an organization, the goal may be to recruit more members. To an educational institution, an overall goal may be to determine how the site can be used to enhance the quality of learning in students. Whatever the motivation, it is essential to keep these goals at the forefront when planning, developing, and maintaining the Web sites (Warlick, 2005). Educational Web sites in particular can benefit from learnability features. Key factors in evaluating a site's learnability include clearly stated objectives and instructions, quality instructional content, and good interactivity throughout the site (Conner, 2005).

In traditional learning, Gagné (1977) describes a cognitive sequence of facts, concepts, principles, and problem solving in which each level of the sequence depends on mastery of the preceding level. Gagné's sequence of instruction is based on the cognitive information processing learning theory that states it is important to present all necessary lower level facts before proceeding to teach at higher levels of the knowledge hierarchy. The theory outlines nine instructional events and corresponding cognitive processes: (1) gaining attention (reception), (2) informing learners of the objectives (expectancy), (3) stimulating recall of prior learning (retrieval), (4) presenting the stimulus (selective perception), (5) providing learning guidance (semantic encoding), (6) eliciting performance (responding), (7) providing feedback (reinforcement), (8) assessing performance (retrieval), and (9) enhancing retention and transfer (generalization). These events provide the necessary conditions of learning and serve as the basis of designing instruction. Because the same principles can also be applied to educational Web sites, statement variables developed for this study included Gagne's conditions of learning.

In providing a pedagogical framework for Web instructional design, Bonk and Dennen (2002) suggest providing multiple paths to learning; supporting the individual construction of knowledge; providing a repository for relevant content information, discussion, and learner constructed products; and using various

instructional strategies, including but not limited to questioning, discussion, critical dialog, guided practice, problem solving, performance modeling, gaming and simulations, and collaboration. A good Web site will allow users to construct knowledge relevant to their interests and experiences. When sites are developed in a way where there is quality of instructional content, users are more likely to transfer learned information to other areas of the site. In a case study involving a child's response to interactive CD-ROM playsets, it was determined that data gathered during the games showed higher overall scores for the game on the second time using the playset. This suggests that the ability to interact with one playset transferred when interacting with the second (Egloff, 2004). Another method that can be used to enhance the quality of instructional content is to provide physical examples and diagrams of the items being discussed. Marschalek (2002) advocates a concept he calls "thinking in 3s." This concept achieves greater depth by designing a Web-based learning environment that contains at least three components for each category examined. Using this concept, an example of an ideal site is one which goes beyond mere text for information purposes. A Web site is enhanced by including visual resources of student and teacher ideas, progression of a student's work over time, and actual statements from teachers and students about the work displayed on the Web site.

Interactivity refers to the two-way communication between visitors on a site and components on the site (Liu, Arnett, Capella, & Taylor, 2001). Interactivity in educational Web sites is a process where students actively participate in their own learning by engaging other students on the Web site in construction of knowledge. Interactive educational Web sites can increase students' knowledge, promote communication skills and powers of reasoning. It is important for Web developers to master effective ways to incorporate a measure of interactivity when designing educational sites. With the availability of various Web development programs, today it is not difficult to make a site interactive. For developers using HTML code and other programming languages, interactive modules can be easily incorporated using elementary levels of HTML coding ultimately assisting developers in providing higher Web site interactivity (Lomerson, 2002).

Technical Functionality

Technical features of Web sites such as download times, image refresh rate, use of audio, video, ability to work with different browsers often determine the success rate of Web sites in attracting repeat visitors (also referred to as sticky sites). For development of educational Web sites, these elements become especially important because equipment used in educational institutions is not often state of the art and may not be able to support cutting-edge technologies such as high-bandwidth Java applets embedded in Web pages for purpose of interactivity. Use of multimedia elements, including audio and video, Web page download time, and cross-browser functionality are key considerations when evaluating the technical functionality of an educational site.

McGrath and Lomerson (2001) stated that visitors are not likely to remain or return to a site if a page takes longer than 8 seconds to load. The challenge for some designers today is to evaluate the trade-off between faster, simpler sites that download quickly, as compared to sites with animated images or large graphics

that may be more visually appealing but may cause significant delays in downloading. McGregor and Yiping (2004) stated that, when discussing the impact of multimedia elements in educational Web sites, some educators have seen the rich array of resources, such as up-to-date media libraries, multimedia presentations, and other applications available on the Internet as having a very positive impact on exposing students to Web-based resources. An example to support this claim is the WebQuest model that was created to give teachers a framework for structuring student-centered learning using the Internet. To further assist students, some educators are not only teaching them how to get the most out of multimedia on the Web, but adventurous teachers are assisting students use existing technology to create multimedia themselves. Bergen (2002) believed as teachers become more comfortable with the computer, these increased skills will be transferred directly to the students they educate.

With many choices available among Web browsers today, Web developers must be sure that their sites can be viewed properly on a number of Web browsers. The market share for the most popular browsers as of April 2005 reported by Lanza (2005) is as follows: Microsoft Internet Explorer, 88.59%; Firefox, 6.71%; Netscape 1.8%; Mozilla, .62%; and Opera, .46%. Different versions of these browsers and their use on different operating systems further complicate the consistency of Web sites' display on different types of computers. As more browsers increase in popularity, Web developers must be prepared to address the growing needs for cross-browser compatibility.

METHODOLOGY

The methodology used in this study was based on a previous research study of perceptions on information security software (Hazari, 2005). The sample in this study consisted of 57 graduate business students at a state university in the southeast United States. Because of absence of strict standards that have clear definitions of what components educational Web sites should (or should not) contain, students were not given a single Web site to evaluate, but were exposed to research on various topics such as usability, learnability, and technical content in Web site design and then asked to comment on educational Web sites in general. This would provide a theoretical context within which to evaluate Web sites. Students were instructed to visit a Web site that explained the nature of the study and provided information on how the Q-sort statements should be sorted. This was important because students are used to completing questionnaires in survey format that use Likert scale, open-ended, or close-ended questions (such as those used during end-of-term class evaluation of instruction), but may not be familiar with the peculiarities of the Q-sort procedure. To reduce data errors and extract usable data, instructions were presented in detail on a separate page before the respondents were shown the statements for the study. A pilot study was also conducted earlier to make sure the data collection could be done correctly, and students who participated in the pilot test were asked questions about any problems they may have faced when completing the questionnaire.

Q-sort methodology relies on using theories for item development. It is useful in exploratory research and a well-developed theoretical literature guides and

supports its uses (Thomas & Watson, 2002). Q-sort uses an ipsative (i.e., self-referenced) technique of sorting participants' statements about subjective conditions. It is a variation of a factor analysis technique that uses Q-methodology theory to analyze correlation measure (Brown, 1980). Respondents to Q-sort studies are typically required to sort statements into a predefined normal distribution scale. Initially, the survey is presented with questions in random order and the respondent organizes statements in different categories. To view entered data, the respondent also can update statement rankings to see where the statements fall under each category. In the past, the Q-sort technique used index cards for sorting, but now Web-based data collection programs (such as WebQ) are common. One advantage of using the WebQ method is that data submission errors are reduced because the program verifies that the statements are sorted according to predefined requirements.

Because the questionnaire asked for self-referent perception, external validity was not considered to be an issue because there was no outside criterion for subjects' own point of view. Three faculty members in the business school reviewed the questionnaire to establish face validity. Validity and reliability of Q-sort instruments are different from other surveys (e.g., attitudinal instruments) because regular psychometric scales assume there is an entity that has invariant or quasi-invariant aspects which can be measured objectively. However, the rank order provided by the Q-sort subjects shifts attention from meaning of the stimuli toward intentionality of the Q-sorter in which case both validity and reliability are different compared to regular scales. This is Beebe-Center's (1932) distinction between the methods of expression and the methods of impression, the former emphasizing the relationship between a variable (scale) and a response, and the latter emphasizing the relation between variable (subjective preference) and a stimulus (Q Statement).

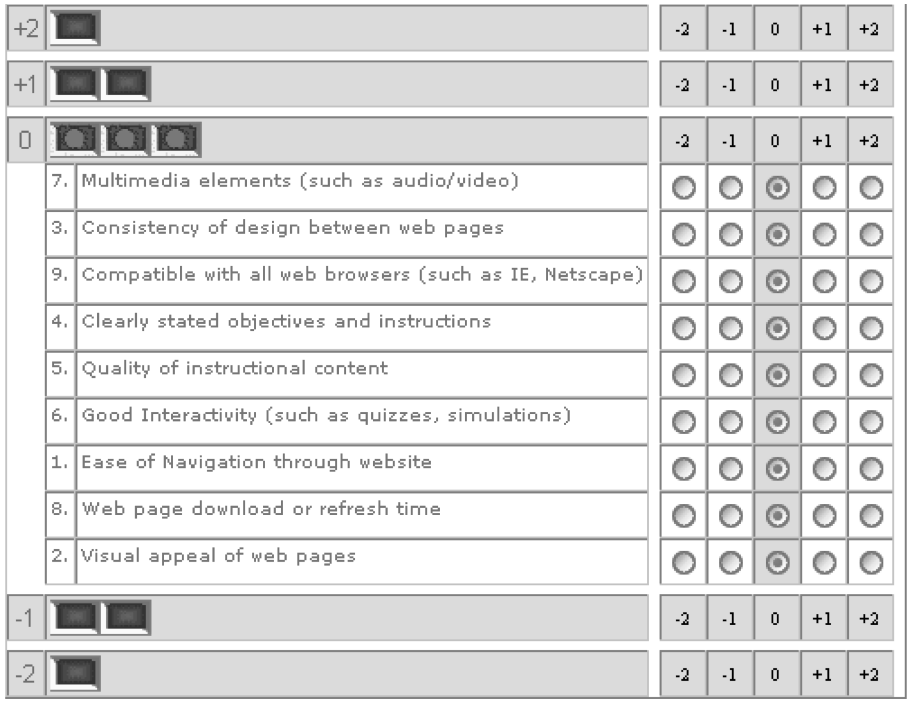
In this study the statements were classified as Most Important (+2), Important (+1), Neutral (0), Less Important (−1), and Least Important (−2). Students had to select one statement each as Most Important and Least Important, two statements each as Important and Less important, and three statements as Neutral. Once these statements were selected based on the above rule, the boxes would turn green, indicating students had correctly categorized statements of their choice. A sample survey is shown in Figure 1.

DATA ANALYSIS

According to Brown (1980):

> Q technique is a set of procedures whereby a sample of objects is placed in a significant order with respect to a single person. In its most typical form, the sample involves statements of opinion (Q sample) that an individual rank-orders in terms of some condition of instruction. The items so arrayed comprise what is called a "Q sort." Q sorts obtained from several persons are normally correlated and factor-analyzed by any of the available statistical methods. Factors indicate clusters of persons who have ranked the statements in essentially the same fashion. Explanation of factors is advanced in terms of commonly shared attitudes or perspectives (p. 5).

Figure 1: WebQ questionnaire for categorizing student responses.



Q-factor Analysis is also considered a type of inverse factor analysis in which the cases (subjects) rather than statement variables (features) are clustered. A review of educational Web site literature was used to extract the following statement variables relating to criteria for evaluation of educational Web sites. Operational definitions of these variables as they relate to the study are provided below:

USABILITY

1. Ease of navigation through Web site [NAVI]
2. Visual appeal of Web pages [VISU]
3. Consistency of design between Web pages [CONS]

LEARNABILITY

4. Clearly stated objectives and instructions [OBJT]
5. Quality of instructional content [CONT]
6. Good interactivity (such as quizzes, simulations) [INTR]

TECHNICAL FUNCTIONALITY

7. Multimedia elements (such as audio/video) [MULT]

Table 1: Participant-ranked scores of educational Web site features.

Statement	Mean	*SD*
Ease of navigation	3.84	.98
Quality of instructional content	3.72	.96
Clear objectives/Instructions	3.49	1.01
Good interactivity	3.21	.88
Visual appeal	3.00	1.03
Web page download time	3.00	1.01
Compatibility across browsers	2.38	1.08
Consistency of design	2.36	1.06
Multimedia element	1.98	.85

Table 2: Correlation matrix between variables.

	NAVI	VISU	CONS	OBJT	CONT	INTR	MULT	REFR	COMP
NAVI	1.000	.053	−.407*	−.207	−.048	−.106	−.195	−.090	.008
VISU		1.000	−.081	−.304*	−.054	−.117	−.020	−.220	−.271*
CONS			1.000	.044	−.177	−.065	−.228	.050	−.235
OBJT				1.000	.034	−.117	−.154	−.138	−.191
CONT					1.000	.008	−.137	−.311*	−.255
INTR						1.000	.123	−.339*	−.218
MULT							1.000	−.164	−.050
REFR								1.000	.114
COMP									1.000

8. Web page download/refresh time [REFR]
9. Cross-browser (such as Internet Explorer, Netscape) functionality [COMP]

Prior to conducting Q-sort analysis, ranked scores of all participants (before identifying factor groups) on each statement variable were calculated for preliminary descriptive statistics. These are shown in Table 1 (mean score normalized as: 5 = Most important, 1 = Least important).

By transposing the data matrix, correlation between the nine feature variables shows a low level of correlation between statements. This indicates there was a high degree of independence among the statement categories as used in the analysis. This finding is important because it supports the assertion that the statements represent relatively independent statement variables as obtained from the review of literature.

In the correlation matrix shown in Table 2, significant correlations ($p < .05$) exist between ease of navigation and consistency of design, visual appeal and clearly stated objectives, visual appeal and cross-browser functionality, and quality of instructional content and Web page download time. These features can therefore be considered as one group for further analysis.

In Q-factor analysis the correlation between subjects rather than variables are factored. The factors represent groupings of people with similar patterns of response during sorting (Brown, 1980; Thomas & Watson, 2002). Following guidelines

Table 3: Eigenvalues of unrotated factors.

	Eigenvalues	As Percentages	Cumul. %
1	21.33	37.43	37.43
2	8.03	14.09	51.53
3	7.41	13.00	64.53
4	5.99	10.51	75.04
5	4.01	7.04	82.08
6	3.87	6.80	88.88
7	3.72	6.53	95.41
8	2.61	4.59	100.00
9	.00	.00	100.00

Table 4: Ranked statement totals with each factor.

No.	Statement	Factor 1		Factor 2	
1	Ease of navigation	.68	3	1.71	1
2	Visual appeal	−.01	5	−.33	7
3	Consistency of design	−.10	6	−1.86	9
4	Clear objectives	.95	2	−.04	6
5	Quality of content	1.44	1	.83	2
6	Good interactivity	.35	4	.08	5
7	Multimedia	−1.35	8	−.85	8
8	Web page download time	−.40	7	.19	4
9	Compatible with browsers	−1.57	9	.28	3

for Q-factor analysis, eight factors were initially identified with eigenvalues >1. eigenvalue is the amount of variance in the original variable associated with the factor. These factors and their percentage of variance are shown in Table 3.

These factors were rotated (varimax rotation) to maximize the loading of each variable on one of the extracted factors while minimizing loading on all other factors. Factors selected for rotation are usually identified by taking those with an eigenvalue greater than one (Kline, 1994). However, in this study, the more rigorous Kaiser rule of selecting factors whose eigenvalue is at or above the mean eigenvalue (in this case 6.33) was used. Factors 1, 2, and 3, which represented almost 65% of total variance in data, were then subjected to principal component analysis with varimax rotation. Following rotation, a factor matrix identified two factor groups with similar patterns of responses. In each group there were several respondents who were in agreement and highly loaded on that factor. The statements in which these two factor groups were ranked are shown in Table 4.

Table 5 shows correlations between factors. Similar to the earlier findings about variable independence, the factor groups also show a high degree of independence.

The normalized scores for each factor group were then examined. This provided a measure of relative strength of importance attached by the factor to each

Table 5: Correlation between factors.

Factor	1	2
1	1.0000	.3933
2	.3933	1.0000

Table 6a: Normalized factor 1 score.

No.	Statement	z-Score
5	Quality of content	1.441
4	Clear objectives	.951
1	Ease of navigation	.679
6	Good interactivity	.349
2	Visual appeal	−.008
3	Consistency of design	−.097
8	Web page download time	−.402
7	Multimedia	−1.347
9	Compatible with browsers	−1.566

Table 6b: Normalized factor 2 score.

No.	Statement	z-Scores
1	Ease of navigation	1.708
5	Quality of content	.825
9	Compatible with browsers	.279
8	Web page download time	.19
6	Good interactivity	.081
4	Clear objectives	−.044
2	Visual appeal	−.334
7	Multimedia	−.849
3	Consistency of design	−1.857

statement on the scale used during sorting. Tables 6a and 6b show these scores for each group.

Adherents of Factor 1 felt strongly in favor of Statement 5 (Quality of Content), Statement 4 (Clear Objectives), and Statement 1 (Ease of Navigation), but opposed Statement 9 (Browser Compatibility) and Statement 7 (Multimedia).

The results for Factor 2 are consistent with the Factor 1 group for two of the statements: Ease of Navigation and Quality of Content. Consistency of design ranked the third highest in both factor groups. The largest dissension between the Factor 1 and Factor 2 groups involved browser compatibility, which ranked low in the Factor 1 group but ranked high in the Factor 2 group.

Limitations of the study

The sample used in the study comprised 57 students enrolled in a graduate business course at the university. The purpose of this study was to determine operant

subjectivity in a field where empirical research is severely lacking. The nature of this study was not to prove some general proposition but to seek a better understanding of group characteristics that directly relate to design and evaluation of educational Web sites. The perception of users is intended to guide development of Web sites that are easy to navigate, have quality content, are technically sound, and meet learner goals and objectives. The study can also be replicated by using students from different institutions and other disciplines.

DISCUSSIONS AND APPLICATIONS FOR PRACTICE

Taking lessons from traditional instruction which can be applied to Web-based learning, the design of instruction needs to be structured within the context of elements available for use in that medium. For Web sites this can be achieved by using principles of instructional design. Instructional design is the systematic development of instructional specifications using learning and instructional theory to ensure the quality of instruction. It is the process of analysis of learning needs and goals as well as the development of an effective delivery system to meet those needs (classified as Learnability and Usability in this study). According to Berger and Kam (1996), it also includes development of instructional materials, activities, and valuation of all instruction and learner activities. Using these instructional design principles, educational Web sites can be designed to encompass a range of formats that can vary from simple drill and practice exercise type presentations to creating scenarios using text, graphics, audio, and video. This information is then presented to learner(s) for discussion of problem-based activities (such as in a constructivist environment). Instructional design also establishes a structured framework for designing lessons within an environment that can range from face-to-face classroom teaching to self-paced online learning. Kemp (1985) stated that proper sequencing of instruction is important to learning. Ease of navigation (identified in this study as the most important variable) can contribute to sequencing of instruction. Kolb (1984) has shown that students prefer to learn in an environment that reflects their preferred cognitive style and also learning style (Gordon, 1995). This encompasses elements used in the study, such as interactivity, quality of content, clear objectives, and use of multimedia elements in the lesson.

Preliminary descriptive statistics showed that participants gave the highest ranks to ease of navigation, visual appeal, and consistency of design. The Q-sort analysis from which the two factor groups emerged ranked quality of content, ease of navigation, and clear objectives as the most important criteria. Ease of navigation also refers to the information architecture of the Web site. There is evidence of good navigation and visual appeal being a useful measure in the design of all Web sites (Nielsen, 1999; Wodtke, 2002). This indicates how a site is organized according to its information, its functional flow as it leads the user through different sections, and its ability to help a user achieve a certain task. The normalized factor scores provided a measure of relative strength of importance attached by factors to each statement on the scale used during sorting. As mentioned earlier, adherents in the Factor 1 group felt strongly in favor of quality of content, clear objectives, and ease of navigation. The results of the Factor 2 group were consistent with two of the three variables from the Factor 1 group, that is, ease of navigation and quality of content. The most

dissension between the two factor groups involved clear objectives and browser compatibility. Use of learning objectives is common practice in traditional paper-based instructional and administrative materials such as course syllabi and learning modules. But only one group listed course objectives highly in comparison to other statement variables. This relates directly to the previously mentioned general category of *Learnability* which emphasizes using clearly stated objectives, along with quality instructional content. From the results of this study, it was seen that not all subjects agreed that including course objectives was a high priority.

The Interactivity component in educational Web sites ranked near the middle of the statement variable list in this study. Interaction in online education can be achieved using students' engagement with course materials, external resources (e.g., libraries), subject matter experts, and peer conversation (as in discussion boards). Previous research had described interactivity as a necessary component in online learning because it uses an active method of learning that simulates instructor–student interaction of a traditional learning environment (Moore, 1993). While this study was not intended to prove a general proposition, interactivity did not rank highly; therefore, more research is needed to determine the importance of interactivity in online education and its relevance to students having different styles, as well as students from different disciplines.

One of the lowest preferred elements in both factor groups was multimedia content in Web sites. This result was surprising because multimedia has previously been shown (Agarwal & Karahanna, 2000; Hoffman & Novak, 1996) to improve cognitive engagement and cognitive absorption in users. In a case where a class used different videos to supplement lecture lessons, student interviews showed that classes conducted with video-assisted instruction were more interesting and made the subject matter easier to learn (Wise, 1996). Also, other research suggests that, because of the good attitude of students toward learning with multimedia, teachers get excited about teaching (Mercurious, 2004). Based on the results of this study, further research needs to investigate the use of multimedia specifically in educational Web sites.

In the Q-sort analysis, subjects were classified into two groups. Twenty of 57 subjects were classified under the Factor 1 group and 11 subjects were classified under the Factor 2 group. This classification of factor groups gave a better idea of group characteristics. With the Factor 2 group ranking browser compatibility and Web page download time as higher ranked factors, it appears that this group may have comprised students who are more technical in nature and may have had some experience in developing Web sites. Further research can investigate differences in Web criteria evaluation between students with a technical background as compared to nontechnical students. This also emphasizes the fact that Web design and development is a group process where a variety of skill sets (such as project management, content area expertise, instructional designer, programmer, etc.) are needed to develop effective Web sites.

CONCLUSIONS

In this study, Q-methodology was used to define participant viewpoints and perceptions, empirically place participants in groups, provide sharper insight into

participant-preferred directions, identify criteria that are important to participants, explicitly outline areas of consensus and conflicts, and investigate a contemporary problem relating to features needed in educational Web sites by quantifying subjectivity. As mentioned earlier, the nature of Q-sort analysis is not to prove some general proposition. Instead, this study sought a better understanding of group characteristics that directly relates to design and evaluation of business education Web sites. Quality of content and ease of navigation were shown to be two important variables when designing business education Web sites. Although previous research had shown that interactivity and multimedia can play a key role in improving learner outcomes, participants in this study did not consider these to be important elements in business education Web sites. The perception of users can be used to guide development of Web sites that are easy to navigate, have quality content, are technically sound, and meet learner goals and objectives. Although this study was not conclusive in arriving at a unified set of factors for business education Web site development, it does provide empirical evidence for Web site designers and educators regarding features that are considered important for educational Web sites. The study also adds value to the current literature on the design of Web sites and usability. Results of this study show there is a need for further research on educational Web site development because of their unique objectives and characteristics.

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Sunil Hazari is an associate professor in the Department of Management and Business Systems, Richards College of Business, University of West Georgia. His teaching and research interests are in the areas of information security, infrastructure design of e-commerce sites, Web usability, and organizational aspects of e-learning. He has authored several peer-reviewed journal publications in information and instructional technology areas, has presented papers at national conferences, and is an editorial board member of information system journals.

Barbara Johnson currently teaches Multimedia Presentations and Computer Applications at Forest Park High School in Clayton County, Georgia. She also serves as the Department Chair of the Vocational Department. She has worked in various positions within accounting, finance, and database administration. Her interests include curriculum development and training paraprofessionals and teachers to maximize their effectiveness in the classroom.