# User Expectations and Rankings of Quality Factors in Different Web Site Domains

*Ping Zhang and Gisela M. von Dran*

ABSTRACT: In the emerging electronic environment, knowing how to create customer-centered Web sites is of great importance. This paper reports two studies on user perceptions of Web sites. First, Kano's model of quality was used in an exploratory investigation of customer quality expectations for a specific type of site (CNN.com). The quality model was then extended by treating broader site types/domains. The results showed that (1) customers' quality expectations change over time, and thus no single quality checklist will be good for very long, (2) the Kano model can be used as a framework or method for identifying quality expectations and the time transition of quality factors, (3) customers in a Web domain do not regard all quality factors as equally important, and (4) the rankings of important quality factors differ from one Web domain to another, but certain factors were regarded as highly important across all the domains studied.

KEY WORDS AND PHRASES: Customer quality expectation, qualitative analysis, thematic analysis, Web site design, Web site domain, Web site quality, Web usability, Web user perception.

In recent years, numerous studies have focused on the design of Web sites for general information seeking and for electronic commerce purposes [6, 7, 10, 11, 34, 36, 37]. The guidance for designers provided by most of these studies is largely based on heuristics or rule of thumb, although a few try to identify Web site design features that contribute to user satisfaction or dissatisfaction [39]. None address users' quality expectations or give any insight into whether users perceive some design features as more important than others.

In the Web environment for general information seeking and business-to-consumer electronic commerce, users are customers. Understanding their expectations and how they feel about the Web sites they use is becoming a very serious concern. A company's continued success comes from two groups: new customers and repeat customers. Since it always costs more to attract new customers than to retain current customers, customer retention is more critical than customer attraction. The key to customer retention is customer satisfaction. Delighting customers goes beyond satisfying them. Delighted customers are more effective advocates for a company than all the paid advertisements it places in the media [19]. While the success of a company or an organization is dependent on many factors, its Web site plays a central role. In the Internet era, users experience an organization's Web site's quality before they decide whether to commit themselves to the organization [26]. The Web site functions as a "window" through which users have their initial interaction with the organization. Its design crucially affects their perception and attitude toward the organization [8].

The objective of the present research is to build a theoretical framework for evaluating Web site quality from the perspective of user/customer satisfaction through theoretical and empirical investigations. Specifically, a Web site quality model is developed based on Kano's model for consumer expectations of product and service quality [17, 31]. The study tests whether Web users can identify different quality types according to the Kano model within a specific type of Web site domain (CNN.com). Then the quality model is expanded and refined by examining different types of Web site domains using a different research method. The refined quality model is intended to provide a mechanism or tool that will enable Web site designers and evaluators to identify quality factors and their transitions over time. From a theoretical perspective, the research extends existing marketing studies on consumer perceptions/behaviors into the new electronic market environment. In so doing it provides a promising framework for future investigations in the ever-changing economic environment.

## Literature Review

### Current Web Site Studies

The phenomenal growth and use of the Web during the last decade is providing fertile ground for research activities. Since the Web is a new medium for business interactions, service and product providers as well as infrastructure suppliers are seeking the most effective and competitive means to communicate with potential customers, motivate them to access or purchase their products and services, engender customer trust, and establish a leadership position by developing a competitive edge. The Web site is an entry facilitator or barrier in achieving these traditional goals in a new environment.

Web site evaluations and usability studies have been a fruitful area in the past several years. They include conceptual discussions of what should be evaluated and how to do it [15, 25]. Several researchers recommend applying traditional usability criteria to the Web environment [15, 20, 24, 33]. Others have developed criteria specifically for the Web. Most of the initial work in Web evaluation provided heuristics or checklists for Web site evaluation [1, 9, 18], but later efforts have increasingly adapted theories from other disciplines. Conger and Mason, for example, recommend the use of theoretical frameworks from other disciplines for Web site evaluations [6]. Small, using the ARCS model from instructional design as a base, developed WebMAC (Web Motivational Assessment Checklist) [34]. Smith reviewed the evaluation criteria for print materials and argued that in most cases the criteria could be applied to the Internet domain [35]. Among the empirical studies, Wilkinson, Bennett, and Oliver take a bottom-up approach by compiling Internet evaluation criteria from different sources [37]. With a similar focus on Internet information resource quality, Borges, Morales, and Rodriguez start from Nielsen's heuristics guidelines to evaluate 10 Web sites for universities and colleges [4, 24]. Spool et al., focusing on information-retrieval tasks, conduct usability studies on the Web sites of several large companies [36]. A growing number of

empirical studies examine customer expectations and requirements in the new environment of electronic commerce [32]. Jarvenpaa and Todd report on factors that consumers found salient when browsing through selected electronic malls [16]. Stressing that effective customer interfaces are absolutely mandatory, Lohse and Spiller examine the relationship between sales and user interface design and describe six desirable attributes that influence store traffic and sales [22]. Pereira discovers significant differences in the affective reactions of subjects depending on their level of product knowledge and the search strategies of the software agents they use [30]. Ho and Wu identify five factors as antecedents for customer satisfaction, and find logistical support the most important [14]. Palmer and Griffith suggest that the interaction between a firm's market offerings and the technical characteristics of the Web will have an impact on the firm's marketing activities and site design [28]. They suggest that firms categorized as highly information intensive are more able to capitalize on the low cost of the Internet, come under pressure to provide full information, have to have cutting-edge technology, and will reap the greatest benefits. Liang and Lai, who study the quality of store design and analyze consumer choices, find that design quality significantly affects consumer choice of electronic stores [21]. Classifying design factors as either motivators, hygiene factors, or media richness factors, their research shows that three hygiene factors were among the top five desirable features, that motivators are the key to creating competitive advantage, and that media richness factors are not as important as suggested. According to Wolfinbarger and Gilly, Web site design needs to differentiate between the needs of goal-directed and experiential users [38]. They find that the majority of on-line buyers do not expect or desire high touch service, but are motivated by features that increase their sense of control and freedom, including order tracking, purchase histories, savings information, optional e-mail notification, and special deals. Comprehensive information about products facilitates the goal-directed buying of "time starved consumers" [3].

While the research studies mentioned above make important contributions to a growing body of knowledge, they address many different aspects of Web site design factors, purposes, and user categories. Missing, however, is a broader theoretical framework within which assumptions and hypothesis about Web design can be systematically tested [32, 39, 40]. "Many empirical studies of interactive computer use have no theoretical orientation. Data is collected, but no underlying model or theory of the process exists to be confirmed or refuted. Such a theory would be very useful because with many design decisions there are too many alternative proposals to test by trial and error. A strong theory or performance model could reduce the set of plausible alternatives to a manageable number for testing" [2, p. 573].

To develop such a theory or model, Zhang et al. evaluate whether theories and models developed for other organizational contexts and purposes can be applied to the Web environment [39, 41, 42]. If the answer is yes, the accumulation of knowledge can be accelerated and customer satisfaction with Web design and e-commerce be increased. One of the organizational theories frequently applied to different fields of study is Herzberg's motivation-hygiene theory [12, pp. 71–91; 13]. It has been used in marketing as well as informa-

tion sciences to identify and distinguish features that lead to customer or user satisfaction or dissatisfaction. Herzberg's research is important because of his conceptualization of satisfaction and dissatisfaction as distinct constructs rather than two values of the same dimension. Zhang et al. apply Herzberg's theory to differentiate hygiene and motivator features of Web sites [39, 41, 42]. While subjects clearly identify some features as hygienic or motivational, there is also a substantial number of features whose classifications appear to depend on individual differences and time factors.

To address some of the limitations of Herzberg's theory, this research is designed to empirically test the applicability of a marketing model to the Web environment with the long-term goal of developing a theory of Web design that takes technical as well as affective aspects into consideration.

## The Kano Model

Kano, a Japanese management consultant and researcher, defined three levels of customer expectations for product and service quality that businesses must meet in order to succeed: (1) basic, (2) performance, (3) exciting. *Basic* quality is the minimum acceptable to the customer and encompasses things customers take for granted and therefore do not think about—their presence goes unnoticed, but their absence will generate complaints. The buyer of a car, for example, assumes that it has a functioning steering wheel, working brakes and lights, and so on. A guest in a hotel expects the service provided to include clean towels and running hot and cold water. *Performance* quality expectations are consciously stated needs—features typically mentioned in TV commercials or other advertisements and discussed as quality items in conversations between customers. Their presence is consciously noted, and their absence is felt as a disappointment or a disadvantage. The size and price of a car, the length of the warranty, and the rate for repairs are examples of performance quality. In the hotel example, the responsiveness and attentiveness of service personnel when one is checking out evoke a sense of satisfaction or dissatisfaction—the less time one has to wait in line and the more attention one receives, the more satisfied one will be. Last, *exciting* quality features are those features that delight customers and inspire loyalty. Since customers usually do not know the existence of or have a conscious need for features of this kind, they will not miss them when not provided. Examples for cars are side airbags, a built-in compass, a dashboard and steering wheel that imitate the cockpit of an airplane, while a service example in a hotel would be the provision of a basket of fruit, bottled water, shoe shining, or ironing at no extra cost.

The Kano model assumes that with time and imitation by others, exciting quality features turn into performance expectations, and performance quality features migrate toward basic expectations [31].

The Kano model was chosen in the present research for three reasons. It represented a parsimonious extension of Zhang et al.'s use of Herzberg's two-factor theory for distinguishing customers' needs [39, 41, 42]. It addresses the issue that the nature of certain quality factors changes over time, an impor-

tant attribute in the fast-moving Web environment. Finally, it is embedded in the quality movement that puts the customer first, continuously evaluates processes, and emphasizes the use of data and employee commitment [23].

## A Web Site Quality Model: An Application of the Kano Model

In the Web environment, the Web (user interface) can be regarded as a service and users as customers. They browse, or "surf," the Internet, access, retrieve, and share information, interact with others over the Internet, order products or trade stocks, and obtain entertainment. Each Web site delivers a special service. The quality of this service plays a greater role than the quality of services to consumers in other sectors, such as hospitals or hotels, or the customer service of a bookstore. First of all, customers of traditional services usually experience the service quality after they have committed to the organizations. In the case of the Web, however, users experience the service quality first and then decide whether to commit [27]. Second, since there is no face-to-face human interaction in the Web environment, service adjustments based on verbal or nonverbal cues (e.g., body language) are impossible. Thus the design of the Web site is of crucial importance in delivering service [27, 38].

In the study described below, the Kano model is applied to the Web environment in order to systematically examine the features commonly used in Web site design. It was chosen for this purpose because it provides a parsimonious and easy-to-understand process for classifying known Web site features according to quality dimensions. As compared to several other models that originated in the fields of marketing and information systems, the Kano model has the advantages of providing identified dimensions of quality and an explanation for the transition of features to different quality designations over time. The use of Kano's model eliminates the debate over the applicability of the SERVQUAL instrument to the IS context and the methodological weaknesses and complexity of that instrument. In addition, the time element in the Kano model recognizes that perceptions of quality change after one has purchased a product or used a service, or becomes more familiar with the product or service in general. This provides a more realistic timing of the assessment of quality, because the judgment is not based on the difference between expectation and use of the product. Expectations may be highly unrealistic, due to insufficient information and inexperience.

The Kano model has the very important advantage of identifying quality features that fulfill unstated needs and make products or services into market leaders. It is assumed here that studying such "delighters" and the time needed for their transition to performance or basic quality features will be especially critical in the fast-moving Web environment. Another strength of Kano's model is the identification of features that provide basic quality, such as preconditions or antecedents for user satisfaction to occur and the understanding that performance and delighter features may become preconditions as time passes.

The study hypothesizes that Web design features can be categorized into three quality types that meet the three quality needs: basic, performance, and exciting. *Basic* features are taken for granted and get the Web site "into the game"—they support expected needs of users on a Web site. Examples are active links and legibility. *Performance* features get the Web site to "stay in the game" and thus contribute to its performance quality. Support for different platforms is an example of a performance feature. Exciting features make users delighted with the Web site—such features are something users do not generally expect from a Web site but are excited by when they see them. By making the Web site "the leader in the game," these features generate user loyalty. An example of an exciting feature is the social feedback associated with using a Web site, such as building of a customer's reputation that occurs on eBay.com as transactions occur. The study also hypothesizes that the quality type of features may change with the passage of time. Some exciting features eventually become performance features, and some performance features become basic features.

## Data Collection

In their study of a two-factor model for Web site design, Zhang et al. constructed a list of 74 features in the Web environment [39, 42]. The list was refined by comparison with several existing Web checklists or studies, resulting in a list of 65 features. A group of 76 students who were experienced Web users then clarified the list of features and classified them into categories in the context of using the CNN.com Web site, resulting in a group of 44 core features that carried high agreement among the participants. These features, although considered Web site design features, are things Web designers can manipulate during the design stage to achieve a high-quality Web site. The effects of some of the features are actually determined by the user as well as the design. Features like "fun to explore," "humor," and "learning new knowledge or skills" resemble some of Herzberg's motivation factors that have to do with the content of the job. For example, something that one user views as humorous or as new knowledge may not be so to another.

These core features and the corresponding categories are employed in the present study. Among the 12 categories identified by Zhang et al. [39, 42], "surfing activity" and the corresponding two features are omitted because they have little to do with Web sites and pertain more to tasks a user undertakes. Table 1 lists the 42 core features and the 11 corresponding categories.

The 70 participants in the study identified the quality characteristics of each Web site design feature. Most of them were graduate students from two professional schools, and several were professionals from a university in the northeastern part of the United States. Among the subjects, 32 percent were male and 68 percent female. On average they had been using the Web for 4.6 years (std. 2.2) at 12.6 hours per week (std. 9.2). The average age was 33 (std. 8). The subjects completed a questionnaire. In order to identify a similar situation while evaluating the quality nature of the features, they were asked to draw upon their own experiences while using the CNN.com Web site or similar Web sites. CNN.com was selected because of its wide range of coverage, which

| Category | Feature ID (FID) | Features |
|---|---|---|
| C1 Information content | F1-1 | Information on Web site stays for a reasonable period of time before it disappears. |
| | F1-2 | Absence of improper materials. |
| | F1-3 | Accurate information. |
| | F1-4 | Appropriate detail level of information. |
| | F1-5 | Up-to-date information. |
| | F1-6 | Relevant information. |
| | F1-7 | Complete coverage of information. |
| | F1-8 | Content that supports Web site's intended purpose. |
| | F1-9 | Controversial materials. |
| | F1-10 | Novel (new) information. |
| C2 Cognitive outcomes | F2-1 | Learned new knowledge and/or skills by using Web site. |
| C3 Enjoyment | F3-1 | Use of humor. |
| | F3-2 | Multimedia. |
| | F3-3 | Fun to explore. |
| C4 Privacy | F4-1 | Access requirements (e.g., pay a fee, sign on, enter a password, provide some private info before one can access info). |
| | F4-2 | Authorized use of user's data for unanticipated purposes. |
| | F4-3 | Authorized collection of user data. |
| | F4-4 | Assurance that user-entered data is encrypted. |
| C5 User empowerment | F5-1 | User controls order or sequence of information access. |
| | F5-2 | User controls how fast to go through Web site. |
| | F5-3 | User controls opportunities for interaction. |
| | F5-4 | User controls complexity of mechanisms for accessing information. |
| | F5-5 | User controls difficulty level of information accessed. |
| C6 Visual appearance | F6-1 | Attractive overall color use. |
| | F6-2 | Sharp displays. |
| | F6-3 | Visually attractive screen layout. |
| | F6-4 | Attractive screen background and pattern. |
| | F6-5 | Adequate brightness of screens/pages. |
| | F6-6 | Eye-catching images or title on homepage. |
| C7 Technical support | F7-1 | Indication of system loading/responding time. |
| | F7-2 | Support for different platforms and/or browsers. |
| | F7-3 | Stability of Web site availability (can always access Web site). |
| C8 Navigation | F8-1 | Indication of user's location within Web site. |
| | F8-2 | Navigation aids. |
| | F8-3 | Directions for navigating Web site. |
| C9 Organization of information content | F9-1 | Presence of overview, table of contents, and/or summaries/headings. |
| | F9-2 | Structure of information presentation is logical. |
| C10 Credibility | F10-1 | Reputation of Web site owner. |
| | F10-2 | External recognition of Web site (e.g., site has won awards, number of times it has been visited). |
| | F10-3 | Identification of site owners/designers. |
| C11 Impartiality | F11-1 | Unbiased information. |
| | F11-2 | Absence of gender or racial/ethnic biases and stereotypes. |

**Table 1. Web Site Design Features and Their Categories.**

meant that most people would be likely to find something interesting. The instructions in the questionnaire defined the three quality types and provided examples. The participants were asked to (1) judge the quality type of each feature at the present time as basic, performance, exciting, or unclear quality, and (2) recall, from their own experience, whether a feature's quality type had changed over time. The subjects spent an average of 46 minutes (std. 27) on the questionnaire.

### Results and Discussion

Table 2 shows the counts of quality designations by participant (the first five columns). Several features (e.g., F1-9, F4-1, F4-2, F4-3) had unclear quality for more than 25 percent of the subjects. Nevertheless, most of the subjects were able to judge features as being of particular quality types. In order to show how the participants in the sample judged the quality types of the features, an illustrative average score was calculated for each quality. Among the participants who could determine the quality nature of each feature, a different weight was assigned to each different quality type. The weights were only for distinguishing different judgments and were ordinal in nature. Weight was assigned 1 for basic, 2 for performance, and 3 for exciting features. Owing to their ordinal nature, the weight assignments could also be reversed, so that 3 was for basic features and 1 for exciting features. Specifically, q-score = (Num_Basic*1 + Num_Performance*2 + Num_Exciting *3)/ Num_Subjects, where Num_Subjects is the number of subjects who judged this particular feature's quality type (excluding the Unclear Quality count). The q-score is in the last column of Table 2. Figure 1 shows the averaged scores plotted by the order of the score.

The features were divided into three groups so that they could be examined from a three-quality-types perspective. The divisions were based on two factors: the "significant jump" on the plot, and the semantic meaning of the features around the division points. Specifically, the division between basic and performance types was between F7-3 (stability of Web site availability: can always access the Web site) and F4-1 (access requirements). The division between performance and exciting was between F10-1 (reputation of Web site owner) and F5-3 (users controls opportunities for interaction). The implication of these divisions is that in the context of using the CNN.com Web site, the basic features are regarded as taken for granted when present. They contribute to the minimal acceptable quality of the users. The performance features are consciously stated or advertised features that give a competitive edge to the Web site. They keep the Web site in the game. The exciting features are not consciously known quality that delights. They make the Web site a leader. For example, the minimal requirement for a news-channel Web site is that the information provided is accurate (F1-3 "accurate information" as a basic feature). Being up-to-date and providing complete coverage are expected to be features that distinguish one news channel from another (thus F1-5 and F1-7 as performance features). Users do not expect that all news channels can provide novel information. Being able to do so will definitely delight users (thus F1-10 is an exciting feature). It is worth noting that the quality scores are for illustrating the quality designations by this group of subjects. The formula

| FID | Basic | Performance | Exciting | Unclear quality | q-score |
|---|---|---|---|---|---|
| F1-1 | 32 | 24 | 8 | 5 | 1.6 |
| F1-2 | 36 | 22 | 4 | 7 | 1.5 |
| F1-3 | 39 | 23 | 8 | 0 | 1.6 |
| F1-4 | 19 | 33 | 16 | 2 | 2.0 |
| F1-5 | 32 | 23 | 15 | 0 | 1.8 |
| F1-6 | 27 | 31 | 10 | 2 | 1.8 |
| F1-7 | 18 | 38 | 14 | 0 | 1.9 |
| F1-8 | 40 | 19 | 9 | 2 | 1.5 |
| F1-9 | 12 | 20 | 10 | 28 | 2.0 |
| F1-10 | 7 | 41 | 21 | 1 | 2.2 |
| F2-1 | 11 | 27 | 31 | 0 | 2.3 |
| F3-1 | 12 | 24 | 20 | 14 | 2.1 |
| F3-2 | 6 | 23 | 34 | 7 | 2.4 |
| F3-3 | 10 | 26 | 33 | 1 | 2.3 |
| F4-1 | 22 | 22 | 7 | 19 | 1.7 |
| F4-2 | 23 | 12 | 7 | 27 | 1.6 |
| F4-3 | 25 | 21 | 4 | 20 | 1.6 |
| F4-4 | 25 | 23 | 12 | 10 | 1.8 |
| F5-1 | 22 | 36 | 10 | 1 | 1.8 |
| F5-2 | 26 | 24 | 16 | 4 | 1.8 |
| F5-3 | 17 | 23 | 19 | 11 | 2.0 |
| F5-4 | 9 | 30 | 19 | 12 | 2.2 |
| F5-5 | 11 | 30 | 18 | 11 | 2.1 |
| F6-1 | 28 | 30 | 10 | 1 | 1.7 |
| F6-2 | 26 | 27 | 12 | 5 | 1.8 |
| F6-3 | 24 | 36 | 10 | 0 | 1.8 |
| F6-4 | 28 | 33 | 9 | 0 | 1.7 |
| F6-5 | 44 | 19 | 4 | 3 | 1.4 |
| F6-6 | 25 | 29 | 15 | 1 | 1.9 |
| F7-1 | 32 | 27 | 7 | 3 | 1.6 |
| F7-2 | 29 | 25 | 13 | 3 | 1.8 |
| F7-3 | 36 | 22 | 12 | 0 | 1.7 |
| F8-1 | 36 | 23 | 5 | 5 | 1.5 |
| F8-2 | 26 | 37 | 6 | 1 | 1.7 |
| F8-3 | 39 | 22 | 6 | 3 | 1.5 |
| F9-1 | 25 | 34 | 11 | 0 | 1.8 |
| F9-2 | 25 | 36 | 6 | 3 | 1.7 |
| F10-1 | 18 | 25 | 16 | 11 | 2.0 |
| F10-2 | 12 | 30 | 16 | 12 | 2.1 |
| F10-3 | 35 | 17 | 8 | 10 | 1.6 |
| F11-1 | 34 | 25 | 6 | 4 | 1.6 |
| F11-2 | 35 | 25 | 8 | 2 | 1.6 |

**Table 2. Quality Designation Counts and the q-Score of Each Feature.**

has certain limitations; and the divisions of the three types are subjective. One limitation of the formula for the q-score is that features within the "performance" range may be merely a collection of "basic" and "exciting" features that averaged out into the "performance" range. An examination of the quality designation counts for each of the 19 performance features (columns 2–4 of Table 2) shows that this is not true. Thus the formula and corresponding plot help in visualizing the quality nature of the features.
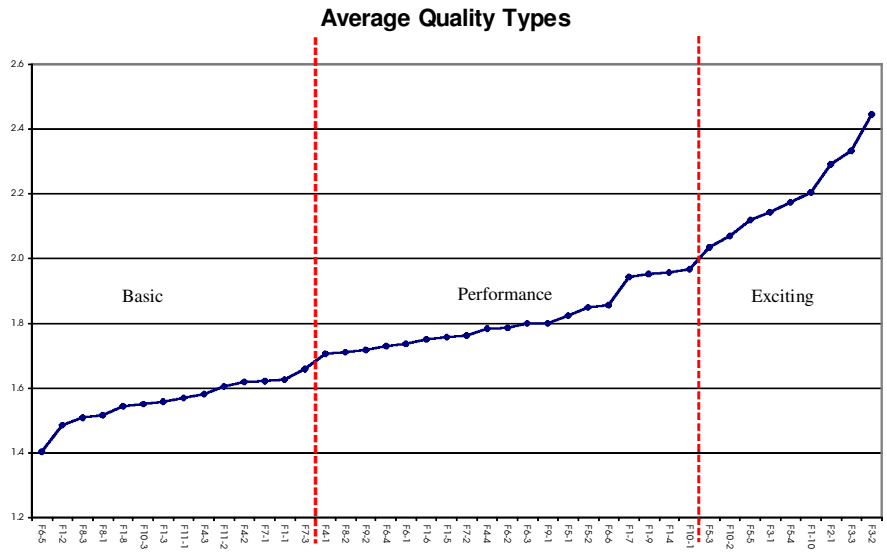
**Figure 1. Average Quality Scores for Basic, Performance, and Exciting Features**

The average q-score of the features in each category is taken in order to have an understanding of the three types of quality expectations at the category level (see Table 1). Figure 2 plots the result. Again, the divisions of the three types are based on "significant jumps" and the semantic meanings of the categories around the divisions. According to Figure 2, "C11–impartiality" and "C8–navigation" are basic quality categories, "C5–user empowerment," "C2–cognitive outcomes" and "C3–enjoyment" are exciting quality categories, and the rest are performance categories.

Figures 1 and 2 show that basic quality factors (either features or categories) tend to be more about user expectations of (1) predictability and stability of available information, services, and supportive resources (F1-1, F1-3, F11-1, F11-2), (2) adequate and available environmental condition to accomplish the goals (F6-5, F7-3), (3) accurate roadmaps and milestones to provide reality checks (F8-1, F7-1), and (4) congruency between stated mission and activities or products (F1-8, F10-3). Since they are taken for granted, their presence does not generate satisfaction, and their absence contributes to user dissatisfaction.

Performance factors are consciously stated needs. They are dependent on contexts, purposes, user cultural background, and individual characteristics. They facilitate task performance and satisfy overtly stated needs of customers. Their absence will be noticed and will disappoint users.

Exciting factors are more about a user's (1) acquiring new knowledge (F2-1), (2) being emotionally involved in a positive way (F3-1, F3-3), and (3) being in control (F5-5, F5-3). They surprise, impress, and delight users. They engender enthusiasm and build customer loyalty and motivation to the Web site. They are desirable for businesses that want to create a competitive strategic advantage.
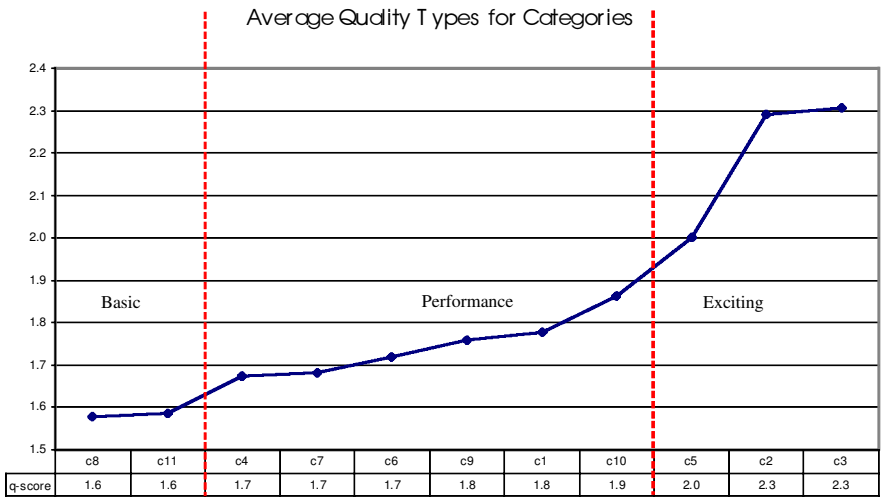
| | c8 | c11 | c4 | c7 | c6 | c9 | c1 | c10 | c5 | c2 | c3 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| q-score | 1.6 | 1.6 | 1.7 | 1.7 | 1.7 | 1.8 | 1.8 | 1.9 | 2.0 | 2.3 | 2.3 |

**Figure 2. Average Scores for Basic, Performance, and Exciting Categories**

## Quality Transitions

One of the important contributions of the Kano model is that factors initially considered exciting quality will migrate, over time, to become performance and then basic quality. In the fast-changing Web environment, the perception of quality transition has important implications for Web site designers. Subjects in the study were asked to confirm or disconfirm this idea and evaluate each feature by sharing their own perceptual changes. Some of the subjects, when asked to judge the transitional nature of quality over time, thought that certain features never changed. Others indicated that certain features definitely changed and gave an estimate of the transition time in terms of frequency of visits.

Table 3 represents three examples of the quality transition from exciting in the past to performance in the present time. The numbers in the table are the number of subjects who made the judgment. Table 4 shows three examples, judged to be basic quality in the present, that were recalled as performance quality in the near past, and as having been exciting features initially.

## Limitations

This first study used a top-down approach. The Kano model was applied to a list of core features identified by Zhang and von Dran [39, 42]. The purpose was to examine customers' expected quality factors and the possible time transition of the quality in a general news Web site (CNN.com). The study had several limitations, as discussed below. Some of these were addressed in the second study.

1. Although it is unlikely that all the features have the same importance to users, the study did not distinguish features by weight of importance.

| Feature | Exciting ➡ performance | |
|---|---|---|
| | Yes | Never |
| $F_{5-2}$ Users can control how fast to go through site | 14 | 9 |
| $F_{9-1}$ Presence of overview, TOC, and/or summaries/headings. | 21 | 10 |
| $F_{6-6}$ Eye-catching images or title on homepage | 22 | 3 |

**Table 3. Quality Transition of Exciting to Performance.**

| Feature | Exciting ➡ performance | | Performance ➡ basic | |
|---|---|---|---|---|
| | Yes | Never | Yes | Never |
| $F_{6-5}$ Adequate brightness of screens/pages | 2 | 19 | 9 | 24 |
| $F_{7-3}$ Stability of site (can always access it) | 2 | 15 | 12 | 13 |
| $F_{8-2}$ Navigating aids | 4 | 12 | 16 | 10 |

**Table 4. Quality Transition of Exciting to Performance, and Performance to Basic.**

This limitation is addressed in the second study because it is critical for designers to know which features are most important to users.

2. There is no evidence as to whether the quality expectations for features are the same in different domains. This too is addressed in the second study. If the importance of a feature varies in different domains, one may infer that the quality expectations for the feature will also differ.

3. Methodologically, the original list of features was constructed with a top-down approach in an effort to be as general as possible without being constrained by a particular domain. This procedure may have led to the omission of some domain-specific features. The second study uses a purely data-driven approach to reflect user perceptions of features in different domains. This approach does not rule out the emergence or discovery of domain-specific features.

4. The generalizability of the results is limited by the demographic characteristics of the participants, who were highly educated, infor-mation-literate or professionals, and primarily female. These limita-tions will be addressed in future studies when the fully developed model/theory is tested.

## An Extended Web Site Quality Model: Ranked and Domain-Specific Quality Factors

The second study extended the Web site quality model by examining differ-ent Web site domain types and users' perceptions of the relative importance

of the quality factors in different domains. Independent of the first study, it used a bottom-up inductive thematic analysis approach to derive Web site design features from subjects' answers to a questionnaire [5]. Six Web site domains were selected based on commonly used subject areas and potentially different user purposes: financial (e.g., CNNfn.com, quote.yahoo.com), e-commerce (e.g., Amazon.com, e-Bay.com, or other e-tailer Web sites), entertainment (e.g., a cartoon or a game Web site), education (e.g., National Geographic or a university's Web site), government (e.g., U.S. Department of Labor, and the White House Web site), and medical or health information Web sites (e.g., WebMD.com and Dr. Koop).

## Data Collection

The participants in the study were asked to list, in priority order, the five most important Web site features for each of six different Web site domains. Sixty-seven graduate students at a major northeastern university participated. They were paid $10 upon their completion of the survey. Three of the subjects did not understand the requirements and provided unusable answers, and these sets of data were dropped during the analysis. Table 5 shows the example answers by one subject.

## Coding in Thematic Analysis

Subjects' answers to the questions were examined using the thematic analysis method [5]. In this data-driven approach, two independent raters worked directly from the raw answers to extract words and phrases that were used to generate the codes. The close relation between the codes and the raw answers improved the coding consistency between the raters. The codes were measured by magnitude of appearance (i.e., frequency). The software used for the coding was ATLAS.ti, version WIN 4.2.

The unit of the analysis (defined as a quotation in ATLAS.ti) was regarded as the whole answer a subject gave for one domain. The unit of coding (termed a code in ATLAS.ti) was the particular features that subjects listed in their answers. The codes were initially developed using the original words and phrases in the quotations in one domain, the financial domain. Most of the survey responses were manifest, but some were latent, and were interpreted by the raters [5, p. 16]. A consensus meeting with a third rater resolved disagreements between the two independent raters. This included establishing rules on how to break quotations into meaningful units of coding while keeping the priority ranking provided by the users in the codes. Thus, for s181's answer for the entertainment domain (which is a quotation; *see Table 5*), five codes were developed with the priority embedded in the codes: (1) multimedia 1, (2) interaction 2, (3) display/images/graphics 3, (4) quick download time 4, and (5) links 5.

A supercode is defined as a term with distinctive meaning; and a code is a supercode with a suffix indicating the priority. For example, "customization" is a supercode and may include five codes: customization 1, customization 2, customization 3, customization 4, and customization 5. Thus it is possible that

| SID | Finance | E-commerce | Enter-tainment | Education | Govern-ment | Medicine/health |
|-----|---------|------------|----------------|-----------|-------------|-----------------|
| s181 | Current information (i.e., recent updates), variety of different markets, readily available detailed information, other links, graphs and other supporting historical data | Don't really utilize e-commerce Web sites | Multimedia, interaction, displays, sharp images, graphics, quick download time (if applicable), links | Navigation to find appropriate material, good searches (advanced features), downloadable publications, so you don't have to view on-line (pdf files), links, references | Organization, table of contents, current information, easy access to current regulations, good searches, downloadable regulations | References to medical associations, current information, searches, different points of interest, accessibility |

**Table 5. Example Answers by One Subject.**

in a given domain, only one or two codes were used from a supercode. Before the code scheme was applied to other domains, the supercodes were scaled into a more manageable list [5, p. 134]. This included the consolidation of similar supercodes as a new supercode with a higher level of abstraction. For example, after the scaling, the codes for s181's quotation for the entertainment domain became (1) multimedia 1, (2) interactivity 2, (3) visual design 3, (4) site responsiveness 4, and (5) links to info 5. The result of the scaling was a new code schema of 118 codes.

When the two raters coded the remaining domains, the original words or phrases from the subjects were identified as belonging either to an existing supercode or a new supercode. Consensus meetings were conducted for coding results of each of the domains and the inter-rater reliability scores were calculated both before and after the meetings. All inter-rater reliability scores are above 85 percent.

Clustering is defined as "the organization of multiple themes into groups" [5, p. 134]. The clustering of the supercodes revolved around the creation of families and placement of supercodes within them. For example, the family of "Navigation" included codes like "easy to navigate," "navigation aids," and "clear layout of information," to name a few. Since the clustering was based on the code scheme and not on any previous theory, the families more accurately reflect the respondent's answers.

As an iterative process, the scaling was repeated once all the domains were coded. The scaling task was coupled with the refinement of families. Several supercodes with single responses (one response for the entire supercode) were compressed with other supercodes. Similarly, family memberships were adjusted in order to eliminate families with only one supercode and to reflect stronger semantic coupling among supercodes.

## Data Analysis and Results

Some of the subjects did not use or never used Web sites in certain domains (see s181 in the e-commerce domain in Table 5) and thus could not and did not provide any opinions about which features were most important. For those who provided perceptions on some or all domains, the analysis was conducted at two levels: code and cluster (or family, as noted in ATLAS.ti) of codes. Since the designers or evaluators of Web sites sometimes need to focus on a small number of factors that affect user perceptions of Web sites, it may be helpful to group features into a higher level of abstract units, namely, clusters or clusters of features, that provide a better overview of the characteristics of Web site features. Since subjects were able to give a list of features with priorities (order of importance), this information was used in the analysis in the form of weighted frequencies at both the code and clusters levels.

### Weighted Rank of the Most Important Features for Different Domains

For each code in each domain, the weighted score was determined by the frequency of the code in the domain multiplied by the weight for the priority assigned by the subjects. That is: Score = PriorityWeight * Frequency, while PriorityWeight is designed as: first priority (most important) has a weight of 5, second (second-most-important) 4, third 3, fourth 2, and fifth 1. Table 6 lists the five most important features for each of the six domains based on the weighted frequencies. Table 7 shows the common and domain-specific features. The following observations are derived from the tables.

1. The financial domain had high requirements on the nature of the information, such as *up to date*, *accuracy*, *multiple sources*, and *timeliness.*

2. *Easy to navigate* was also very important and ranked as number 4 for the financial domain. For all other domains, however, it was ranked as either 1 or 2, and thus was a must-have feature for all six domains.

3. *Up-to-date information* was very important for the financial domain, and also for the government, medical, and entertainment domains. It was not listed among the five most important features for the education and e-commerce domains.

4. The entertainment domain had high demand on *visual design, multimedia* and *site responsiveness*, which were not on the list for any of the other five domains.

5. *Search tool* was ranked as important in the education, government, medical, and e-commerce domains.

6. The education and medical domains required *comprehensiveness of information*, a feature not ranked on the five-most important lists in the other four domains.

7. *Accuracy of information* was most important for the medical domain, somewhat important for the financial, education, and government

domains, but not among the five most important for the e-commerce and entertainment domains.

8. *Security of data* was ranked number 1 for e-commerce but did not appear in any other domain.

### Weighted Rank of the Five Most Important Clusters for Each Domain

There were a total of 15 clusters of features, as shown in Table 8. One of them, "Do not use / never used the domain," was disregarded. The weighted score of a cluster was calculated by using the weighed scores of the supercodes belonging to the cluster. Table 9 lists the five most important clusters for each of the six domains, while Table 10 shows the common and domain specific clusters. As can be seen in Tables 9 and 10,

1. *Navigation* was ranked among the three most important clusters in all domains.

2. *Completeness/comprehensiveness of information* was among the two most important clusters in all but the e-commerce and entertainment domains.

3. *Site technical features* (most responses were from the search tool feature) was ranked from the third to the fifth cluster in all but the financial and entertainment domains.

4. *Currency/timeliness/update* was among the top three for the financial, medical, and government domains.

5. *Accuracy* was listed as the fourth or fifth cluster for the financial, medical, and government domains.

6. *Readability/comprehension/clarity* was ranked as fourth or fifth for the financial, education, and e-commerce domains.

Table 10 also indicates that three domains had unique clusters. For example, the education domain required *information reliability/reputation*, e-commerce demanded *security/privacy* and *product and service concerns*, while entertainment required four unique families: *visual design*, *engaging*, *information representation*, and *site accessibility/responsiveness*. For the e-commerce domain, users treated products/services as Web site features. This implies that having impressive or great Web site features alone is not enough—users need good products and services from the company behind the Web site.

## Discussion

The results show that the important features and clusters are more common than different across the six domains. This finding, if confirmed in other studies, can lead to the development of a group of features important in all domains. The fact that the values attached to these common features and clusters

| Order | Finance | Score | Education | Score | Govern-ment | Score |
|---|---|---|---|---|---|---|
| 1 | Up-to-date information | 92 | Easy to navigate | 107 | Easy to navigate | 100 |
| 2 | Accuracy of information | 81 | Search tool | 85 | Clear layout of information | 77 |
| 3 | Multiple information sources | 76 | Accuracy of information | 72 | Up-to-date information | 66 |
| 4 | Easy to navigate | 52 | Comprehensiveness of information | 55 | Search tool | 64 |
| 5 | Timely information | 32 | Clear layout of information | 54 | Accuracy of information | 62 |

| Order | E-commerce | Score | Medicine/ | Score | Enter-tainment | Score |
|---|---|---|---|---|---|---|
| 1 | Security of data | 121 | Accuracy of information | 87 | Visual design | 172 |
| 2 | Easy to navigate | 97 | Easy to navigate | 60 | Easy to navigate | 70 |
| 3 | Appropriate explanatory text | 59 | Search tool | 53 | Site responsiveness | 68 |
| 4 | Search tool | 45 | Up-to-date information | 52 | Multimedia | 58 |
| 5 | Product and service price concerns | 44 | Comprehensiveness of information | 52 | Up-to-date information | 50 |

**Table 6. Five Most Important Features for the Six Web Site Domains.**

differ, however, implies that users have different quality expectations when using different types of Web sites. Presumably the quality divisions would also be different for different Web sites. Figures 1 and 2 show the quality division for the CNN.com Web site, a news channel site. The divisions into basic, performance, and exciting features are likely to vary for other Web sites, an assumption that will be tested in future research.

Several domain-specific features and clusters were not identified in the first study. For example, *product and service price concerns* is specific to the e-commerce domain, and *timely information* is specific to the financial domain. *Appropriate explanatory text* is necessary in the e-commerce domain because this is a relatively new channel for consumers to use to conduct business and thus has a high need for clear explanations. And since e-commerce is relatively new, four of the five most important features were not captured in the earlier study and are not similar to any other domain. This finding implies that the context and purpose of Web sites can be major influences on user expectations. As the Web is used for new and emerging activities, designers will have to creatively and vigilantly anticipate user requirements rather than assume that Web design features from one context can simply be applied in another.

| | Education | Government | Medicine | Entertainment | e-commerce | Finance |
|---|---|---|---|---|---|---|
| **Common features** | 1 Easy to navigate | 1 Easy to navigate | 2 Easy to navigate | 2 Easy to navigate | 2 Easy to navigate | 4 Easy to navigate |
| | 3 Accuracy of information | 5 Accuracy of information | 1 Accuracy of information | | | 2 Accuracy of information |
| | | 3 Up-to-date information | 4 Up-to-date information | | 5 Up-to-date information | 1 Up-to-date information |
| | 2 Search tool | 4 Search tool | 3 Search tool | | | |
| | 5 Clear layout of information | 2 Clear layout of information | | | | |
| | 4 Comprehensiveness of information | | 5 Comprehensiveness of information | | | |
| **Domain-specific features** | | | | 1 Security of data | 1 Visual design | 5 Timely information |
| | | | | 3 Appropriate explanatory text | 3 Site responsiveness | 3 Multiple information sources |
| | | | | 4 Search tool | 4 Multimedia | |
| | | | | 5 Price concerns | | |

**Table 7. Five Most Important Features: Common and Domain-Specific.**

*Note*: Numbers are given in priority order, with 1 the most important.

Many of these features, as well as the categories/clusters, have been identified in other studies [14, 21, 22, 28, 29, 38], and most of them pertain to e-commerce Web sites. The two studies described in this paper systematically examined these features according to a forward-looking (time effect) quality model and user's perceptions of their importance in specific Web site domains. This adds two significant dimensions to the identification of Web site features and advances the creation of an overall theoretical framework. For example, navigation, technical support, multimedia, and presentation and content of information have been identified by Ho and Wu, Liang and Lai, Lohse and Spiller, and Palmer and Griffith, among others, as important features of e-commerce Web sites [14, 21, 22, 28]. Some of these researchers found that categories like the goal orientation of the users or culture need to be taken into consideration when designing company Web sites [29, 38]. However, the studies reported here identify the significant meanings of these features and cat-

| | Family | Definition | Finance | E-Commerce | Entertainment | Education | Government | Medicine/Health | Totals |
|---|---|---|---|---|---|---|---|---|---|
| D01 | Accuracy | No errors, correct, exact, precise, right, true | 19 | 11 | 2 | 19 | 14 | 21 | 86 |
| D02 | Completeness/ compre-hensiveness of information | Large in scope or content, contains variety of information or sources | 51 | 13 | 23 | 53 | 42 | 51 | 233 |
| D03 | Currency/ timeliness/ update | Information is current, up to the moment, real-time, timely | 46 | 10 | 16 | 18 | 32 | 27 | 149 |
| 0D4 | Engaging | Cognitive advancement, emotional connections, personal expressions | 5 | 3 | 42 | 13 | 2 | 7 | 72 |
| D05 | Information reliability/ reputation | Information dependable, condition of being held in high esteem, authoritative, good reputation of information source | 11 | 7 | 5 | 19 | 14 | 17 | 73 |
| D06 | Information representation | The way information is presented, maybe in different format/media, customized displays | 16 | 11 | 22 | 8 | 1 | 3 | 61 |
| D07 | Navigation | Features to make navigation possible, site maps | 31 | 65 | 33 | 55 | 53 | 35 | 272 |
| D08 | Visual design | Visual appearance | 2 | 7 | 46 | 19 | 3 | 3 | 80 |
| D09 | Product and service concerns | Features concerned with products/services offered/ sold through Web site, not about site itself; price and availability of products/services | 8 | 64 | 4 | 5 | 10 | 12 | 103 |
| D10 | Readability/ comprehension/ clarity | Ability to comprehend meaning of written or printed words or symbols, to perceive or receive well | 17 | 19 | 11 | 22 | 20 | 18 | 107 |
| D11 | Relevant information | Information that directs to the point, having to do with matter at hand | 19 | 1 | 0 | 12 | 8 | 13 | 53 |
| D12 | Security/privacy | Confidentiality of information, things that give or assure safety and guarantee | 7 | 47 | 4 | 1 | 6 | 9 | 74 |

| | Family | Definition | Finance | E-Commerce | Entertainment | Education | Government | Medicine/Health | Totals |
|---|---|---|---|---|---|---|---|---|---|
| D13 | Site accessibility/ responsiveness | Being able to access Web site; responsiveness of site to user's request in terms of time. | 12 | 19 | 21 | 10 | 4 | 8 | 74 |
| D14 | Site technical features | Such features as search tools, downloadable (printer-friendliness), chat rooms. | 6 | 19 | 2 | 30 | 24 | 22 | 103 |
| D15 | Do not use / never used | | 12 | 3 | 10 | 2 | 12 | 8 | 47 |
| | Total frequency | | 262 | 299 | 241 | 286 | 245 | 254 | 1587 |

**Table 8. Clusters of Supercodes and Frequency Counts Across Domains.**

egories to the user's quality expectations and ultimately to user satisfaction and dissatisfaction. This will enable companies to consciously decide how to invest their time and resources when designing Web sites.

Last, Web site designers and evaluators should understand that Web site quality features have a dynamic, changing nature. No checklist can go unchanged for long for any domain or quality expectation. The e-commerce domain shows how new features emerge into the most important features when customers use the Web for different purposes and as the technology advances.

## Conclusion

This paper reports the results of two studies. The first applied a marketing model, the Kano quality model, to a single type of Web site in order to develop a Web site quality model. The second expanded the quality model to a broader range of Web sites by independently determining the most important Web site design factors in six different domains. The expanded Web site quality model indicates that (1) users of a Web site distinguish three types of quality factors that correspond to their quality expectations, (2) the quality nature of the factors may change over time, (3) the same factor may have different quality designations in different domains, and (4) users do not regard all the factors within the same quality type as equally important, and thus each domain may require unique and domain-specific factors.

The most important factors in most domains appear to be of the basic and performance types, and few are of the exciting type. This was to be expected, because, according to Kano, users are not consciously aware of exciting features and categories. When they compare products or services, they usually

| Order | Finance | Score | Education | Score | Government | Score |
|---|---|---|---|---|---|---|
| 1 | Currency/timeliness/ update | 173 | Navigation | 186 | Navigation | 193 |
| 2 | Completeness/ comprehensiveness of information | 129 | Completeness/ comprehensiveness of information | 142 | Completeness/ comprehensiveness of information | 114 |
| 3 | Navigation | 93 | Site technical features | 98 | Currency/ timeliness/update | 96 |
| 4 | Accuracy | 81 | Information reliability/reputation | 79 | Site technical features | 76 |
| 5 | Readability/ comprehension/clarity | 54 | Readability/ comprehension/clarity | 78 | Accuracy | 62 |

| Order | E-commerce | Score | Medicine/ Health | Score | Entertainment | Score |
|---|---|---|---|---|---|---|
| 1 | Security/privacy | 201 | Completeness/ comprehensiveness of information | 149 | Visual design | 172 |
| 2 | Navigation | 196 | Navigation | 111 | Engaging | 132 |
| 3 | Product and service concerns | 162 | Currency/ timeliness/update | 97 | Navigation | 105 |
| 4 | Readability/ comprehension/clarity | 64 | Accuracy | 87 | Information representation | 74 |
| 5 | Site technical features | 56 | Site technical features | 64 | Site accessibility/ responsiveness | 68 |

**Table 9. The Most Important Clusters for the Six Domains.**

address their consciously known needs. The expanded Web site quality model provides a method that allows designers to identify the basic and performance factors that provide preconditions for consumer satisfaction and the company's ability to stay in business. Knowing the basic and performance factors, however, is not enough to attract new customers or retain existing ones. Designers have to use their creative energy to identify exciting factors that address consumers' unstated emotional and affective needs. Anticipation of exciting factors will provide a competitive edge that can vault a company into a leading position.

The two studies presented here provide empirical evidence about user perceptions of Web site quality factors. Guided by these results, Web site designers should focus on users' basic and performance quality expectations and the most important factors when designing Web sites. Many of these factors are systemic and technical requirements. Nonetheless, as the first study shows, exciting Web sites provide something extra that meets the unstated needs of users. In the increasingly competitive Web environment, designers who want to give their products and services a competitive edge are advised to pay

| | Education | Government | Medicine | Entertainment | e-commerce | Finance |
|---|---|---|---|---|---|---|
| **Common clusters** | 1 Navigation | 1 Navigation | 2 Navigation | 3 Navigation | 2 Navigation | 3 Navigation |
| | 3 Site technical features | 4 Site technical features | 5 Site technical features | | 5 site technical features | 5 Site accessibility/ responsiveness |
| | 2 Completeness/ comprehensiveness of information | 2 Completeness/ comprehensiveness of information 3 Currency/ timeliness/ update 5 accuracy | 1 Completeness/ comprehensiveness of information 3 Currency/ timeliness/ update 4 accuracy | 1 Currency/ timeliness/ update 2 Completeness/ comprehensiveness of information 4 accuracy | | |
| | 5 Readability/comprehension/ clarity | | | 5 Readability/ comprehension/ clarity | Readability/ comprehension/ clarity 4 | Information representation 4 |
| **Domain-specific clusters** | 4 Information reliability/ reputation | | | | Security/ Privacy 1 | 1 Visual design |
| | | | | | Product and service concerns 3 | Engaging 2 |

**Table 10. Five Most Important Clusters: Common and Domain-Specific.**

attention to users' affective, intellectual, and aesthetic needs, which tend to be more subjective and elusive.

The major limitations of the two studies discussed in this paper include the demographic characteristics of the participants (homogeneous university-related people with high levels of Web experience). In addition, the studies relied on participants' recall of using the Web rather than actual Web use experience and did not control for mode of interaction with the Web. Owing to the exploratory and qualitative nature of the studies, there was no control on users' answering the questionnaires (as in the case of a lab-controlled experiment). Last, the research was not designed to quantitatively capture the dynamic (time transition) nature of the quality features and categories. These and other limitations are being addressed in ongoing research studies.

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PING ZHANG (pzhang@syr.edu) is an associate professor in the School of Information Studies, Syracuse University. She has a Ph.D. in information systems from the University of Texas at Austin, and an M.Sc. and B.Sc. in computer science from Peking University, Beijing, China. Her research has appeared in *Decision Support Systems, Journal of the Association for Information Systems, Journal of the American Society for Information Science and Technology, e-Service Journal, IEEE Computer Graphics and Applications, Simulation, Journal of Education for MIS,* and *Journal of Research on Computing in Education*, and in the proceedings of several national and international conferences. She received Best Paper awards from the American Conference on Information Systems in 2001 and from the International Academy for Information Management in 1997, and an Excellence in Teaching award from the University of Texas at Austin in 1994.

GISELA M. VON DRAN (gvondran@som.syr.edu) is professor of strategy and human resources at Syracuse University's School of Management. She has a D.P.A. degree from Arizona State University, an M.L.S. from Vanderbilt University, and a B.S. from the Universitaet des Saarlandes in Germany, and before embarking on an academic career held administrative positions at Arizona State University and Texas Tech University. Her research interests include organizational strategy, management of information-based organizations, and Web user interface studies from a motivational perspective, and she has written about management and personnel issues with an emphasis on organizational change, leadership, and staff empowerment. Her work has appeared in *National Productivity Review*, *Project Management Journal*, *International Journal of Computers and Engineering Management*, *Journal of the American Society for Information Science and Technology*, *Computers and Society*, *e-Service Journal,* and *Journal of Applied Management Studies*.