Cultural Signifiers of Web Site Images

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ABSTRACT: Web sites rely on pictures and animation to convey subtle messages that are more effectively communicated nonverbally. We argue that such messages could have strong cultural content, which should be understood in developing Web sites. Hence, this paper explores the cultural content of Web site images and develops a theory for Web-image signifiers. This is done in two phases. Phase I has an interpretive

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qualitative approach that uses Grounded Theory to identify signifiers and to develop the Web-image signifiers (WIS) theory. Phase II quantitatively tests the WIS theory. Together, these two phases identify and validate signifiers of cultural dimensions in Web site images. More interestingly, the results uncover that cultural dimensions are signified in five categories, of which two, humans and buildings categories, are the most prominent. The contribution of this paper is in developing a comprehensive theory for the cultural content of Web images, identifying 48 signifiers in Web images, discovering new categories of signifiers, and providing insights into the nature of cultural signification by testing the theory. Such knowledge could heighten our sensitivity and awareness of hidden cultural messages in Web site images. The WIS theory could provide a novel approach to the cultural studies of Web images and other artifacts with cultural content. The results of this work have immediate application in the design of Web sites for a multicultural audience.

KEY WORDS AND PHRASES: cultural signifiers, Grounded Theory, Hofstede's cultural dimensions, semiology, Web-image signifiers theory, Web site images.

WRITTEN COMMUNICATION IS MORE THAN 6,000 YEARS OLD [99]. Although its origin is not well understood, written communication arguably has its origin in rock carving and rock painting in the "pre-writing" stage of written languages [119]. Drawing images preceded writing. Written languages have evolved by deconstructing, simplifying, and organizing concepts embedded in images. "To write" in many languages, including English, has the corresponding etymology of "to scratch" or "to paint" [119, p. 4]. Some languages, such as Chinese and Japanese, have remained pictorial in their structure [138]. Primeval Chinese *ku-wan gesture pictures* preceded pictographs [44], and thousands of years ago Native American tribes notched or painted sticks to convey messages [44]. Moreover, "the Chauvet cave paintings recently discovered in France are 30,000 years old" [44, p. 1]. In the early rise of Christianity, church carving was the primary form of mass communication, as most people were not literate. Even in their primitive forms, these depictions are complex and represent multiple concepts, including movements, emotions, and attitudes.

It is argued that images are more primal in human sensory communications. "It is seeing which establishes our place in the surrounding world; we explain the world with words, but words can never undo the fact that we are surrounded by it" [14, p. 7]. Visual culture—in visual arts and mass entertainment (television, animations, video/Web-based games, and avatars)—has become a thriving area of study in multiple disciplines. It has, to the indignation of many, overtaken the written word as the popular mode of asynchronous communication, leading to lamentations such as "Visual culture is taking over the world—at the expense of written word" [99, p. 24]. Visually dominant communication is upon us and it behooves a technical and commercial communicator to understand its various dimensions and become an *eideteker* or "possessor of a deep understanding of the structure of visual knowledge" [103, p. 13].

The Internet, with its increasing bandwidth, has accelerated and globalized visual communication. Images of various types and forms, such as pictures, graphs, animations, icons, avatars, and emoticons, have become tools for communication across the Web. Thus, technology has increased the role of visual artifacts as effective modes of asynchronous mass communication. The global nature of the Internet makes it a medium of choice for intercultural communications in commerce, service, entertainment, and community exchanges. Showing a picture of the product could be more effective than describing it—particularly to nonnative buyers. Images in particular "are no longer subordinate to verbal texts . . . rather, images are integral to all forms of (a broadly conceived) 'writing,' and this suggestion accurately describes writing within the Web" [114, p. 4].

While Internet use has reached 77.4 percent in North America [62], it constitutes only 13.5 percent of all global Internet users (266 of 1.967 billion users) [62]. More than half of Internet users reside in non-English-speaking countries [62]. For the period 2000–2010, the grwoth of Internet users in North America was 146.3 percent, compared to 672.3 percent for the rest of the world (computed based on data from [62]). The rapid growth of non-U.S. Internet users will further increase the importance of culturally appropriate visual artifacts on the Web. This becomes increasingly true because the "Web is not a culturally neutral medium" [124, p. 75], and Web site design preferences vary across cultures [9, 28, 102, 123, 131].

There is abundant evidence of the importance of culture in information systems (IS) success [36, 39, 63, 70, 81, 105, 121, 135]. This point has been supported by studies showing that national differences and cultures pose serious challenges for IS adoption [58, 70, 112, 127, 129] and for Internet adoption and commercialization [4, 21, 129]. It has been shown that culture affects Web site usability and performance. Inclusion of images [128] and visual design of Web sites are strongly associated with satisfaction [134] and trust [28], lead to reuse intentions [83], and provide clues for visitors in judging whether a Web site is targeted to them [131]. It is reported that the "congruity" of a Web site's language (English versus Spanish) and graphics with a visitor's culture lowers the cognitive effort needed to use the Web site [84], and that fit between culture-laden advertising appeal (individualist versus collectivist) and a culture-laden picture (individualist versus collectivist) is likely to generate positive cognitions and affects [92]. Thus, making a Web site culturally congruent could enhance Web sites' usability [98], thus enhancing customer satisfaction, trust, and ultimately, loyalty [9].

Although the research indicates the importance of culture in Web designs and visual artifacts in multiple disciplines, little systematic knowledge exists about the cultural signifiers of Web images. Following [8, 140], we define *cultural signifiers of Web images* as elements that reflect cultural dimensions of the image. (Examples of cultural signifiers are the gender of humans or the style of their clothing, such as formal attire, in the image.) Zahedi et al. [140] have identified cultural signifiers (for masculinity-femininity) in Web documents and noted the need for the investigation of cultural signifiers in Web images. Cyr [28] has noted a similar need in her study of

Web site design and its relation to trust and satisfaction across three countries, which has called for a systematic investigation of Web site visual design and culture. This paper attempts to address this gap by attempting to answer the following research questions: (1) What are the cultural signifiers of Web images? and (2) How do cultural signifiers differ across cultural dimensions?

Using Web images as the unit of analysis, we investigate these questions in two phases: one qualitative and the other quantitative. Phase I (qualitative) identifies 48 distinct cultural signifiers of Web images and develops the Web-image signifiers (WIS) theory. In this phase, we use the configural theory [114] to theoretically justify the search for cultural signifiers in Web images and semiology [42] as the theoretical lens identifying cultural signifiers. We use Hofstede's cultural dimensions in the application of semiology. The method of analysis in Phase I is the interpretive approach using Grounded Theory [54, 104, 130]. It involves 245 Web images from 14 countries.

In Phase II (quantitative), we test the WIS theory that emerged from Phase I using 900 images on home pages of 728 Web sites for 3 domains (universities, hospitals, and banks) from 39 countries. The analysis of data in Phase II generally supports the propositions of the WIS theory and provides new insights into the associations between cultural dimensions and their signifiers.

This paper makes unique contributions to theory and practice. It is the first to develop a comprehensive list and categories of Web-image signifiers and to propose the WIS theory, which provides a novel theoretical perspective for the existence of signifiers and their relationships with dimensions of culture. It is the first to discover the systematic signification of traditional and modern dimensions of culture in Web images. Its contributions to practice are in the detailed and extensive identification of signifiers and the ways these signifiers communicate cultural contents. The identification of relationships among signifiers provides insight into how to create culturally congruent Web images.

Phase I: Identifying Cultural Signifiers of Web Images

As Table 1 indicates, research into the influence of culture on Web site design has been an active area of investigation, and a number of research papers focus on identifying Web site differences among different countries and cultures.

These studies have shown that culture plays a significant role in Web site design and design element preferences. However, these studies neither provide a systematic, detailed list of Web-image signifiers, nor propose a theory to explain their existence. This paper is the first to address these gaps.

Cultural dimensions have been defined differently by a wide variety of researchers (see [81] for a review). Hofstede identifies five cultural dimensions: masculinity-femininity, individualism-collectivism, high and low power distance, high and low uncertainty avoidance, and long- and short-term orientation.

In addition to these dimensions, there are many other dimensions, such as high/low context, monochromic/polychromic, high/low trust, ideocentric/allocentric, pragmatism/idealism, rational/humanism, free will/determinism, wealth accumulation/just

Table 1. Summary of Research in Web Site Culture

Author(s)	Summary: Unit of analysis, cultural dimensions, data, method, results
	Focus: Web site
Amant [5]	**Dimension:** Different countries. **Unit:** Image. **Data:** Theoretical paper. **Results:** Suggested that images have different meanings in different international settings, e.g., electric plug, mail box. Suggested four-step guidelines based on prototype theory for developing images for global consumption.
Barber and Badre [9]	**Dimension:** Different countries. **Unit:** Web site and user. **Data:** 18 countries' Web sites. **Results:** The first study identified *cultural markers* in 15 categories, e.g., language, color, font style, shapes, HTML specific, orientation. The second study got mixed results. For U.S. participants, no impact of varying the cultural markers was observed. However, for Italian participants, the Italian designs were preferable for navigation markers but not for color.
Cyr and Trevor-Smith [29]	**Dimension:** Hofstede. **Unit:** Web site. **Data:** 90 municipality Web sites from Germany, Japan, and United States. **Results:** Focus group identified eight categories of site characteristics: language, layout, symbols, content and structure, navigation, links, multimedia, and colors. The review of the Web sites revealed significant differences in each of the listed categories suggesting different design preferences across cultures.
Kale [67]	**Dimension:** Hofstede. **Unit:** Gaming Web site. **Data:** Theoretical paper. **Results:** Posited relationships among the cultural dimensions and Web site features and themes. For instance, it is suggested that themes of novelty and pleasure on gaming Web sites would be viewed more favorably in collectivist cultures, and more personalized themes would be viewed more favorably in individualist cultures.
Kale et al. [68]	**Dimension:** 10 dimensions drawn from Hofstede [59] and Trompenaars [133]. **Unit:** Web site. **Data:** Theoretical paper. **Results:** Provided propositions relating cultural dimensions with Web communication. For instance, it is suggested that in high power distance a more formal tone will be preferred.
Marcus and Gould [86]	**Dimension:** Hofstede. **Unit:** Web site home pages. **Data:** Two Web sites per dimension. **Results:** Pointed out the differences in the home page design of the culturally different countries. For example, the U.S. (high individualism) Web site focuses on the visitor, whereas the Costa Rican (high collectivism) Web site emphasizes a national agenda and downplays the individual tourist.

(continues)

Table 1. Continued

Author(s)	Summary: Unit of analysis, cultural dimensions, data, method, results
Okazaki and Rivas [102]	**Dimension:** Hofstede individualism/collectivism. **Unit:** Product Web page. **Data:** 60 Web sites (Japan, Spain, and United States). **Results:** As hypothesized, found that Japanese Web pages demonstrated fewer individualistic values when compared to Web pages from the United States and Spain.
Robbins and Stylianou [111]	**Dimension:** Hofstede. **Unit:** Web site. **Data:** 90 Fortune 500 companies' Web sites. **Results:** For each of the cultural dimensions, found that one or more of the indicators was significant.
Salinas [115]	**Dimensions:** Uses culture as a set of ideologies and values. **Unit:** Web site image. **Data:** Nike's 1997–1998 Web site. **Results:** Argued images are configurations of artifacts, figures representing ideological and cultural values.
Singh et al. [124]	**Dimension:** Hofstede + Hall's high-low context. **Unit:** Web site elements. **Data:** 40 Web sites (United States and China). **Results:** Presented a framework of 35 cultural categories to measure cultural adaptation of Web sites.
Singh et al. [125]	**Dimension:** Hofstede + Hall's high-low context. **Unit:** Web site. **Data:** 93 Web sites (Japan, United States, India, and China). **Results:** Showed that local Web sites of the countries studied reflect cultural values of the country of origin, and also differ significantly on cultural dimensions.
Smith et al. [126]	**Dimension:** Hofstede. **Unit:** Web site. **Data:** Two bank Web sites from India and three from Taiwan. **Results:** Presented a process model for developing usable cross-cultural Web sites. Also, using the example of the five Web sites, the paper demonstrates how to develop *cultural fingerprints* that can diagrammatically compare the cultural profile of a Web site with that of its target culture.
Zahedi et al. [139]	**Dimension:** Hofstede + time orientation. **Unit:** Web site. **Data:** Theoretical paper. **Results:** Posited that the cultural factors and individual factors (age/gender, professional knowledge, IT knowledge, flexibility, information processing abilities, and cultural knowledge) impact Web site design effectiveness, which leads to overall satisfaction with Web design.
Zahedi et al. [140]	**Dimension:** Hofstede masculinity/femininity. **Unit:** Web site text unit. **Data:** 90 Web pages, more than 550 text units. **Results:** Identified a total of 56 signifiers for masculinity and femininity in Web documents. These signifiers were divided into four categories of belief, attitude, rhetoric, and syntactic signifiers.

Focus: user/developer

Cyr [28]	**Dimension:** Hofstede. **Unit:** User. **Data:** 571 participants from Canada, China, and Germany. **Results:** Found that the effects of visual, navigation, and information design on trust and satisfaction, and the effects of trust and satisfaction on e-loyalty, depend on the cultural background of the users.
Cyr et al. [30]	**Dimension:** Hofstede. **Unit:** User. **Data:** 30 users each from United States, Germany, Japan, and Canada **Results:** Found that in terms of design preferences, many design elements were statistically different between Germany and the United States, and between Japan and the United States.
Cyr et al. [31]	**Dimension:** Hofstede. **Unit:** User. **Data:** 30 users each from Canada, Germany, and Japan. **Results:** Found that (1) human images (with facial features) have greater image appeal, (2) perceived social presence was highest in Web sites with human images with facial features, (3) higher image appeal resulted in higher trust, and higher perceived social presence resulted in higher trust. Moreover, found that the perception of human images in terms of aesthetic properties, symbolism, affective properties, and functional properties varied across cultures.
Kang and Corbitt [69]	**Dimension:** Hofstede individualism/collectivism. **Unit:** Developers. **Data:** 10 developers (Singapore and Australia). **Results:** Found that designers from Singapore (collectivist) relied more on display colors, company logos, animations, and pictures as opposed to designers from Australia (individualist), who focused more on customer reactions and text.
Sia et al. [122]	**Dimension:** Hofstede individualism/collectivism. **Unit:** User. **Data:** 294 students (Hong Kong and Australia). **Results:** Found that (1) the impact of peer customer endorsement(s) on trust building is stronger in a collectivistic culture (Hong Kong) as opposed to an individualistic culture (Australia) and (2) portal affiliation was effective only in the individualistic culture (Australia).
Simon [123]	**Dimension:** Hofstede power distance and individualism/collectivism. **Unit:** User. **Data:** 160 users. **Results:** Found that in terms of cultural differences the participants from different cultural clusters had significant Web design, perception, and satisfaction differences.
Sun [131]	**Dimension:** Different countries. **Unit:** User. **Data:** Three graduate students from Germany, China, and Brazil. **Results:** Found that the cultural markers do make an impact on the usability of the Web pages. People from different cultural backgrounds prefer different *cultural markers.*

enough, Newman et al.'s five dimensions [124], and Hampden et al.'s seven dimensions [124]. Hofstede's cultural dimensions have been extensively validated [50, 124], widely cited [108, 111], considered "remarkably influential" [1, p. 886], and used extensively in the culture research. Of the 21 articles in Table 1, 16 use Hofstede's dimensions (four of which supplement them). Others refer to specific countries (four papers) or values (one paper). It seems that Hofstede's dimensions have become nearly synonymous with national culture [45, 50].

However, Hofstede's cultural dimensions have been the subject of criticism (e.g., [13]). Their stability over time [89, 90], completeness [3, 65], and "true" representation of cultural differences [1, p. 886] have been questioned. Hofstede and McCrae note that "correlations of the country scores computed from the replications with the original IBM scores do not tend to become weaker over time" [61, p. 64]. We chose Hofstede's cultural dimensions in this paper since no other typology is as extensively replicated and validated, and it would be difficult to conclude that other dimensions would necessarily be more complete or represent cultural differences more effectively. We chose not to add dimensions to those of Hofstede since other dimensions are reported to overlap with one or more of Hofstede's dimensions [25], making Hofstede's dimensions a superset of other cultural dimensions.

Conceptual Framework

In the conceptual framework for this study, we rely on the configural theory to assert the existence of cultural signifiers and on semiology for the process of uncovering the cultural signifiers. Culture is defined as "the collective programming of the mind which distinguishes the members of one group or category of people from another" [59, p. 5]. It is also defined in terms of values, rituals, heroes, and symbols [117]. Beyond the reflection of objects they depict, images are symbols that convey social meanings understandable by a given society or group. Berger [14] investigated ideologies embedded in images in visual culture (art, entertainment, and commerce) and critically searched for the values that such images convey. We subscribe to Berger's argument that images are cultural phenomena and cultural artifacts that at once suggest and communicate the social norms of the image initiator to the viewer [85]. This point of view is formalized in the *configural theory,* which asserts both image makers and viewers are active participants in constructing and assigning social meanings to images [66, 114] that could be below the conscious level. For example, in a Web site, the image of a man wearing a red, white, and blue hat not only functionally represents the objects (a man wearing a colorful hat) but also culturally could signify the man's patriotism. A U.S. viewer understands this message and may identify with the patriotic sentiment and feel culturally and emotionally connected to the Web site. A viewer who is not familiar with the colors of the U.S. flag and the tradition of wearing such a hat as a symbol of the wearer's patriotism may consider the man in the image to be odd and rebellious against the norm of somber colors for men's attire. In this way, the configural theory provides the theoretical justification for the assertion that Web site

Table 2. Semiology in IS and Web

Author	Description	Area
Andersen [6]	Uses semiotics as a framework to study IS.	IS
Barron et al. [12]	Uses semiotics as a theoretical foundation to establish an analytical framework to understand, classify, and compare IS of various generations, including data processing systems, management information systems, decision support systems, expert systems, and executive support systems.	IS
Liu [82]	Presents principles of semiotics and presents the methods for requirements analysis and modeling.	IS
Nadin [96]	Uses semiotics for designing IS, and argues that regardless of whether system designers know it, they are in fact using semiotics for user-interface design.	IS
Backhouse and Cheng [7]	Uses semiotics to create a model for the contract creation process and applies it to e-commerce.	Web
French [46]	Uses semiotics in a Taiwanese finance Web site to show how a single home page can be interpreted in terms of the meanings it communicates.	Web
Zahedi et al. [140]	Uses semiotics and hermeneutics as the theoretical foundation to identify cultural signifiers of Web documents as they relate to the masculinity/femininity dimension.	Web

images are configured to convey cultural messages, hence cultural signifiers of Web images exist, and we can uncover them.

To identify potential cultural signifiers, we need to deconstruct Web images. To do this, we employ semiology, which is a theory of symbols or signs [106, 116]. In IS research, it has been applied in the investigation of IS and e-commerce, as summarized in Table 2.

Semiology investigates "meaning making" or signification by identifying signifier and signified and their interplays that convey cultural messages [42, 95]. There are three components in semiology. *Signifier* constitutes observable elements, *signified* is the hidden cultural dimension or ideology, and *signification* is the recurrent observed relationship between a signifier and a signified. In applying semiology to our study, *signifier* constitutes the observable components of an image (e.g., the gender of a person in the image or the number of persons in the picture), *signified* is the hidden cultural dimension under investigation, and *signification* is the recurrent observed relationship between the signifier and the cultural dimension.

In this application, "signifieds" are Hofstede's [59] five cultural dimensions: masculinity-femininity (MAS-FEM), individualism-collectivism (IND-COL), high and low power distance (HPD-LPD), high and low uncertainty avoidance (HUA-LUA), and long- and short-term orientation (LTO-STO). We propose that the hidden cultural dimension that is signified by signifiers is one of these five cultural dimensions. The

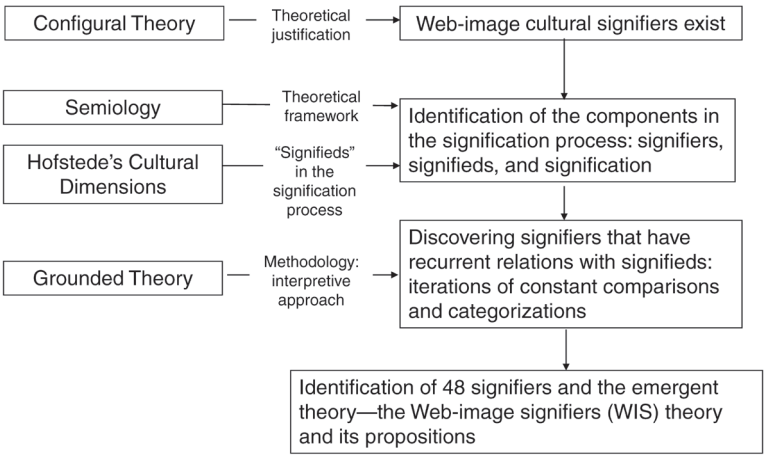

Figure 1. Summary of the Phase I Approach

signification is the recurrent relation between a signifier, such as the gender of a person depicted in the image, and the measure of a cultural dimension (such as MAS-FEM) of the Web site. Cultural dimensions of a Web site are quantified by cultural indices of the country (provided by Hofstede) to which the Web site belongs. We will then uncover the signifiers using Grounded Theory. Figure 1 summarizes the approach.

Data Sources

The protocol for data collection involved using the main images in home pages of Web sites. This decision was made in order to focus on the general message of each Web site, which is expected to capture and hold visitors' attention in their encounter with the Web site. These images were not used to depict any particular aspect of the Web site (e.g., links or those associated with a given story) and were to provide an overall impression of the Web site. Web site selection was done in two steps: (1) the Google search engine specific to a country was used to find Web sites, and (2) for each country, Web sites from three domains (hospitals, universities, and banks) were selected to control for the influence of Web sites' domain. (Key words such as hospitals, banks, and universities were used to find the domain-specific Web sites.) We expected that these types of Web sites (as opposed to e-commerce Web sites) had more local focus and, therefore, were designed to communicate in the local language with the audience internal to the country of origin. It was thus easier to identify countries of origin for these Web sites. If there was more than one image, we chose to focus on the images that were most prominently displayed on the home page of Web sites (larger images that were the focal point).

The decision for the choice of country of origin was made based on the cultural indices reported by Hofstede [59]. In selecting the countries for collecting Web sites, we categorized countries into high and low in each of the five dimensions. The high category in one dimension was assigned to the countries that are in the top 33

percentile of the cultural index of the dimension. Similarly, the low category was assigned to countries that fall in the bottom 33 percentile of the respective dimension index. The process of selection of these countries was sequential and took place in multiple iterations of constant comparison in Grounded Theory analysis in that we continued capturing and comparing images until no new signifiers could be identified. In analyzing a given dimension, we continued to capture Web sites of countries that were high or low on that dimension. One author searched, identified, and selected Web sites and removed as many country identifiers as possible from Web sites and put their home page images in pools of data for the high and low in each dimension (such as IND and COL). Another author with experience in Grounded Theory carried out the analysis. This was done to minimize any bias or preconceived ideas about a given country in the analysis.

While the author who prepared the image pools made an attempt to balance the number of Web sites from each country, the strict enforcement of such balance was neither possible nor necessary. Some countries (such as Jamaica or Nigeria) did not have as many Web sites as others in the three domains (universities, hospitals, and banks). We believe that there was adequate diversity and variety in countries, domains, and images to safeguard against potential country or domain bias. Table 3 reports the final list of countries and Web sites in each domain, with a total of 245 Web sites.

Methodology

We used Grounded Theory as our methodology for uncovering the signifiers for cultural signification. Grounded Theory is defined as "the discovery of theory from data" [54, p. 1] and involves an iterative process between data collection and analysis through contrasting and comparing findings at each stage with those of the next. The researcher begins with an open mind, looking for the emergence of the theory, which is a conceptualization that is abstracted from the data. The theory development proceeds inductively and iteratively. The researcher is a passive and neutral observer and does not force the theory with structured questions or preconceived notions and beliefs. To stay neutral, the researcher postpones the review of the literature until the theory has been conceptualized [53]. Although in Table 1 we have provided an overall literature review of Web site cultural studies, we followed Glaser's recommendation, coded the data without relying on a prior literature review, and integrated the emergent signifiers with the existing literature as the final stage of the Grounded Theory analysis.[1]

In recent years, two approaches to the coding process in Grounded Theory have emerged—Glaserian and Straussian [57, 72]. The Glaserian approach recommends two coding processes: open (substantive) and theoretical, whereas the Straussian approach [130] recommends three types of coding process: open, axial, and selective. While the first and last coding processes are relatively similar in both approaches, axial coding is unique in the Straussian approach. Axial coding involves making connections among categories and subcategories, which are examined in reference to a "paradigm model" [130, p. 96]. It is intended to provide a "more comprehensive scheme" that covers the data [104, p. 314]. Our coding processes included axial coding to identify the structure of signifier categories in the five cultural dimensions.

Table 3. Web Site Sources for Grounded Theory Analysis in Phase I

Country	Universities	Hospitals	Banks	Total
Costa Rica	7	6	4	17
Greece	5	6	6	17
Guatemala	7	3	3	13
Hong Kong	5	8	5	18
Jamaica	3	1	5	9
Japan	9	6	7	22
Mexico	6	6	6	18
Nigeria	5	1	4	10
Pakistan	11	4	6	21
Sweden	11	4	3	18
Taiwan	9	5	7	21
United Kingdom	9	4	6	19
United States	6	8	6	20
Yugoslavia	5	9	8	22
Total	98	71	76	245

The Grounded Theory analysis started with an "open" coding process for the identification of image elements. This included two tasks: observing an element in the image, and comparing the element in images in Web sites belonging to similar or different levels of a given cultural dimension. The central iterative process in Grounded Theory is the constant comparison of coded elements. The constant comparison for each cultural dimension, such as high and low uncertainty avoidance (HUA-LUA) commenced with comparing image elements in two pools of HUA and LUA. For example, when the presence of human expression was observed, the expressions were compared in images and "broad-smiling expression" was identified as a candidate signifier. The images in HUA and LUA were compared to check whether broad-smiling expression signified LUA—its presence varied in images belonging to HUA and LUA, leading to broad-smiling expression as a signifier of LUA.

The axial coding process was intended to provide a deeper understanding of the potential signifiers and their relationships and to provide a parsimonious set of signifiers that captured cultures in images [104]. The "paradigm model" was the focus on differences in the signification process in extremes of each dimension. Continuing with the above example, the iterative process led to the identification of "half-smile expression" as an element. The constant comparison showed that half-smile and broad-smile expressions had similar signification functions (both signified LUA) and were difficult to distinguish in some images. They were categorized as "people smiling." In another round, children's smiling expressions were identified. A subsequent analysis led to the emergence of "people or children smiling" as a signifier of LUA. As signifiers emerged, they also were categorized into a more abstract set of categories. See Figure 2 for some examples of signifiers.

As signifiers were identified and categorized, more Web sites were captured and images were added to high-low pools to validate and provide additional contrasts. The

Figure 2. Examples of Signifiers

stopping rule, per Grounded Theory, was the lack of emergence of new signifiers. Once signifiers for, say, COL-IND were identified, another set of images were analyzed for masculinity-femininity (MAS-FEM) for comparative analysis and categorization. The knowledge of the identified signifiers in COL-IND was used to see if they were present in MAS-FEM contrasts as we looked for additional MAS-FEM signifiers. If new signifiers emerged from the constant comparison in MAS-FEM, the COL-IND pools were revisited to see if such contrasts existed in COL-IND. In revisiting COL-IND, more Web images were added to the pool and examined to make sure that the process for COL-IND was not terminated prematurely. When the third dimension was examined, the same revisiting process was repeated for COL-IND and MAS-FEM. Emergent signifiers were further compared and contrasted in the axial coding stage, leading to three general categories: humans, colors, and nonhuman objects. In the final stage (selective coding), these categories were refined to five (humans, buildings, trees, object enumeration, and colors). The emergent core theory—Web-image signifiers (WIS)—was developed based on these five categories. In what follows, we report the results of open and axial coding for each cultural dimension. We then compare the emergent categories and refine them for the selective (theoretical) coding to conceptualize the WIS theory.

Emergent Findings: Collectivism and Individualism

According to Hofstede,

> Individualism pertains to societies in which the ties between individuals are loose: everyone is expected to look after himself or herself and his or her

Table 4. Signifiers of Collectivism and Individualism in Web Images (Axial)

Collectivism (COL)	Individualism (IND)
Humans	**Humans**
Multiple individuals (includes children, adults or body parts), mix of genders	Single adult male (solo)
Multiple males (male adults as well as male children or combination), no females	Single adult female (solo)
Multiple females (female adults as well as female children or combination), no males	Single child
Multiple children	Single adult male (may be with females)
Use of color	Single adult female (may be with males)
Black, dark blue, gray, or other somber colors	One or two individuals in focus
Bright red color	People or children smiling
Nonhuman objects	One individual/body parts for one individual
Multiple buildings	Multiple individuals but one person is focused
Multiple objects (e.g., multiple cows painted on one painting)	People disconnected (e.g., not looking in same direction)
Multiple trees	**Use of color**
	Pink or soft colors, soft red
	Nonhuman objects
	Single object (e.g., a toy, a statue, a shadow, a fruit, a computer—each by itself)
	Single tree (prominently focused)

> immediate family. Collectivism, as its opposite, pertains to societies in which people from birth onwards are integrated into strong, cohesive groups, which throughout people's lifetime continue to protect them in exchange for unquestioning loyalty. [59, p. 76]

Table 4 reports findings for the signifiers of individualism and collectivism, which resulted from the open coding (signifiers identification) and subsequent axial coding (categories).

The single most frequently observed signifier of individualism and collectivism in Web images is the number of persons or objects in the picture. In individualism, normally a single person is depicted in the image. Colors in individualism are mostly in pink or soft colors or soft red, whereas colors in Web sites of countries with collectivism tendencies are in black, dark blue, gray, somber colors, or bright red. Nonhuman objects in individualism are depicted as single objects, whereas in collectivism, objects are in groups.

Emergent Findings: Masculinity and Femininity

Hofstede defines masculinity-femininity as follows: masculinity pertains to societies in which "gender roles are clearly distinct: men are supposed to be assertive, tough, and focused on material success, whereas women are supposed to be more modest,

Table 5. Signifiers of Masculinity Versus Femininity in Web Images (Axial)

Masculinity (MAS)	Femininity (FEM)
Humans	**Humans**
Men in pictures	Females in pictures
One man in authority	Multiple females
Male in formal attire	One woman in authority
Nonsmiling faces	Female in formal attire
Women are not in authority position	Family or relationship is shown (husband–wife, children)
Use of color	One individual/body part for one individual; no gender is identified
Black, dark blue, gray, or other somber colors	People or children smiling (all or some)
Nonhuman objects	**Use of color**
Solid man-made structures	Pink or soft colors, soft red
Full-scale buildings; shows the height of the building and/or the whole complex	Pictures are softened with soft brush or faded colors and lines
	Nonhuman objects
	No buildings in pictures

tender, and concerned with the quality of life" [59, p. 120]; femininity pertains to societies in which "gender roles overlap: both men and women are supposed to be modest, tender, and concerned with the quality of life" [59, p. 120]. Table 5 contrasts the signifiers of masculinity and femininity.

The signifiers of masculinity include men in pictures, men in authority, and men in formal or professional attire. The signifiers of femininity include females in pictures, women in authority, and women in formal or professional attire. We found some exceptions in the United Kingdom, which is scored high in masculinity but shows fewer instances of masculine signifiers in its Web images.

The color signifiers of masculinity are black, dark blue, and other somber colors, whereas the femininity color signifiers include pink, soft colors, and soft red. In nonhuman images, the masculinity is most often signified by solid, man-made structures, whereas femininity signifiers include body parts with no gender identification and the lack of a building in the image.

Emergent Findings: Power Distance

Power distance is defined as "the extent to which the less powerful members of institutions and organizations within a country expect and accept that power is distributed unequally" [59, p. 46]. The comparative analysis of images from high and low power distance countries revealed a number of power distance signifiers, as shown in Table 6. The most frequent signifiers of HPD are a single person in an authority position and the person's gesture, attire, and distance from others. Facial expressions are nonsmiling.

Table 6. Signifiers of Power Distance in Web Images (Axial)

High power distance (HPD)	Low power distance (LPD)
Humans	**Humans**
Person in the image is in the position of authority	No single person is in the position of authority
Multiple individuals, but one person is focused	No single person has authority over others
Nonsmiling faces	People or children smiling
Male in formal attire	**Nonhuman objects**
Nonhuman objects	Buildings have no grandeur
Buildings have grandeur	Natural landscape
Solid man-made structures	Buildings are not full scale
Full-scale buildings; shows the height of the building and/or the whole complex	Landscape with no tall trees

Since HPD normally is accompanied by collectivism, the collectivism signifier (group of people) is also depicted in pictures. Images from LPD Web sites show no single person in the position of authority or show focus on one person over the others; humans' poses are mostly casual and relaxed. Grandeur and full-scale building signify HPD, whereas LPD has natural landscape and buildings that are not full scale.

Emergent Findings: Uncertainty Avoidance

Uncertainty avoidance is "the extent to which the members of a culture feel threatened by ambiguous or unknown situations" [59, p. 167]. It shows the extent of comfort with the unstructured, novel, and unexpected. The comparative analysis of images from high and low uncertainty avoidance countries revealed a number of uncertainty signifiers, as shown in Table 7.

This dimension did not lead to many signifiers. The human signifiers of high uncertainty avoidance are people supporting each other, such as holding hands or helping. Family is depicted in the image and people's expressions are mostly nonsmiling. In contrast, low uncertainty avoidance shows people or children smiling. No color signifier could be identified for this dimension. The nonhuman signifiers of high uncertainty avoidance include buildings with grandeur, which are shown in full scale. At the same time, buildings in low uncertainty avoidance have no grandeur or the image "shows inside the building."

Emergent Findings: Long- and Short-Term Orientation

Long-term orientation (LTO) reflects the importance of future in a culture. LTO is associated with "perseverance and thrift," whereas short-term orientation (STO) is associated with "respect for tradition, preservation of 'face,' and fulfilling social obligations" [59, p. 210]. The human signifiers of LTO are symbolized by multiple

Table 7. Signifiers of Uncertainty Avoidance in Web Images (Axial)

High uncertainty avoidance (HUA)	Low uncertainty avoidance (LUA)
Humans	**Humans**
People support each other, such as holding hands, helping	People or children smiling
Family is shown	**Nonhuman objects**
Nonsmiling faces	Buildings have no grandeur
Nonhuman objects	Building's interior is shown
Buildings have grandeur	
Full-scale buildings, shows the height of the building and/or the whole complex	

individuals, both men and women. In STO, only one or at most two individuals are in focus. No color signifier was found for this dimension. Table 8 lists the signifiers associated with LTO and STO.

Nonhuman signifiers for LTO include multiple trees, single buildings with trees, multiple buildings, buildings that have grandeur, and solid man-made structures. For STO, many images did not have any building. If they did have a building, it lacked grandeur and was not solid. There were single buildings with no trees. If there was a landscape, it did not have tall trees.

Integration Phase of Grounded Theory

The last phase of Grounded Theory involves a literature review to integrate the findings and emerging theory with existing knowledge [53, 140]. A large portion of the literature review in Table 1 was done at this stage of analysis, with results that support our findings.[2] Further support regarding individualism-collectivism is the finding that the individualism index for any country correlates with print advertisements containing only a single person [47]. The same study has also found that print advertisements from collectivist countries were associated with frequent group portrayal and with infrequent portrayal of a single person. The analysis of advertisements from the United States, United Kingdom, and India showed the data were in accordance with Hofstede individualism-collectivism indices [47]. Furthermore, Alden et al. [2] analyzed television commercials from the United States, Germany, Thailand, and South Korea and concluded that television commercials in countries that are high on the individualism index portrayed more single individuals. The study found that advertisements from Thailand and South Korea had a *lower* percentage of "fewer than three people," while advertisements from the United States and Germany had a *higher* percentage of "fewer than three people." Contrary to the above findings, Cutler et al. [27] examined advertisements from eight different countries and did not find a strong relationship between the number of people portrayed and the individualism–collectivism index. Chinese commercials generally reflect Chinese values of collectivism [20, 142]. Supporting

Table 8. Signifiers of Long- and Short-Term Orientation in Web Images (Axial)

Long-term orientation (LTO)	Short-term orientation (STO)
Humans	**Humans**
Multiple males	One or two individuals in focus
Multiple females	**Nonhuman objects**
Multiple individuals	No buildings
Nonhuman objects	Single building, no trees
Multiple trees	Buildings have no grandeur
Single building with trees	Buildings are not solid
Multiple buildings	Landscape with no tall trees
Buildings have grandeur	
Solid man-made structures	

the above notion, another study has reported that Western commercials use appeals that reflect individualism and independence [141]. These studies provide support for our findings related to the multiplicity of humans and objects in the Web images of collectivist cultures.

Masculinity-femininity has been an important variable for explaining differences in advertising between American and European cultures [38]. A study containing data on television commercials in four countries—Sweden, Russia, the United States, and Japan—found that a country's femininity (measured by the femininity index) is clearly reflected in the country's television commercials [91]. Moon and Chan [94] found that television advertising in Hong Kong (a masculine society) uses more masculine appeals (such as work), while television advertising in Korea (a feminine society) uses more feminine appeals (such as courtesy and family). Zahedi et al. [140] identified distinct signifiers for cultural masculinity and femininity in Web documents.

The Emergent Theory and Propositions: The Web-Image Signifiers (WIS) Theory

The Grounded Theory analysis led to the identified 48 signifiers. The selective phase (or theoretical phase) involves categorization that leads to the selective or theoretical results [53, 130] for building theory—the WIS theory in this case. At the selective/theoretical coding phase, we compared the categories of signifiers across cultural dimensions and identified five categories: humans, buildings, trees, object enumeration, and colors.

The "human" signifier category contains 56 percent of signifiers. The "building" signifier category is the next most prevalent category with 23 percent of signifiers. These two categories account for about 80 percent of all signifiers. The other three categories (trees, object enumeration, and colors) account for the remaining 20 percent (8 percent, 4 percent, and 8 percent of signifiers, respectively). Considering "what," "why," and "how" aspects in theory [136], Web-image cultural signifiers and their categories constitute the "what" aspect of the WIS theory.

Why?

The next step is to establish the reasons for the existence of these signifiers and their categories. In other words, why do humans and buildings constitute the bulk of Web-image signifiers? In answering this question and subsequent questions regarding the details of signifiers, our theoretical reasoning will be built on the meta-theoretical framework of evolutionary psychology and cultural co-evolution. Therefore, a brief introduction of evolutionary psychology and cultural co-evolution is needed in order to set the stage for the conceptualization of the WIS theory.

Evolutionary psychology has its basis in Darwin's theory of evolution through natural selection for survival [32], mating, and child rearing [33]. In evolutionary psychology, the principles of human evolution form the meta-theory or the fundamental theoretical lens for model conceptualization, proposition development, and behavior predictions. Evolutionary psychology posits that along the biological evolution, human brain functions have evolved to increase the chances of survival and mating by adapting to the environmental conditions in which primitive humans lived, and that the modern humans' patterns of brain function, behaviors, and cognitive processes have their foundations in this evolutionary process [10, 11, 16, 17, 43, 55]. Thus, evolutionary psychology is based on the principles that human behaviors are the results of their brain functions, which have evolved to solve problems faced by our primitive human ancestors in order to survive and reproduce, and that many of these neural activities, inherited from our primitive ancestors' mind, take place below the conscious level [26, 132]. In recent years, evolutionary psychology as a meta-theory has received considerable attention in diverse domains, including sociology, neuroscience, economics, and consumer behavior (see, for example, [49, 120, 137]). Kock has introduced evolutionary psychology to the IS research by applying it in e-communication and Web design as well as proposing an integrative framework for theorizing in IS research [74, 75, 76, 77].

Cultural co-evolution posits that cultural phenomena have co-evolved as the result of psychological evolution and adaptation [48]. In cultural co-evolution, cultural variations emerge through two pathways—transmission and evocation [48, 132]. Cultural transmission takes place through social interactions and learning. The cultural variations due to cultural evocation emerge as a result of ecological, environmental, and social variations and the resultant evolutionary psychology. In other words, humans have physical, psychological, and cultural co-evolution processes that work in tandem [49, 109]. In their integrative framework, Gangestad et al. [48] argue that generations of novel cultural phenomena are based on evolutionary psychology, and that this adaptation process should be clearly specified and scientifically tested. We subscribe to this framework as the meta-theory in conceptualizing the WIS theory and its propositions.

Why the Humans Category?

Using evolutionary psychology as the theoretical lens, we argue that human features are the most universally familiar signs in our life span. Infants learn to recognize

their parent or caretaker features for nourishment and survival—per the attachment theory [71, 107]. As they grow, individuals learn to distinguish between their friends and enemies, and select their mates partly by their physical features. The cooperation and social activities of humans are based on recognizing human features, expressions, and their social positions as expressed by their physical appearance and position vis-à-vis others. In other words, from birth to death, humans are continuously engaged in processing information about various human signs such as features, expressions, postures, and positions. The evolutionary process has created the most efficient pathways for processing human signs since they are critical in survival, mating, and child rearing. Therefore, human signifiers should be the most efficient and least cognitively taxing signifiers for the signification of cultural dimensions. This is particularly critical in the Web environment, where Web elements with high cognitive loads rarely get processed [97]. Hence, as proposed in the WIS theory, we expect to have the human category of signifiers for the signification of Web images, and this category should be the most prominent category of cultural signifiers.

Our conceptualization is in line with the media naturalness theory (as opposed to media richness). Evolutionary psychology has been used to develop the theory of media naturalness based on the argument that face-to-face communication is the gold standard for human communication [74, 75]. In a study of the effect of human images in building trust in Web sites using a multimethod approach, it was found that Web sites with human pictures were preferred over those without human pictures [31]. The WIS theory supports this finding and provides a theoretical explanation for it.

Why the Buildings Category?

Culture has been a field of study in architecture, and building designs and structures have been considered conveyers of cultural heritage throughout history. However, to our knowledge, there has been little scholarship in using building attributes in Web images to convey cultural messages. Therefore, our finding that building signifiers constitute the second most important category for cultural signification in Web images is a new discovery. The question is why building signifiers should occupy such a prominent position for signification of cultural dimensions in Web images.

Buildings represent both shelter and accomplishment in conquering the forces of nature. After food, shelter plays the most important element in human survival. Individuals' homes have been the most visible sign of their prosperity, power, and riches. Even in modern times, the extent of individuals' resources is demonstrated by the size, number, and grandeur of their dwellings, and in almost all societies individuals' status is judged by their homes. Even today, kings, presidents, chief executive officers of large companies, and celebrities signal their power and status by living and working in superior and elegant structures. The importance and even sanctity of individuals' homes is reflected in the castle doctrine in American and British law [19]. It codifies the norm that "a man's home is his castle," and using deadly force in the defense of one's home is acceptable. This principle goes as far back as the Torah (Old

Testament), which prohibits murder except in the defense of one's home [78, p. 33]. Males who owned larger homes signaled the superiority of their resources to attract the most suitable mates, who desired to shelter and raise offspring in the safety of a solid structure—a norm that still exists in many societies. Infants learn to recognize their homes as a safe place and feel threatened when taken out of their homes.

Nations have built palaces, castles, public monuments, arches, and structures for their leaders and heroes in celebration of their victories. Grand private and public buildings represent safety from predators (animals or humans) and natural forces. Buildings are also places for socializing and creating community and support, which deeply resonate in the human psyche.

As shelters for survival, signs of wealth for attracting suitable mates, places for rearing children in safety, symbols of power, and socially sanctified places, buildings form the second most efficient way for the signification of cultural dimensions. Having been raised to take notice of buildings, primitive humans have evolved to cognitively process features of buildings. Therefore, the WIS theory posits that building features are the second most important category of Web-image signifiers for cultural signification.

Why Trees? Why Object Enumeration? Why Colors?

Following the same line of reasoning, one can argue that our primitive ancestors relied on landscapes and trees to forage for their food and find safety when pursued by animal predators. Moreover, early on, hunter-and-gatherer societies learned to enumerate objects. The carved notches on prehistoric bones testify to the attention and use of enumeration by primitive humans. It is argued that numbers and enumeration have been the center of humans' awareness of their environment for survival and cultural needs since well before recorded history [56]. This finding is also novel because trees as well as the multiplicity of objects in images have not been the subject of cultural studies.

The meaning of colors, however, has been examined in cultural studies. A study of the preferences for various colors in Germany, Japan, and the United States reported differences in color preferences [29]. Although there are many studies examining the significance of color in culture, no theoretical explanation for the cultural importance of colors has been offered. We argue that the cultural importance of colors is due to their roles in survival and mating. Humans have learned to distinguish fresh and, therefore, safe-to-eat food by color (and smell). Those who could distinguish safe foods survived and reproduced, leading to a human race that has the capability to differentiate colors. Color recognition enabled primitive humans to judge the health of their potential mates by their colors, such as the color of lips, cheeks, skin, eyes, and nails. Genetically, women have a higher capability of color perception [64], which could be because primitive women had the primary role in food foraging and preparation and needed keener color perception to evaluate the nutritional value and safety of food ingredients. Hence, the WIS theory posits that trees, colors, and number of objects form the remaining (but less prominent) categories of cultural signifiers.

Details of Signifiers

The Grounded Theory analysis has led to the identification of 48 signifiers, and their selective (theoretical) codings are reported in Tables 9–13. The examination of these tables shows two emergent patterns: (1) some signifiers signify more than one (up to four) cultural dimension—for example, the signifier "people or children smiling" (row 19 in Table 9) signifies four cultural dimensions; and (2) for the most part, the signifiers with multiple significations have a well-defined pattern—for example, the same signifier "people or children smiling" signifies IND, FEM, LPD, and LUA (all on one extreme of the cultural dimensions mostly associated with Western countries). In contrast, the signifier "full-scale buildings" (Table 10) signifies MAS, HPD, and HUA (all on the other extreme of cultural dimensions typically associated with Eastern countries). Similar patterns are observed in almost all multidimension signifiers.

Why Multidimension Signifiers?

The question is how can we determine what multidimension signifiers actually signify and how the emergent WIS theory explains these findings. In the development of cultural dimensions, Hofstede not only reported on the cultural indices but also examined significant correlations among the cultural indices; for example, "large power distance countries are more likely to be more collectivist" [59, p. 54]. There are similar systematic patterns of relationships among other dimensions. Signifiers that signify one cultural dimension may also signify a correlated dimension. However, what has not been examined is a more general and profound pattern in these relationships and their implications.

Hofstede [59] has detailed each country's location in the four quadrants of low-low, high-low, low-high, and high-high (L-L, H-L, L-H, and H-H) for each pair of cultural dimensions. Table 14 reports the list of countries that have been located in the H-H quadrant when pairwise two-dimensional comparisons were done for COL-HPD, MAS-HPD, MAS-COL, MAS-HUA, COL-HUA, and HPD-HUA. (We have not reported on long- and short-term orientation because this dimension was added later and suffers from a lack of adequate data and analysis). As Table 14 shows, 126 countries have been placed in the H-H quadrant of six pairwise comparisons.

Of these 126 H-H pairwise cases, only 15 percent (19 cases) belong to Western European countries. Moreover, the United States and Canada do not appear in this list. An examination of the countries in the L-L quadrant of the above pairwise comparisons shows that they almost exclusively contain western European countries, the United States, and Canada. In other words, countries in the H-H quadrants have a pattern highly associated with COL-MAS-HPD-HUA, whereas the L-L countries have a pattern highly associated with IND-FEM-LPD-LUA. Except for a few of cases, these findings match the patterns of multidimension signifiers in Tables 9–13.

The 48 multidimension signifiers show a relatively consistent pattern of signification for countries that do *not* have a west European origin (Traditional), and another for countries with a west European origin (Modern). Our Grounded Theory results indicate that these signifiers may signify either Traditional Group with distinct sets

Table 9. Emergent Human Signifiers

Number	Human signifiers	COL	IND	MAS	FEM	HPD	LPD	HUA	LUA	LTO	STO
1	Family is shown				X			X			
2	Female in formal attire				X						
3	Females in pictures				X						
4	Male in formal attire			X		X					
5	Men in pictures			X							
6	Multiple children	X									
7	Multiple females	X			X					X	
8	Multiple individuals	X								X	
9	Multiple individuals but one person is focused		X			X					
10	Multiple males	X								X	
11	No single person has authority over others						X				
12	No single person is in the position of authority						X				
13	Nonsmiling faces			X		X		X			

(continues)

Table 9. Continued

Number	Human signifiers	COL	IND	MAS	FEM	HPD	LPD	HUA	LUA	LTO	STO
14	One individual/body parts for one individual, no gender				X						
15	One man in authority			X							
16	One or two individuals in focus		X								X
17	One person is in position of authority					X					
18	People disconnected		X								
19	People or children smiling		X		X		X		X		
20	People support each other							X			
21	Single adult female (solo)		X								
22	Single adult female (may be with males)		X								
23	Single adult male (solo)		X								
24	Single adult male (may be with females)		X								
25	Single child (solo)		X								
26	One woman in authority				X						
27	Women are not in authority position			X							

Table 10. Emergent Building Signifiers

Number	Building signifiers	COL	IND	MAS	FEM	HPD	LPD	HUA	LUA	LTO	STO
1	Buildings are not full scale						X				
2	Buildings are not solid										X
3	Buildings have no grandeur						X		X		X
4	Buildings have grandeur (impressive)					X		X		X	
5	Full-scale buildings, the height of the building and/or the whole complex			X		X		X			
6	Building's interior is shown								X		
7	Multiple buildings	X								X	
8	No building				X						X
9	Single building with trees									X	
10	Single building with no trees										X
11	Solid man-made structures			X		X				X	

Table 11. Emergent Tree Signifiers

Number	Tree signifiers	COL	IND	MAS	FEM	HPD	LPD	HUA	LUA	LTO	STO
1	Landscape with no tall trees						X				X
2	Multiple trees	X								X	
3	Natural landscape						X				
4	Single tree		X								

Table 12. Emergent Object Signifiers

Number	Object signifiers	COL	IND	MAS	FEM	HPD	LPD	HUA	LUA	LTO	STO
1	Multiple objects	X									
2	Single object		X								

Table 13. Emergent Color Signifiers

Number	Color signifiers	COL	IND	MAS	FEM	HPD	LPD	HUA	LUA	LTO	STO
1	Black, dark blue, gray, or other somber color	X		X							
2	Bright red color	X									
3	Picture softened with soft brush or faded colors and lines				X						
4	Pink or soft colors, soft red		X		X						

Table 14. Countries with High Pairwise Correlations—Fourth Quadrant of Hofstede Tables

COL-HPD	MAS-HPD	MAS-COL	MAS-HUA	COL-HUA	HPD-HUA
Arab countries	Arab countries	Arab countries	Arab countries	Arab countries	Arab countries
Argentina	Argentina	Argentina	Argentina	Argentina	Argentina
Brazil	Belgium	Colombia	Austria	Brazil	Belgium
Chile	Colombia	Ecuador	Belgium	Chile	Brazil
Colombia	Ecuador	Greece	Colombia	Colombia	Chile
East Africa	Greece	Hong Kong	Ecuador	Costa Rica	Colombia
Ecuador	Hong Kong	India	Germany	Ecuador	Ecuador
Greece	India	Jamaica	Greece	Greece	France
Guatemala	Italy	Japan	Italy	Guatemala	Greece
Hong Kong	Japan	Malaysia	Japan	Iran	Guatemala
Indonesia	Malaysia	Mexico	Mexico	Japan	Iran
India	Mexico	Pakistan	Pakistan	Korea	Italy
Iran	Pakistan	Philippines	Switzerland	Mexico	Japan
Jamaica	Philippines	Venezuela	Venezuela	Pakistan	Korea
Japan	Venezuela			Panama	Mexico
Korea				Peru	Pakistan
Malaysia				Portugal	Panama
Mexico				Salvador	Peru
Pakistan				Taiwan	Portugal
Panama				Thailand	Salvador
Peru				Turkey	Spain
Philippines				Uruguay	Taiwan
Portugal				Venezuela	Thailand
Salvador				Yugoslavia	Turkey
Singapore					Uruguay
Taiwan					Venezuela
Thailand					Yugoslavia
Turkey					
Uruguay					
Venezuela					
West Africa					
Yugoslavia					
32	15	14	14	24	27

Note: Countries that are underlined are western European.

of interrelated dimensions of COL, MAS, HPD, and HUA, or Modern Group with interrelated dimensions of IND, FEM, LPD, and LUA. Traditional Group and Modern Group correspond with Kim's [73] Type II and Type I cultures.

Why Traditional and Modern Signifiers?

The next step is to examine the theoretical explanation for Traditional Group and Modern Group. The literature in cultural psychology supports this grouping. There

is a relatively rich literature in cultural psychology that compares east Asian and European North American cultures (e.g., [22, 23, 87, 100, 101]). Lehman et al. [80] provide a review of literature on the cultural psychology studies of east Asians and European North Americans and summarize a body of research in which the contrasts between the individuals from the West and east Asia have revealed patterns of distinct psychological profiles and different ways of thinking. Moreover, a study of ethics in information technology (IT) reports that east Asian and Western cultural values differ in ethical practices as well [34].

Moving from Traditional Group to Modern Group represents the co-evolution of culture though evolutionary psychology and evolutionary biology. In its simplest form, the line of reasoning is as follows. Culture reflects and embodies behaviors, values, ideas, and artifacts of groups [48]. Cultures are either transmitted or evoked [132]. Transmitted culture emerges through interactions among members of various groups, whereas evoked culture is the consequence of the environment and conditions that individuals live in and adapt to [48]. The adaptation is based on Darwinian principles. We rely on this logic and argue that the traditional cultural dimensions of COL, MAS, HPD, and HUA were evoked in older countries and countries with limited wealth/resources in order to increase the chance of survival thorough group support (COL), to attain success and compete with others in order to attract a suitable mate (MAS), to have access to resources and exchange resources for protection (HPD), and to avoid unpredictable threats and risk of harm (HUA). In an environment of limited resources, uncertain social order, and difficult natural environments, the traditional cultural dimensions have helped communities survive and enabled them to transmit these values to subsequent generations as wisdom for survival and prosperity. The hierarchical structure, high power distance, collectivism, masculinity, and conservatism of most organized religions testify to these coded cultural wisdoms (see, for example, [18] for a discussion of the role of religion in countries with HPD).

Modern Group represents cultural dimensions of countries with increased resources and wealth, improved tools, weapons, and technology, as well as more stable social orders. In these countries, individuals were enabled to survive on their own by more advanced production tools while benefiting from the order and protection provided by the overall society. The nature of wealth production relied on innovation and commerce, which required an open but orderly society [18]. Hofstede [59] observed that the per capita gross national product (GNP) values of countries were highly correlated with the IND index. It is reported that countries with LPD are more economically prosperous and have healthier societies [18]; that there is a strong correlation between LUA values and economic prosperity [37]; and that there is a strong negative correlation between economic prosperity and in-group collectivism practices (an index close to Hofstede's COL index) [51]. Therefore, the need for COL and the reliance on HPD for protection decrease with the increase in available resources. With increased contributions of women to resource generation and active participation in society, the emphasis on aggression, success, and competition for mating was modified, giving rise to FEM [41]. Therefore, it is expected to have signifiers of Modern Group signify the modern dimensions of culture (IND-FEM-LPD-LUA).

How Are Traditional Group and Modern Group Signified?

In the Web environment, Web image signifiers need to provide a coherent set of cultural significations in order to signal and communicate cultural values efficiently. This coherence is along the Traditional and Modern cultural dimensions. Therefore, the WIS theory posits that each Web-image signifier signifies one or more cultural dimensions of either Traditional Group or Modern Group, but not both, since a signification that represent both groups could create cognitive dissonance and reduce the efficiency of the cultural message. This coherence may take place below the conscious level, as argued by evolutionary psychology.

Propositions of the WIS Theory

Theorizing from the Grounded Theory analysis has led to the development of the WIS theory, which posits that cultural contents of Web images are signified by signifiers in five categories: humans, buildings, trees, object enumeration, and colors. The foundation of these signifiers is based on the evolutionary psychology and co-evolution of culture, and on biology based on Darwinian principles. The signification takes place more frequently along the grouping of Traditional and Modern extremes of cultural dimensions. The following propositions summarize the testable arguments in the WIS theory.

Proposition 1: Web-image signifiers signify cultural dimensions of Web images.

Proposition 2: Web-image signifiers have five categories: humans, buildings, trees, object enumeration, and colors.

Proposition 3: Humans-category signifiers are the most commonly used signifiers in Web images.

Proposition 4: Buildings-category signifiers are the second most commonly used signifiers in Web images.

Proposition 5: Individual signifiers signify one or more Traditional or Modern dimensions, but not both.

Proposition 6: Humans-category signifiers with focus on males and male authority more often signify Traditional cultural dimensions.

Proposition 7: Humans-category signifiers with focus on females, absence of authority, and absence of gender identification more often signify Modern cultural dimensions.

Proposition 8: Buildings-category signifiers with emphasis on the grandeur and strength of buildings more often signify Traditional cultural dimensions.

Proposition 9: The lack of buildings-category signifiers in Web images more often signifies Modern cultural dimensions.

Phase II: Quantitative Analysis and Test of the WIS Theory

In Phase II, we used a quantitative approach to test the WIS theory. It involved collecting and coding signifiers of Web images to examine their associations with the cultural dimensions of their countries of origin. Two quantitative methods were used. The first method was the polychoric correlation method. When one of the two variables in the correlation analysis is binary, the appropriate method is polychoric correlation analysis [118]. The second method involved testing the proportion difference of each signifier in each cultural dimension.

Data

For Phase II, relying on the country-specific Google search, an inventory of 728 Web sites from 39 countries was created. We included countries that had at least one cultural dimension at the high or low end, that had a Google search available for them, and that varied in their continent and size. The high or low categorization was done following the same method used in Phase I. (The cultural indices for China were not part of Hofstede [59] and are separately available [60].) The number of Web sites for each country was based on the results of the Google search in the three domains (hospitals, universities, and banking). Some smaller countries had fewer Web sites in one or more domains, such as in banking or hospitals. These three domains were chosen since they cater to local population and local culture. Most of the selected Web sites were in the language of the country of origin.

The URL and country identifiers were removed at coding time. The inventory included the images in Phase I. This was done because of the limited number of countries on the extreme cultural dimensions and the associated Web sites. In order to reduce the potential for disproportionate influence of Phase I data, coding was performed by coders who were not involved in the Grounded Theory analysis in Phase I. A few images (less than 2 percent) that were too crowded with very small images or too vague for clear coding were excluded. A total of 900 images were coded, as shown in Appendix Table A1. Signifiers were coded using binary variables (1 = presence, 0 = absence).

A coding guide was developed and two coders independently coded signifiers in the images. They then discussed their coding results. When a signifier of an image was ambiguous and the coders did not agree, the average of the two coders was used in the analysis and the signifier was coded as 0.5. For example, if one coder considered a color bright red and the other soft red, then the signifier for the color bright red was coded as 0.5 and the signifier for the soft red also was coded as 0.5. There was no attempt to force agreement between the two coders.

Data for a total of 48 signifiers were collected. Each image was coded for all 48 signifiers, of which 33 signifiers were directly coded and 15 signifiers were computed based on the other coded data. For example, we coded the presence of humans in images and whether humans were smiling. We then used these two coded fields to determine those cases in which the expression was not smiling in images that contained humans. This was done to avoid inconsistencies in data. If the coders disagreed, the

average (0.5) was assigned. The Kappa coefficient for 33 directly coded signifiers was 96 percent using SAS. The kappa was computed before the disagreements between the coders were averaged. The final data set included 44,100 observed signifiers for 900 images.

Data Analysis

The unit of analysis was an image. Hence, the data set contained 900 data points. We used two methods to test the WIS theory. The first method tested the significance of the polychoric correlation between each dimension index and signifiers for that dimension; for example, the IND index of the Web image's country was correlated with coded signifiers for IND and COL. The second method tested the difference between the observed proportions of each signifier for high and low extremes of each dimension. In this test, the sample size varied since we used only those countries that had an index value in the high (upper third) or low (lower third) range, as in Phase I. We then applied the *z*-test to test the difference in two proportions:

$$Z = \left(\hat{p}_1 - \hat{p}_2\right) \Big/ \sqrt{\frac{\hat{p}_1\left(1-\hat{p}_1\right)}{n_1} + \frac{\hat{p}_2\left(1-\hat{p}_2\right)}{n_2}},$$

where $\hat{p}_1$ (or $\hat{p}_2$) is the proportion of occurrences of a signifier in images belonging to countries with high (or low) values of the cultural index, and n_1 (or n_2) is the total number of images for those countries [88]. In this case, Z^2 is equivalent to a chi-square test. This method is based on frequencies in two extremes and does not include all 900 images for each signifier.

Results of Analysis

Table 15 shows results for the categories of signifiers. Of the 900 images used for the first four dimensions and the 458 images used for LTO, more than half of the observed signifiers belonged to the humans category, followed by the buildings category. Together, these two categories had more than 90 percent of observed signifiers. The results provide support for Propositions 3 and 4. Furthermore, each category of signifiers signified either Traditional or Modern cultural dimensions, but not both, except for one case in the trees category. Thus, Proposition 5 was supported at the category level (individual signifiers will be discussed later). At the category level, humans-category signifiers signified Modern cultural dimensions for all dimensions except HUA-LUA. Buildings-category signifiers signified Traditional dimensions in all five dimensions. We also found that the object enumeration category signified the Modern dimensions of culture in dimensions (IND-FEM-LUA-STO), whereas the trees category signified the Traditional dimensions of culture (MAS-LPD-LUA-STO). Together these results provide support for Propositions 1 and 2 at the category level, and for the grouping of cultural dimensions into Traditional (COL-MAS-HPD-HUA-LTO) and Modern (IND-FEM-LPD-LUA-STO) in Web-image cultural signifiers.

Table 15. Frequency and Proportions of Signifier Categories (Color Category Is Always Present)*

Signifier category	$N = 900$ Frequency first four dimensions	$N = 458$ Frequency LTO/STO	Proportion of signifiers in high- and low-dimension countries**									
			COL-IND		MAS-FEM		HPD-LPD		HUA-LUA		LTO-STO	
			P_1 $n_1 = 356$	P_2 $n_2 = 415$	P_1 $n_1 = 254$	P_2 $n_2 = 254$	P_1 $n_1 = 237$	P_2 $n_2 = 440$	P_1 $n_1 = 213$	P_2 $n_2 = 223$	P_1 $n_1 = 76$	P_2 $n_2 = 271$
Humans	487+11 (55%)	253+6 (56%)	**0.54**[b]	**0.60**[b]	**0.50**[a]	**0.60**[a]	**0.52**[c]	**0.60**[c]	**0.55**[d]	**0.56**[d]	**0.38**[c]	**0.57**[c]
Buildings	328+7 (37%)	154+5 (34%)	**0.38**[a]	**0.29**[a]	**0.43**[a]	**0.31**[a]	**0.40**[a]	**0.28**[a]	**0.44**[b]	**0.37**[b]	**0.55**[a]	**0.31**[a]
Object enumeration	249+27 (29%)	136+12 (31%)	**0.27**[b]	**0.33**[b]	**0.25**[d]	**0.30**[d]	0.30	0.32	**0.21**[a]	**0.29**[a]	**0.22**[b]	**0.34**[b]
Trees	134+1 (15%)	67+1 (15%)	**0.13**[d]	**0.14**[d]	**0.19**[a]	**0.12**[a]	**0.18**[c]	**0.13**[c]	**0.16**[d]	**0.15**[d]	**0.21**[a]	**0.12**[a]

* Bold and shaded bold indicate statistical significance in Traditional and Modern dimensions, respectively.

Levels of significance are reported as follows:

[a] Statistically significant both in the proportion z-test and polychoric correlation, both at $p < 0.05$;

[b] statistically significant both in the proportion z-test and polychoric correlation, one at $p < 0.05$ and another at $p < 0.10$;

[c] statistically significant only in one test at $p < 0.05$;

[d] statistically significant in both tests at $p < 0.10$, or significant only in one test at $p < 0.10$.

** The frequency for each signifier is shown by two numbers: the first number indicates cases where the two coders have the same code. The second number indicates cases where the two coders did not agree, and 0.5 was assigned. The derivations or summations were not simple additions or matching values since the code contained 0.5 assignments (the average of two coders when they disagreed). Proportions will not add to 100 since images have more than one signifier.

P_1 = number of times a signifier is observed in high-dimension countries for a particular index/total number of high-dimension countries' images in the sample (n_1).

P_2 = number of times a signifier is observed in low-dimension countries for a particular index/total number of low-dimension countries' images in the sample (n_2).

Humans-Category Signifiers

Table 16 reports frequencies, proportions, and results of two tests for the signifiers in the humans category. Of 27 signifiers, 23 were supported as signifiers for one or more dimensions (85 percent), of which 18 (78 percent) signified one or more Traditional or Modern dimensions, but not both. This provided a strong support for Proposition 5 at the individual signifier level. Furthermore, signifiers with focus on males and male authority (such as "male in formal attire," "multiple males," "one man in authority," "one person in the position of authority") were significant in Traditional dimensions, supporting Proposition 6. Signifiers with focus on females, absence of gender identification, or lack of authority (such as "females in formal attire," "females in picture," "multiple females," "no single person has authority over others," "one individual/body parts for one individual, no gender") significantly signified Modern cultural dimensions, supporting Proposition 7. Furthermore, of these 18 signifiers, 15 signified Modern dimensions as opposed to 3 for Traditional dimensions, indicating that Modern dimensions of culture rely more on humans-category signifiers.

Buildings-Category Signifiers

Table 17 shows the results for the buildings category. Proposition 8 was supported since the buildings signifiers that represented grandeur and strength were significant for the Traditional cultural dimensions. The results for the "no building" signifier provided support for Proposition 9 in that the lack of building signifiers more frequently signifies the Modern dimensions of culture.

Even the building signifiers such as "buildings are not full scale" or "buildings have no grandeur" signified the Traditional dimensions of culture. Hence, the results for building signifiers show that buildings signifiers are suitable for the signification of Traditional dimensions. Conversely, the lack of buildings signifiers is suitable for the Modern dimensions of culture.

Tree, Object Enumeration, and Color Signifiers

Table 18 reports the results for signifiers in the other three categories. The results support Proposition 2 that the trees, object enumeration, and colors categories are among the primary cultural signifiers. Except for one signifier (landscape with no tall trees), the results for the trees category support Proposition 5, in that each signifier was significant in one or more dimensions of Traditional or Modern dimensions, but not in both. The signifier "natural landscape" signified Modern dimensions of culture (IND-LPD), whereas landscaped trees ("multiple trees" and "single trees") signified Traditional dimensions. The signifiers in the object enumeration category more frequently signified Modern dimensions, indicating the suitability of these signifiers for Modern dimensions of culture. The "single object" signifier was significant for IND-LUA, whereas "multiple objects" was significant for STO. This result also indicates the prevalence of objects in images in STO.

Table 16. Frequency, Proportions, and Test of Signifiers in the Humans Category*

Signifier	Frequency first four dimensions	Frequency LTO/STO	Proportion of signifiers in high- and low-dimension countries**									
			COL-IND		MAS-FEM		HPD-LPD		HUA-LUA		LTO-STO	
1. Family is shown	39+2	17+1	0.04	0.05	**0.03**[d]	**0.06**[d]	**0.03**[d]	**0.05**[d]	**0.04**[d]	**0.05**[d]	**0.01**[d]	**0.04**[d]
2. Female in formal attire	105+7	52+3	0.15	0.12	**0.13**[c]	**0.16**[c]	0.14	0.12	**0.13**[d]	**0.17**[d]	0.12	0.10
3. Females in pictures†	291+16	146+8	0.35	0.36	**0.31**[a]	**0.39**[a]	**0.32**[d]	**0.37**[d]	**0.34**[d]	**0.36**[d]	**0.22**[b]	**0.35**[b]
4. Male in formal attire	118+10	58+5	**0.17**[c]	**0.12**[c]	0.13	0.15	**0.17**[d]	**0.13**[d]	0.17	0.15	0.17[b]	0.10[b]
5. Men in pictures†	303+15	157+6	0.36	0.35	0.30	0.34	0.37	0.36	0.36	0.35	0.32	0.34
6. Multiple children	19+1	11+1	0.03	0.02	0.02	0.03	0.02	0.02	0.02	0.02	**0.00**[c]	**0.03**[c]
7. Multiple females	145+5	67+4	**0.20**[d]	**0.17**[d]	**0.14**[a]	**0.22**[a]	0.17	0.17	0.20	0.20	0.14	0.15
8. Multiple individuals	313+13	151+6	0.38	0.35	**0.32**[d]	**0.39**[d]	0.38	0.36	0.40	0.38	0.32	0.32
9. Multiple individuals but one person is focused	19+5	12+2	**0.02**[d]	**0.03**[d]	0.02	0.03	**0.01**[c]	**0.03**[c]	0.02	0.02	**0.01**[d]	**0.04**[d]
10. Multiple males	146+6	75+5	**0.21**[b]	**0.15**[b]	**0.13**[d]	**0.17**[d]	**0.21**[d]	**0.16**[d]	0.19	0.19	**0.22**[d]	**0.15**[d]
11. No single person has authority over others†	239+18	117+10	0.29	0.29	**0.24**[d]	**0.29**[d]	0.27	0.29	**0.27**[d]	**0.30**[d]	0.22	0.27
12. No single person is in the position of authority†	404+19	214+12	**0.43**[a]	**0.52**[a]	**0.41**[a]	**0.50**[a]	**0.39**[b]	**0.52**[b]	**0.42**[c]	**0.47**[c]	**0.29**[a]	**0.52**[a]
13. Nonsmiling faces†	299+19	139+13	0.35	0.35	**0.32**[b]	**0.41**[b]	0.34	0.36	**0.41**[a]	**0.29**[a]	**0.23**[d]	**0.31**[d]
14. One individual/body parts for one individual, no gender	17+5	8+2	**0.03**[d]	**0.01**[d]	**0.01**[a]	**0.04**[a]	0.01	0.01	0.03	0.02	0.01	0.02

15. One man in authority	53+6	22+4	**0.08**[a]	**0.04**[a]	0.06	0.07	**0.10**[c]	**0.05**[c]	**0.11**[b]	**0.06**[b]	**0.08**[b]	**0.03**[b]
16. One or two individuals in focus	100+15	53+13	**0.11**[c]	**0.14**[c]	**0.12**[d]	**0.09**[d]	0.12	0.14	**0.10**[c]	**0.13**[c]	**0.07**[b]	**0.15**[b]
17. One person is in position of authority†	75+8	33+6	**0.11**[b]	**0.07**[b]	0.09	0.10	**0.13**[c]	**0.08**[c]	**0.13**[d]	**0.09**[d]	**0.09**[c]	**0.05**[c]
18. People disconnected	10+1	7+0	0.01	0.01	0.01	0.01	0.01	0.01	0.01	0.02	0.03	0.01
19. People or children smiling	185+14	110+10	**0.20**[a]	**0.26**[a]	0.19	0.21	**0.19**[a]	**0.26**[a]	**0.15**[a]	**0.28**[a]	**0.15**[b]	**0.28**[b]
20. People support each other	42+13	23+7	0.04	0.06	0.04	0.03	0.05	0.06	0.07	0.05	0.05	0.06
21. Single adult female (solo)†	67+12	45+5	**0.06**[a]	**0.12**[a]	0.09	0.08	**0.05**[a]	**0.12**[a]	**0.05**[b]	**0.08**[b]	**0.01**[a]	**0.13**[a]
22. Single adult female (may be with males)	147+16	80+8	**0.16**[b]	**0.20**[b]	0.17	0.17	**0.15**[b]	**0.21**[b]	**0.14**[d]	**0.16**[d]	**0.09**[a]	**0.20**[a]
23. Single adult male (solo)†	77+11	46+2	**0.07**[a]	**0.10**[a]	0.09	0.08	0.08	0.11	0.08	0.10	**0.04**[c]	**0.11**[c]
24. Single adult male (may be with females)	158+13	82+4	**0.16**[b]	**0.20**[b]	0.18	0.18	0.17	0.21	0.17	0.17	**0.09**[c]	**0.19**[c]
25. Single child (solo)†	14+2	9+0	0.03	0.01	0.01	0.02	**0.00**[d]	**0.01**[d]	0.02	0.02	0.03	0.02
26. One woman in authority	26+4	11+3	0.04	0.03	0.03	0.04	0.04	0.04	0.03	0.03	0.01	0.03
27. Women are not in authority position†	262+19	132+11	0.31	0.33	**0.28**[d]	**0.34**[d]	**0.28**[d]	**0.33**[d]	**0.31**[d]	**0.33**[d]	**0.20**[b]	**0.32**[b]

*, **, a–d: See Table 15 notes.

† Signifiers were computed based on other 33 signifiers and additional codes (such as whether the image contained humans, trees, or buildings).

Table 17. Frequency and Proportions of Building Signifiers*

Signifier	Frequency four dimensions	Frequency LTO/STO	Proportion of signifiers in high- and low-dimension countries**									
			COL-IND		MAS-FEM		HPD-LPD		HUA-LUA		LTO-STO	
1. Buildings are not full scale†	172+17	83+11	**0.23**[a]	**0.15**[a]	0.21	0.17	**0.21**[b]	**0.14**[b]	0.24	0.21	**0.32**[c]	**0.19**[c]
2. Buildings are not solid†	11+8	4+5	0.02	0.01	0.02	0.02	0.02	0.02	0.02	0.02	0.01	0.02
3. Buildings have no grandeur†	237+16	106+12	**0.31**[a]	**0.19**[a]	**0.30**[a]	**0.23**[a]	**0.27**[b]	**0.20**[b]	**0.35**[a]	**0.24**[a]	**0.43**[c]	**0.23**[c]
4. Buildings have grandeur (building is impressive)	82+10	41+7	0.07	0.10	**0.13**[b]	**0.08**[b]	**0.13**[c]	**0.08**[c]	**0.09**[d]	**0.13**[d]	**0.12**[c]	**0.08**[c]
5. Full-scale buildings, the height of the building and/or the whole complex	147+13	66+9	**0.16**[c]	**0.14**[c]	**0.23**[a]	**0.15**[a]	**0.19**[c]	**0.14**[c]	**0.20**[c]	**0.17**[c]	**0.24**[a]	**0.13**[a]
6. Building's interior is shown	47+17	47+17	0.05	0.07	0.07	0.07	0.07	0.06	0.05	0.07	**0.05**[c]	**0.04**[c]
7. Multiple buildings	94+9	94+9	0.10	0.11	**0.15**[d]	**0.10**[d]	**0.11**[d]	**0.12**[d]	0.08	0.12	**0.18**[a]	**0.10**[a]
8. No building†	565+7	565+7	**0.62**[a]	**0.71**[a]	**0.57**[a]	**0.69**[a]	**0.60**[a]	**0.72**[a]	**0.56**[b]	**0.63**[b]	**0.45**[a]	**0.69**[a]
9. Single building with trees†	69+1	69+1	0.07	0.06	**0.09**[d]	**0.06**[d]	**0.10**[a]	**0.05**[a]	0.09	0.10	**0.11**[b]	**0.06**[b]
10. Single building with no trees†	160+11	160+11	**0.22**[a]	**0.12**[a]	0.20	0.16	**0.19**[a]	**0.12**[a]	**0.27**[a]	**0.16**[a]	**0.28**[c]	**0.15**[c]
11. Solid man-made structures	318+5	318+5	**0.37**[a]	**0.28**[a]	**0.42**[a]	**0.30**[a]	**0.38**[a]	**0.27**[a]	**0.42**[c]	**0.37**[c]	**0.55**[a]	**0.30**[a]

*, **, a–d: See Table 15 notes.

† Signifiers were computed based on other 33 signifiers and additional codes (such as whether the image contained humans, trees, or buildings).

Table 18. Signifier Frequency and Proportions of Tree, Object Enumeration, and Color Signifiers*

Signifier	Frequency first four dimensions	Frequency LTO/STO	Proportion of signifiers in high- and low-dimension countries**									
			COL-IND		MAS-FEM		HPD-LPD		HUA-LUA		LTO-STO	
Tree signifiers												
Landscape with no tall trees	17+0	3+0	0.01	0.02	**0.04**[a]	**0.02**[a]	**0.01**[a]	**0.03**[a]	0.01	0.02	**0.01**[c]	**0.00**[c]
Multiple trees	115+11	59+6	**0.12**[d]	**0.12**[d]	**0.16**[d]	**0.12**[d]	**0.16**[a]	**0.11**[a]	**0.14**[d]	**0.13**[d]	**0.18**[b]	**0.11**[b]
Natural landscape	38+5	13+2	**0.03**[c]	**0.06**[c]	0.07	0.06	**0.02**[a]	**0.06**[a]	0.04	0.03	0.03	0.03
Single tree	11+2	4+0	0.01	0.01	**0.02**[b]	**0.00**[b]	0.02	0.01	0.01	0.02	0.01	0.01
Object enumeration signifiers												
Multiple objects	113+22	58+10	0.14	0.14	0.13	0.15	0.14	0.14	0.12	0.12	**0.08**[a]	**0.16**[a]
Single object	136+16	77+10	**0.14**[a]	**0.19**[a]	0.12	0.15	0.16	0.18	**0.09**[a]	**0.17**[a]	0.14	0.19
Color signifiers												
Black, dark blue, gray, or other somber color	644+27	327+11	**0.71**[a]	**0.77**[a]	0.75	0.78	**0.76**[d]	**0.77**[d]	**0.69**[a]	**0.78**[a]	**0.68**[c]	**0.70**[c]
Bright red color	135+6	66+4	**0.19**[a]	**0.14**[a]	0.13	0.16	**0.19**[d]	**0.14**[d]	0.18	0.15	0.16	0.16
Picture softened with soft brush or faded colors and lines	277+15	127+12	**0.38**[a]	**0.26**[a]	**0.32**[c]	**0.36**[c]	**0.37**[a]	**0.27**[a]	0.32	0.33	**0.36**[a]	**0.23**[a]
Pink or soft colors, soft red	174+25	92+10	**0.21**[c]	**0.21**[c]	0.20	0.21	0.20	0.20	0.20	0.18	0.18	0.20

*, **, a–d: See Table 15 notes.

The results for the colors category also supported Proposition 5 in that they were significant for either Modern or Traditional dimensions (not both), except for one signifier ("picture softened with soft brush or faded colors and lines"). This exception could be due to the fact that soft brush and faded colors and lines are less representative of color and more the result of picture manipulation.

An interesting result in the colors category is that bright red and pink and soft colors including soft red were more significant for Traditional dimensions, whereas black, dark blue, and somber colors were significant for Modern dimensions of culture. It has been reported that in Asian countries red represents happiness, whereas in Western countries red represents danger (see, for example, [29]). For primitive hunter males, red (the color of fresh blood) could have represented danger, the excitement of a new kill, or a sign of life and health. In all its meanings, it attracted immediate attention, leading to the development of immediate recognition of this color. Red and bright colors have been used for distinction and separation—to distinguish clans, groups, and nations, and to separate the ruling class and religious authorities from the masses [113]. Of 271 national flags, 76 percent contain a red color. As the need for group distinction and power distance decreases, so does the use of bright colors for immediate recognition of groups; hence, the use of somber colors becomes more prevalent in Modern dimensions.

The results reported in Tables 15–18 show that 40 signifiers were statistically significant for at least one cultural dimension in the five categories, providing strong support for Propositions 1 and 2.

Cross-Validation Analysis

We carried out a cross-validation analysis to examine the robustness of our results in Phase II and to investigate whether combining the Web sites in the two stages of investigation had any influence on the Phase II results. Note that in this cross-validation process, it was not possible to repeat Phase I analysis since the knowledge about cultural signifiers had already emerged.

We applied a bootstrapping method in the cross-validation analysis in which we randomly selected 10 subsamples from the full data set. The cells for the z-test involved a matrix of 48×10 cells—48 signifiers and 10 high-low levels of cultural dimensions. The bootstrapping was carried out at 90 percent in order to preserve the adequacy of data in most cells. For each of 10 samples, the entire estimation process (reported in Tables 15–18) was repeated for the z-test and the polychoric correlation test. Tables 19–22 report the count of significant results for the bootstrapping outcomes. Table 19 reports the bootstrapping results for the four general categories of signifiers (mirroring Table 15).

The results show the findings for humans and buildings categories are quite robust since the bootstrapping results matched those reported in Table 15. The results for object enumeration were also satisfactory. The lack of significance for object enumeration in HPD-LPD was confirmed since we found no significance in the bootstrapping results for this dimension. COL-IND and MAS-FEM were significant in 80 percent

Table 19. Percentage of Significance in Cross-Validation Results*

Signifier category	COL-IND	MAS-FEM	HPD-LPD	HUA-LUA	LTO-STO
Humans	100	100	100	90	100
Buildings	100	100	100	100	100
Object enumeration	80	80	0+	100	100
Trees	70	90	60	60	100

* Percentage of times the signifier was significant (reported as a, b, c, d in Table 15).

+ Not significant in Table 15 (using full data set).

of bootstrapping results whereas HUA-LUA and LTO-STO were significant in all 10 samples (100 percent). The results for the trees category showed a lower level of robustness since only 60 percent of cases were significant for HPD-LPD and 70 percent for COL-IND. This indicates that this category needs a more refined categorization and further analysis.

Table 20 shows the percentage of significance in bootstrapping for the humans category. Table 20 also shows that out of 135 reported cells, 8 cells had at or below 60 percent support for significant results reported in Table 16. The results for these cells should be used with caution since they are not robust. Table 21 shows that the buildings-category results were all robust, except for two cases in which the percentage of support is at 60 percent.

Table 22 also provides general support for robustness of results in Table 18. In two subsamples, the signifier "landscape with no tall trees" had no observation for LTO-STO, making it impossible to carry out the tests. Furthermore, the results for "multiple trees" should be used with caution because bootstrapping indicated insufficient level of robustness for the "multiple trees" signifier. Similarly, the results for two color signifiers ("black, dark blue, gray, or other somber color" and "bright red color") indicating HPD-LPD should also be used with caution because bootstrapping results indicated a low level of robustness for them as well.

Summary and Discussion

IN PHASE I, WE USED GROUNDED THEORY to identify 48 cultural signifiers of Web images in five theoretical categories. Using evolutionary psychology and cultural co-evolution as the meta-theory, we developed the Web-image signifiers (WIS) theory, which led to nine propositions. In Phase II, we tested these propositions. We collected data for the 48 signifiers from 900 Web images in 728 Web sites from three locally oriented domains (universities, banks, and hospitals) across 39 countries. We used two methods—the polychoric correlation analysis and the proportion difference *z*-test—in testing the statistical significance of each one of 48 signifiers. The proportion difference *z*-test involved observations for the high and low of each dimension.[3]

Table 20. Percentage of Significance in Cross-Validation Results in the Humans Category*

Signifier	COL-IND	MAS-FEM	HPD-LPD	HUA-LUA	LTO-STO
1. Family is shown	50+	70	80	70	100
2. Female in formal attire	40+	100	0+	80	0+
3. Females in pictures	40+	100	80	100	100
4. Male in formal attire	90	0+	30	0+	100
5. Men in pictures	0+	10+	0+	30+	0+
6. Multiple children	0+	30+	0+	0+	100
7. Multiple females	70	100	0+	0+	0+
8. Multiple individuals	10+	90	0+	0+	10+
9. Multiple individuals but one person is focused	90	0+	100	0+	60
10. Multiple males	100	40	70	0+	90
11. No single person has authority over others	0+	40	0+	30	10+
12. No single person is in the position of authority	100	100	100	100	100
13. Nonsmiling faces	0+	100	0+	100	80
14. One individual/body parts for one individual, no gender	80	100	20+	20+	10+
15. One man in authority	100	10+	100	80	100
16. One or two individuals in focus	90	40	0+	100	100
17. One person is in position of authority	80	0+	80	50	100
18. People disconnected	0+	0+	0+	0+	0+
19. People or children smiling	100	0+	100	100	100
20. People support each other	10+	0+	0+	10+	0+
21. Single adult female (solo)	100	0+	100	100	100
22. Single adult female (may be with males)	100	0+	90	70	100
23. Single adult male (solo)	100	10+	10+	20+	100
24. Single adult male (may be with females)	100	10+	50+	10+	100
25. Single child (solo)	40+	20+	30	0+	0+
26. One woman in authority	0+	30+	10+	0+	0+
27. Women are not in authority position	50+	80	80	90	100

* Percentage of times the signifier was significant (reported as a, b, c, d in Table 16).

+ Not significant in Table 16 (using full data set).

Table 21. Percentage of Significance in Cross-Validation Results in the Buildings Category*

Signifier	COL-IND	MAS-FEM	HPD-LPD	HUA-LUA	LTO-STO
1. Buildings are not full scale	100	20+	90	40+	100
2. Buildings are not solid	0+	0+	0+	0+	0+
3. Buildings have no grandeur	100	100	90	100	100
4. Buildings have grandeur (building is impressive)	10+	100	100	60	100
5. Full-scale buildings, the height of the building and/or the whole complex	100	100	80	100	100
6. Building's interior is shown	10+	0+	10+	0+	90
7. Multiple buildings	0+	80	90	30+	100
8. No building	100	100	100	100	100
9. Single building with trees	20+	60	100	0+	100
10. Single building with no trees	100	50+	100	100	100
11. Solid man-made structures	100	100	100	100	100

* Percentage of times the signifier was significant (reported as a, b, c, d in Table 17).

+ Not significant in Table 17 (using full data set).

Table 22. Percentage of Significance in Cross-Validation Results in Tree, Object Enumeration, and Color Categories*

Signifier	COL-IND	MAS-FEM	HPD-LPD	HUA-LUA	LTO-STO
Tree signifiers					
Landscape with no tall trees	10	100	100	0+	80**
Multiple trees	70	60	70	60	100
Natural landscape	90	10+	100	10+	0+
Single tree	10+	90	0+	10+	20+
Object enumeration signifiers					
Multiple objects	10+	10+	0+	0+	100
Single object	100	10+	0+	100	10+
Color signifiers					
Black, dark blue, gray, or other somber color	100	0+	60	100	100
Bright red color	100	30+	60	0+	10+
Picture softened with soft brush or faded colors and lines	100	100	100	0+	100
Pink or soft colors, soft red	100	0+	0+	30+	0+

* Percentage of times the signifier was significant (reported as a, b, c, d in Table 18).

+ Not significant in Table 18 (using full data set).

** In two subsamples, there was no observation for this dimension.

There were eight signifiers that did not have statistical significance in any dimension. Seven of these signifiers had frequencies of 6 percent or less (Tables 16–18). For these signifiers, low frequencies in Phase II might have prevented them from passing the two stringent statistical tests. Although we used three domains to avoid context biases, these low frequencies could be due to the type of domains in our data set. For example, single child or family may not be suitable signifiers in university and bank contexts. It is possible that in other domains, such as in entertainment or elementary education, these signifiers may occur more frequently and hence could be tested statistically. One signifier, men in pictures, had a 30 percent occurrence in all the dimensions. Hence, it is not a signifier in the domains we tested.

In the cross-validation analysis for robustness, we found that in the humans category, eight (out of 135) cells, the reported significance did not have adequate robustness. This could have been caused by the reduced sample size, which unfavorably affects the robustness of those cells for which adequate data have not been observed. We also found that the signifier "multiple trees" lacks adequate robustness in signifying cultural dimensions. Because trees could represent a green environment, it is possible that multiple trees may signify the Traditional and Modern cultural dimensions for different reasons. This category of signifiers should be explored in more detail.

Our results supported the WIS theory in that there were five categories of signifiers. This theory posits that the Web-image signifiers signify either the Traditional cultural dimension extremes (consisting of COL-MAS-HPD-HUA-LTO) or the Modern dimension extremes (consisting of IND-FEM-LPD-LUA-STO), but not both. This proposition was strongly supported in almost all categories of signifiers. Furthermore, the WIS theory posits that the humans category contains the highest number of signifiers and primarily supports Modern cultural dimensions, which was supported by the findings. The second most important Web-image signifiers were in the buildings category, which exclusively signify Traditional dimensions of culture, with "no buildings" as the signifier of Modern dimensions. Modern dimensions had object enumeration, natural landscape, and black and somber colors as signifiers, whereas Traditional dimensions had trees, bright red and pink, and soft red as signifiers. Together, the results supported the propositions in the WIS theory, indicating the validity of the underlying arguments in cultural co-evolution and evolutionary psychology.

Although our findings show that Web-image signifiers are best considered as reflecting the Traditional or Modern dimensions of culture, they can also be used in the signification of individual dimensions of culture. Our findings identified the cultural dimensionality of signifiers—some signified a number of dimensions, while others signified only one. Our results indicated that individualism was signified mostly by human elements and the prominence of a single person alone or among a group of individuals. The affinity of individualism with low power distance was observed in their shared signifier of no person being in a position of authority. The lack of buildings and reliance on natural landscape and object enumeration were signifiers of individualism. Collectivism, on the other hand, was signified by bright red and various features of buildings. Multiple males, male in formal attire, and one man in authority signified collectivism. Masculinity had no human signifier; it was signified

by buildings. In contrast, femininity had no building signifier. Femininity was signified by human signifiers—females (one or more) in the image, female in formal attire, and nonsmiling faces. No signifier for specific color was found, although femininity was signified by softened and brushed colors and lines. It seems that stereotyped signifiers of masculinity and femininity (such as dominance of men or feminine colors) were replaced by more subtle signifiers.

High power distance was signified almost entirely by buildings of various sorts and scales, whereas low power distance had no building signifier. Low power distance was signified by human signifiers, such as no single person in the position of authority and smiling faces as well as natural landscapes. High uncertainty avoidance was signified by nonsmiling faces and full-scale buildings that had no grandeur or single buildings with no trees, whereas low uncertainty avoidance had no building signifier. It was signified by smiling expressions, single object, or single female, and no one in a position of authority.

Long-term orientation shared signifiers with high power distance, collectivism, and masculinity. This provided a rich and relatively long list of highly significant human and nonhuman signifiers for LTO, with focus on men (in authority and in formal attire), buildings of various types, and individuals in authority positions. But STO had no buildings signifier and shared its signifiers with individualism and femininity dimensions.

Theoretical and Practical Contributions

It has been argued that culture has its own genes. "Memes" have been defined as cultural genes that evolve analogous to biological genes [15, 35]. These "cultural DNAs" [40] replicate and transmit through human interactions and creativity. With the advent of the Internet, there has been a sharp increase in competition among memes and in the rate of their transmission. Web images serve as potent carriers of memes since pictures (as opposed to text) have a better fit with the short attention span of Web visitors. Therefore, it is essential to study how cultural dimensions are signified in Web images in order to understand their potency and use them for creating coherent and cognitively consistent images in Web site design.

To our knowledge, this study is the first attempt to comprehensively investigate cultural signifiers of Web images. In doing so, we have developed the Web-image signifiers (WIS) theory, which suggests what the cultural signifiers of Web images are and how they have emerged through the co-evolution of culture. This is the first comprehensive theory that provides theoretical justification for each signifier. It clearly shows how and why cultural signifiers vary across national cultural dimensions. This is an important finding, since any further work in cultural analysis of Web images depends on knowledge of such signifiers.

Our analysis identified five categories of signifiers, among which the "buildings," "trees," and "object enumeration" categories constitute new findings as categories of cultural signifiers.[4] We also identified 48 clearly identifiable signifiers for Web images, of which 40 were shown to be signifiers of cultural dimensions in our data set. This is another important contribution of this study.

It is argued that technology-based communications are "dis-embedded" [52], and Web-based communications with visitors are exemplars of such dis-embeddedness [110]. Such communications lack the emotional and social connectivity that face-to-face interactions naturally promote. Such dis-embeddedness has undesirable consequences, including lower trust and loyalty [110]. Web images that evoke emotional response and social familiarity could promote "re-embeddedness" of Web sites [110]. The use of human images to create warmth and emotional connectivity [31] is an example of re-embeddedness. Composing Web images that fit visitors' cultures could contribute significantly to the re-embeddedness of Web sites, particularly when Web sites are customized to meet the needs of different cultures.

Our work provides an affirmative answer to the question posed in Zahedi et al. as to whether "signifiers [are] present in graphics and other forms of communication on the Web and other venues" [140, p. 118]. Our work extends the work in Zahedi et al. examining the masculinity-femininity signifiers in Web documents. Our findings support the results reported in Cyr [28], Cyr and Trevor-Smith [29], and Cyr et al. [30] arguing that visual features of Web sites have cultural underpinnings, and some types of images (human versus nonhuman) may be preferred over others [31]. Our work provides a theoretical explanation for this finding.

Although there are a number of studies about Web site culture (as summarized in Table 1), they focus on entire Web sites with little or no specific cultural analysis of Web site images, or they examine the configured meanings of images in a selective and limited context [115]. In the few studies that focus on Web images [86, 124, 126], the analyses are limited to a few cases (Web sites) or a few countries (two or three), with the unit of analysis being the entire Web site. Our WIS theory provides an overarching theory for the examination of these findings. This is a major contribution of this research. The emergent grouping of Traditional and Modern dimensions in the signification process is another novel contribution of this work that could provide a foundation for investigating transitions from Traditional to Modern cultural environments.

The empirical contribution of this work is in the immediate use of signifiers in the design of Web sites for a multicultural audience. Research has already shown that the cultural congruity of Web site images may promote higher use. It is argued that understanding culture at national, organizational, and group levels is essential to "successful implementation and use of information technology" [81, p. 357]. The research has shown that cultural fit affects trust and satisfaction [28, 30] and lowers the cognitive effort required to use Web sites [84]. Therefore, the awareness of cultural signifiers could help Web site designers create Web images suitable for their target audience. Furthermore, as the global audience of the Web increases, Web masters will have to customize and personalize their sites to address the special needs and preferences of their culturally diverse audiences. Obvious personalization strategies involve the choice of language and information content (such as currency conversion or subjects of special interest). There is also some guidance for less obvious personalization, such as cultural signifiers within Web documents [140]. However, to our knowledge, there are few general guidelines related to cultural signifiers for images in Web sites. Our results provide such guidelines for creating images that cater to particular cultural groups. This is in line with the assertion that images generate affective response, and

it is the "most extreme image" that determines the overall response [24, p. 7]. Our work also could serve those who create Web artifacts for promotional and marketing purposes on the Web.

Limitations and Directions for Future Research

Our work does not have unconditional generalizability since the data involved 3 domains and 39 countries. Future research should examine our results in other domains. Furthermore, we relied on the expertise of one researcher in the Grounded Theory analysis in Phase I and used two coders in Phase II. The sample size, even though large, is still limited considering billions of existing Web sites. Furthermore, the cross-validation was carried out using a 90–10 split, whereas a 70–30 or 80–20 split would have been preferred for investigating the effect of combining Phase I and Phase II data. Thus, this work should be considered only as a first attempt to identify a comprehensive set of cultural signifiers in Web images that requires further replications and extensions.

Cultural signifiers could evolve over time. Research has so far examined the role of culture-shaping Web site designs and development. The Web may shape culture as well [111, 140]. An area of interesting scholarship would be the investigation of the dynamism and evolution of signifiers over time and across various contexts. Future work could also systematically examine the cultural signifiers associated with the functional aspects of Web sites as well as other typologies of culture. Even when using a home page as the unit of analysis, focusing on other features such as streaming media, animation, and types of icons is also an interesting area for further investigation. Along with visual design features, research could also look into the cultural signifiers associated with navigation design, information design features [28], and themes. Another area that would benefit from future research is studying the impact of culturally fit and unfit Web sites on users' perception of the Web sites, video games, and virtual worlds. Another area of future research is the potential cultural transition of Traditional to Modern group in cyberspace over time—a cultural convergence.

Conclusion

In this research, we argued that images are more primal in human sensory communications than written words. In an era of increasing de-Westernization of the Web [62], it becomes even more important to configure Web site images with care and insight. Culturally appealing Web sites lead to increased online satisfaction and trust [28]. Pictures are easier to process than text, and pictures that match Web users' culture may lead to increased stickiness of the Web site.

Cultural signifiers are called the "anonymous set of obscure rules" [93, p. 250]. Our work has removed part of the obscurity of cultural signifiers in Web images. The impetus for searching for cultural signifiers was theoretically justified by the configural theory, which suggests that images contain ideologies that reflect their maker's

ethos [114]. Semiology provided the framework for the examination of the signification process. The configural theory and semiology have strong support in the symbolic interaction theory [79], which suggests that people interact with the symbols, forming a relationship to them, and then act based on the symbolic meanings they find within any given situation. Hence, theory informed us that Web users actively participate in deciphering the meaning conveyed by the image and then act accordingly. This act involves staying longer on a Web site, reusing it later, or leaving immediately and never coming back. The WIS theory and its test provide insights for customizing Web site images for visitors of various cultures to convey the message suitable for the intended audience, hence increasing the "stickiness" of Web sites.

Our research identified and categorized 48 cultural signifiers in Web images across five dimensions of national culture, leading to the development of the WIS theory, which explains the nature of the signification process. To our knowledge, no other published research has studied Web images to identify how cultural dimensions are signified. Furthermore, our findings make it possible to investigate the efficacy of using the cultural fit of Web images to design culturally aware Web sites. As the number of Web sites and Web visitors increase globally, such knowledge will be of great importance for those who rely on the Web for the survival of their business. With the exponential increase in Web sites competing for Web users' attention, providing images that match Web users' culture could improve the ambiance of Web sites. Web site owners need to be aware that the cultural signifiers convey immediate messages that require less cognitive effort to process. Thus, in order to pursue true *globalization,* the Web site owners need to take *localization* more seriously.

Notes

1. Due to correlations among cultural dimensions [59], some cultural signifiers appeared in more than one dimension.

2. The inclusion of the literature review in the Introduction was done to help orient the reader.

3. In combining the two tests, in some instances two opposite signifiers signified a dimension. In HPD, buildings with full scale and without full scale and buildings with or without trees were supported as signifiers. Similarly, in HPD, MAS, and LTO, there was support for buildings with and without grandeur. This indicates the importance of buildings in these dimensions. In STO, proportion difference *z*-tests showed support for both smiling and nonsmiling faces and for single as well as multiple objects, because short-term orientation images involved more human faces and objects than those of long-term orientation.

4. Our results are consistent with a large body of research by Nancy Kanwisher at MIT, who has identified specialized regions for faces, places, and landscapes in the human brain (http://mcgovern.mit.edu/principal-investigators/nancy-kanwisher).

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Appendix Table A1. Data for Images in Phase II

Country	University	Hospital	Bank	Total
Australia	16	16	9	41
Austria	12	9	6	27
Canada	7	8	17	32
Chile	9	7	9	25
China	9	3	8	20
Costa Rica	9	5	9	23
Denmark	9	9	8	26
Ecuador	9	2	4	15
Finland	19	3	9	31
Germany	12	5	6	23
Greece	3	5	5	13
Guatemala	10	2	3	15
Hong Kong	5	5	4	14
India	18	9	7	34
Indonesia	12	2	7	21
Ireland	11	10	11	32
Italy	12	4	9	25
Jamaica	3	1	5	9
Japan	11	6	6	23
Malaysia	9	1	2	12
Mexico	10	6	6	22
Netherlands	8	14	6	28
New Zealand	11	4	6	21
Nigeria	6		3	9
Norway	8	9	6	23
Pakistan	11	4	5	20
Panama	5	7	6	18
Philippines	10	4	9	23
Portugal	12	7	2	21
Singapore	5	6	7	18
Spain	5	3	3	11
Sweden	8	5	3	16
Switzerland	13	6	12	31
Taiwan	8	5	6	19
Thailand	10	13	8	31
United Kingdom	9	27	6	42
United States	12	13	19	44
Uruguay	3	4	5	12
Yugoslavia	10	10	10	30
Total	369	259	272	900