Introducing Emotional Interfaces to Healthcare Systems

Rangarajan Parthasarathy and Xiaowen Fang

School of Computing, College of Computing and Digital Media,
DePaul University, Chicago, Illinois, USA
{rparthasarathy,xfang}@cdm.depaul.edu

Abstract. The use of healthcare websites is gaining importance in the United States. It is conceivable that when using healthcare websites, the users may not be in a happy or euphoric emotional state, and would like to be comforted. In this paper, we argue that using emotional interfaces in healthcare systems will attract users, and motivate them to stay, participate and return. We suggest a possible future state for emotional interfaces in healthcare systems. In this context, we present a review of relevant theories and research studies from Computer Science and Psychology, and a subjective ranking of some well-known healthcare websites in the United States with respect to their hedonic and emotional values. Lastly, we discuss our proposal for developing emotional interfaces for healthcare websites.

Keywords: Healthcare Websites, Hedonic Websites, Emotional Websites, Emotional Interfaces.

1 Introduction

Research on patterns of Internet use has found that people primarily use the Internet for communicating through e-mails, and for searching for information ([31]). This information search includes searching for health, disease, and medical information on healthcare websites.

Internet use in healthcare by way of use of healthcare websites has increased significantly between 2000 and 2013. A study by Pew Internet and American Life Project found that 52 million American adults, or 55% of those with Internet access, have used the Internet to obtain medical or health information ([15]). Health care websites have been created in the past few years at a cost of between $250,000 and $1 million ([20]). It is estimated that more than 145 million people use healthcare websites to get health related information ([30]). Healthcare websites satisfy the need of people to obtain health and disease related information in a quick and efficient manner without having to step out of their homes. Before the Internet revolution, patients were dependent on the doctor and the hospital system to instruct and educate them about diseases, and describe various treatment options ([79]). In the computer and Internet age of today, patients are able to obtain healthcare information from healthcare websites, and are thus knowledgeable. They are in a position to discuss or negotiate with the doctor about their individual situations and treatment options. Clearly,

M. Kurosu (Ed.): Human-Computer Interaction, Part II, HCII 2013, LNCS 8005, pp. 150–162, 2013.
© Springer-Verlag Berlin Heidelberg 2013

access to the Internet and the proliferation of healthcare websites have changed the way patients interact with the doctors and hospitals ([51]).

According to the Kaiser Foundation web site ([36]), 51% of the healthcare expenditure of the United States is accounted for by hospital care and physician/clinical services. Although the spending on health care was about $75 billion (7.2% of GDP) or $356 per United States resident in 1970, it rose to $2.5 trillion (17.6% of GDP) or $8160 per United States resident by 2009. This increase in healthcare spending is commensurate with the increased use of healthcare facilities, hospitals, clinics, and doctor services by the public, which has put a tremendous pressure on the healthcare system. The use of healthcare websites by the public somewhat alleviates this pressure, because it is conceivable that many people who find from the healthcare websites that their symptoms are related to common illnesses, may prefer to buy off-the-shelf medication from a drug store, instead of spending many hours of the day to make an appointment, drive to the hospital, and wait in the waiting room to see a doctor. For this and other pertinent reasons, there has been an increasing push in recent times to encourage the use of healthcare information technology ([8], [39]).

Research literature points to differences between functional websites and hedonic websites. Websites are made up of user interfaces. In this paper, both terms are used interchangeably, because emotional interfaces and emotional websites are one and the same with respect to their impact on user emotions. Hedonic websites are designed to provide fun, emotional experiences, feelings of arousal, pleasurable experiences, and pleasurable outcomes, and are designed with individuals seeking sensations on multi-sensory channels. Functional or utilitarian websites have been associated with business and professional purposes ([72]), and usability goals such as efficiency, effectiveness and learnability ([63]). Functional websites allow the users to accomplish tasks in the most efficient and effective way, and are not developed with ease of use, emotions or aesthetics as important considerations. The outcomes from functional or utilitarian websites are resultant from attentive, rational, and task-oriented actions ([3]). By contrast, hedonic websites are designed to provide fun, emotional experiences, feelings of arousal, pleasurable experiences and pleasurable outcomes, and are primarily designed for individuals seeking sensations on multi-sensory channels ([32], [38], [46], [72]). Emotional websites are thus a subset of hedonic websites and convey the same values as hedonic websites, but with an increased emphasis on the emotional aspect. It should be understandable that some hedonic and emotional websites may not have utilitarian values, and vice-versa.

Laurel ([40]) states that emotions play an important role in social interaction through computers. Users of healthcare websites do so primarily to find health related information when they are sick, find ways to prevent sicknesses, or find health insurance information ([15], [51], [77]). Understandably therefore, when using healthcare websites, they experience a range of emotions, mostly negative. They are likely not in a happy or euphoric emotional state and would like to be comforted. Though researchers have explored hedonic, and emotional interfaces, little research has been done with respect to applying these to healthcare systems. Herein lies the research gap for our current research. We argue in this paper that the use of emotional interfaces in healthcare systems will attract users to healthcare websites, comfort and entertain users, and motivate them to stay, participate and return. This behavior, in turn, may

reduce or eliminate the need of face-to-face doctor-patient encounters for information gathering, discussion of treatment options available, and other similar purposes.

2 Hedonic and Emotional Interfaces

Research has shown that both rational and irrational factors play a role in user selection and continued use of websites ([24], [27], [46], and [67]). Rational factors are in tune with the goals of functional or utilitarian websites, and concern themselves with whether the websites facilitate accomplishment of tasks in an effective and efficient manner. By contrast, irrational factors are related to emotions, and therefore are in tune with the goals of hedonic or emotional websites. For example, habit is an example of irrational behavior, whereby the website user will continue to use websites by habit, without subjecting the behavior and the outcomes to detailed analyses ([46]). Van der Heijden ([72]) found determinates of future use intentions concerning hedonic systems. Kim and Hwang ([37]) state that emphasizing the hedonic aspects of mobile Internet applications make them more attractive for younger generations. Schrepp et al. ([63]) found that hedonic qualities have an impact on the attractiveness of interfaces, and the more attractive the interfaces or websites, the higher the user preference for them. Kim and Forsythe ([38]) found that the hedonic aspect of perceived entertainment value was a stronger determinant of attitude toward using product virtualization technologies than perceived usefulness. Fiore et al. ([21]) conducted path-analysis studies and found statistically significant paths between hedonic value and resulting emotional pleasure, and arousal variables, and also statistically significant paths between these three variables and global attitude, willingness to purchase, and willingness to patronize an online store. Hu and Chuang ([34]) found hedonic value to be one of the 'value components' that had a direct and positive effect on customer loyalty intention toward e-retailer websites. Pillai and Mukherji ([58]) found that the playfulness aspect in hedonic social networking websites had a significant impact in the user acceptance of such websites.

Human computer interaction is a social process in which emotions play a significant role ([54], [56], [57]). Research has linked emotions to the consumption of products and services ([3], [4], [32]). Although the term 'consumption' has been primarily associated with consumer behavior with respect to product and service purchases, the same could be extrapolated to apply to the use (consumption) of websites as well. Emotions relating to service provided have been associated with satisfaction and future behavior intentions ([2], [5]). These studies indicate that positive emotions experienced during consumption and service actions greatly influence commitment to the relationship with the providers, and intention to continue the relationship.

Picard ([56], [57]) discusses the importance of building computer systems that respond to user frustrations so as to alleviate them. Isbister ([35]) contemplates the designing of computer interfaces and websites that will translate the movements associated with computer use to "feel good" and pleasurable emotions that will result in less stressful and more healthy human computer interactions. Lim ([45]) found that individuals' sensation seeking behavior and gender influence their emotional responses to visual stimuli during computer mediated slot machining gaming. Lee ([42]) examined the interface-based antecedents of trust in the agent-assisted shopping context, aiming at discovering potential interface strategies as a means to enhance

consumer trust in the computer agent. This work examined the effects of certain interface design factors, including face human-likeliness, script social presence, information richness, and price increase associated with upgrade recommendation by the computer agent, for their usefulness in enhancing the affective and cognitive bases for consumer trust. On the basis of this study, the researchers suggested that it is important for computer agents to reduce information overload experienced by many online shoppers. They further suggested that future development of computer interfaces should aim at flexible adaptation of agents to meet the unique individual needs customizing for situational idiosyncrasies, thus providing high performance and enjoyable experiences to consumers. Tuch et al. ([71]) found through their research that the user's affective experience in an online shopping environment impacts the aesthetics-usability relationship, and contributes to altering the paradigm "what is beautiful is useable".

Gugliotta and Paterno ([25]) present a set of design criteria for designing websites that can be adapted to emotion-related aspects. Miranda et al. ([50]) discuss the use of emotional design in the development of low technology products and the addition of emotion causing strategies in such design that can result in a more desirable interface. Hao et al. ([28]) contend that the emotional response of users has become a key factor to be considered in product designs, and discuss how user's emotional responses can be used to develop new automobile outlines. Welzel et al. ([76]) discuss the term "emotional ergonomics" in the light of cognitive interdependency between ergonomics and marketing of products. Yung et al. ([80]) while acknowledging the importance of emotions for human cognition, motivation, learning, decision-making and intelligence, discuss the development of adaptive interfaces, which would support the users with positive emotion eliciting elements. Walter ([75]) stresses the importance of emotional experiences and alludes to their applications in website design, which he states should create an experience for users that makes them feel like there is a person, and not a machine at the other end. Scaglione ([60]) stresses the need to build emotion evoking websites to attract and retain customers for life, since at the core of every human being is the desire to connect and find meaning in the world. Martin et al. ([63]) found emotion based satisfaction to be a better predictor of future behavioral intention than cognitive measures of satisfaction.

It follows from the above discussion that a healthcare web site that can provide comfort in the form of emotional adaptations involving appropriate emotional responses can attract and retain users, and serve its intended functions both, from an information system perspective, and from an emotional interface perspective. Such a website or interface must be able to evoke a positive emotional response from the user, and eventually improve their mood state by causing an emotion shift from negative to positive emotions.

3 Subjective Evaluation of Healthcare Websites for Hedonic and Emotional Values

To evaluate the extent to which hedonic and emotional values are present or absent in the healthcare websites that are in use today, we selected 15 healthcare websites for evaluation, based on rankings by the Consumer and Patient Health Information Society (CAPHIS), a section of the United States Medical Library Association (CAPHIS,

2012). A thorough literature review pertaining to hedonic websites and emotional websites was conducted, with a view to come up with a list of measures that have been used by researchers to evaluate hedonic and emotional values. The preliminary list yielded 70 measures. This list was examined carefully to select measures that would be most appropriate for a subjective evaluation, because the preliminary list contained measures like "emotional arousal" which may be difficult to assess subjectively. The final list of measures, thought to be appropriate for subjective evaluation purposes, yielded 27 measures which are listed in Table 1. Based on these measures, the authors developed a scale comprising questions of a "yes-no" nature, and also questions that needed an evaluation on a scale of 1 to 5 (with 1 being "very much not so" and 5 being "very much so"). Table 2 and Table 3 present a list of these questions (*Tables 2 & 3 could not be included in this submission due to space constraints, and are available from the authors upon request).*

Table 1. Measures Selected For the Subjective Evaluation

Authors	Paper title	Year	Hedonic Web Site Attributes
Fiore, A., Jin, H., and Kim, J.	For fun and profit: Hedonic value from image interactivity and responses toward an online store	2005	Emotional pleasure (happy-unhappy, annoyed-pleased, dissatisfied-satisfied)
Hartmann, J.B. and Samra, Y.M.	Hedonic and utilitarian aspects of web use: an empirical study among United States teenagers	2008	download videos or movies
			meet new people on the web
Hu, F.L., and Chuang, C.C.	A study of the relationship between the value perception ad loyalty intention toward an e-retailer website	2012	This site not only sells products and services, but also entertains me
			I get so involved when I shop on this website that I forget everything
			I enjoy surfing and shopping from this web site
Hung, W.T., Tsang, S.S., and Liu, H.Y.	Website characteristics and the impact of user perceived value on user behavior	2010	Novelty (web attribute that is perceived by web users as comprising novel information and information)
			Flow experience (a state of consciousness that is sometimes experienced by individuals who are deeply involved in an enjoyable activity)
Hur, Y.	Determinants of sports website acceptance: An application and extension of the TAM model	2007	Enjoyable or not enjoyable
			Also perceived enjoyment which consists of following questions:
Kim, D. and Hwang, Y.	A study of mobile internet user's service quality perceptions from a user's utilitarian and hedonic tendency perspectives	2010	chatting
			sports scores or variety
Kim, J. and Forsythe, S.	Hedonistic usage of product virtualization technologies in online apparel shopping	2007	it is fun
			enjoyable
			interesting
Lee, R. and Murphy, J.	The moderating influence of enjoyment on customer loyalty	2008	Enjoyment (and pleasure)
Li, D.C.	Online social network acceptance: a social perspective	2011	perceived enjoyment
Liao, C., To, P., Liu, C., Kuo, P. and Chuang, S.	Factors influencing the intended use of web portals	2010	visual attractiveness (esp. color scheme & overall layout)
			pleasant layout
			aesthetics
Massey, A.P., Khatri, V., and Montoya-Weiss, M.M.	Usability of online services: The role of technology readiness and context	2007	No direct measures, but refers to the following wrt Hedonic websites:
			Self-fulfilling value (interacting with the site is an end in itself)
			Enjoyment
Pillai, A., and Mukherjee, J.	User acceptance of hedonic vs. utilitarian social networking web sites	2011	Perceived ease of use
Yang, K. and Lee, H.	Gender differences in using mobile data services: utilitarian and hedonic value approaches	2010	feel good when using
			enjoyable
			gives pleasure
			makes me want to use
			web page design style
			graphics
			colors
			attractive visual images

The developed scale was used to perform a subjective evaluation of the 15 healthcare websites selected. The results of this subjective evaluation are presented in Table 2 and Table 3 (*Tables 2 & 3 could not be included in this submission due to space constraints, and are available from the authors upon request)*. From the results of the subjective evaluation, only 1 (Mayo Clinic) of the 15 healthcare websites evaluated (7% of the total healthcare websites evaluated) got an average score of better than 2.5 on scale type 1, and only 2 (Mayo Clinic, WebMD) of the 15 healthcare websites evaluated (14% of the total healthcare websites evaluated) got an average score of less than 1.5 on scale type 2. This means that of the 15 healthcare websites evaluated, at best 2 websites had *some* hedonic and emotional values, but all the other websites did not. These results reflect that there is a tremendous opportunity to improve the existing healthcare websites to make them hedonic and emotional, and to develop new healthcare websites that are hedonic and emotional.

4 Building Emotional Computer Interfaces in Healthcare Systems

Theories from Psychology have guided computer programmers and researchers in Computer Science, by way of helping to understand human behavior and emotions during computer use ([6], [7], [36], [47], and [61]). Emotions are very complex, more pronounced in evolutionarily advanced animals like human beings as compared to primitive animals, and valuable in producing appropriate actions to good and bad situations ([33], [37]). A thorough review of extant research literature in Computer Science and Psychology has revealed that 'appraisal theories' of emotion ([22], [41], [55], [62]) have been favored the most by computer scientists and researchers, for application to hedonic and emotional computer systems. Appraisal theories place the cognitive component at the very onset of an emotional episode, prior to bodily responses, and thus the cognitive component can be invoked as the one that determines which emotion should be produced and how intense it should be ([33]). This is related to the suggestion that an emotional web interface can help with managing the emotion shift of the user from a negative emotional state (Ex. depression, sadness) to a positive emotional state (Ex. hopeful, excited).

We found further, that of all the appraisal theories, the most frequently used theory by researchers in Computer Science is the "Cognitive Structure of Emotions" theory proposed by Ortony, Clore, and Collins ([55]). In this theory, the authors try to stress the holistic nature of emotions, while pointing to the individual emotions evoked by certain conditions. According to this theory, Emotions are "valenced reactions to events, agents or objects, with their particular nature being determined by the way in which the eliciting situation is construed". Ortony et al. ([55]) define an "event" as "people's construals about things about to happen, considered independently of any beliefs they may have about actual or possible causes". When an individual is reacting to events, that individual is reacting to the consequences of the current event, has in mind the consequences of past events, and may either be pleased or displeased with such outcomes. Ortony et al. ([55]) define an "agent" as "things considered in light of their actual or presumed instrumentality or agency in causing or contributing to

events". Agents could be human or non-human, "animate beings or inanimate objects or abstractions, such as institutions and even situations, provided they are construed as causally efficacious in the particular context". When an individual is reacting to agents, that individual is reacting to the behavior or actions of the agents, and may either approve or disapprove of such behavior. Ortony et al. ([55]) define "objects" as "objects viewed *qua* objects", with the possibility that objects could be treated as both objects and as agents depending on the situation. They explain this with the following example: a person who buys a new car that is a constant sources of trouble might blame the car for his series of misfortunes, and in doing so treats the car as an agent (hence disapproves of it), and also as an object only (hence dislikes it). The emotion of liking an object could have the following tokens: adoration, affection, attraction, liking, and love. Similarly the emotion of disliking an object could have the following tokens: aversion, disgust, hate, loathing, repulsion, detest and revulsion. When an individual is reacting to objects, that individual is reacting to the aesthetics of the object such as color, shape, form or size, and may either like or dislike such aesthetics. This is just the starting point. Ortony et al. ([55]) then sub-classify this initial set of emotions into further emotional states based on the aforementioned fundamental hierarchy. For instance, the emotional reaction to objects may elicit "attraction emotions" such as hate or love. Figure 1 shows the complete classification of emotions proposed by the model.

We argue that Ortony ([55])'s theory can be applied to build emotional interfaces for healthcare systems by creation of events, agents and objects in the interface. We posit that in the context of emotional interfaces in healthcare systems, the following would be desirable events: having an interesting session with the website that makes one forget everything else during the interaction, having a web session that provides the answers sought by the user along with detailed explanations in one session (high quality of service), animated and voice-based narratives in the web session (as if one were interacting with a human), and a web session that loads and transitions from one page to the next quickly so that the user gets the desired response in a relatively short time (similar to a hospital visit where one can meet the doctors and nurses without any check-in counters or waiting rooms). In practical terms, while some of the above events (for example the first two) may be achieved with the inputs provided by the domain experts (healthcare experts such as doctors and nurses), the others can be achieved purely through the expertise of the programmer. Hu and Chuang ([34]) consider the impact of websites that provide interesting sessions and flow, in enabling users to get very involved with and forget everything else. This is similar to having an experience involving a book of fiction, in which the reader finds it difficult to stop reading the book from cover to cover, because the chapters are so interesting and 'pull' the reader from one chapter to the next. Massey et al. ([81]) discuss the self-fulfilling value offered by a website, whereby interacting with the website is considered a reward in itself. Ltifi ([43]), Carlos ([13]) and Tarafdar ([70]) have explored the role of website quality in user satisfaction. Yeung & Lu ([80]) and Sharples ([64]) studied the impact of animation, graphics and narrative style in website use. Moustakis et al. ([53]), Cao et al. ([12]) and Tarafdar ([70]) investigated the impact of quick response times including loading times in website use.

We posit that in the context of emotional interfaces in healthcare systems, the following would be desirable agents: chat rooms and blogs that enable the website users to meet and interact with people with similar medical issues, play rooms with quizzes relating to medical issues, videos and animated movies about the medical issue under consideration with the ability to be downloaded and viewed offline, human like interactions such as asking whether the user is satisfied with the information obtained so far or needs more information, or asking the user what they would like to see or where they want to go next (similar to a human like interaction with the user during a face-to-face hospital encounter with a doctor or nurse). In practical terms, the agents mentioned above will primarily involve the expertise of the programmer, while the content and context of the object (for example, what animations should be provided or what questions should be asked) are provided by subject matter experts like doctors and psychologists. Curtis ([52]), Pillai et al. ([58]), Mack et al. ([48]), and Burke ([10]) explored the role of playfulness, chat rooms and blog use in website user satisfaction. Hartmann & Samra ([82]), Hahn et al. ([26]) and Yeung & Lu ([80]) researched the presence of downloadable materials in enhancing website use and user satisfaction. Aldiri et al. ([1]), Sicilia et al. ([65]), and Sundar et al. ([68]) investigated the impact of interactivity in website use.

We posit that in the context of emotional interfaces in healthcare systems, the following would be desirable objects: vibrant and pleasing color schema (for the screen in general, the dialog boxes, the animations and for all related aspects), animation (especially two and three dimensional animations involving the human anatomy to explain the medical condition queried by the user), humorous narratives with interactive graphics that lighten emotions and the mental load (especially when explaining the technical details, symptoms or consequences concerning the medical condition queried by the user), clipart (three dimensional in pastel colors), high brightness, and stability of color tones (associated with mood elevation). Wang et al. ([74]), Cook & Finlayson ([18]), and Cutshall ([19]) explored how beauty in a website through the use of color schema (influenced by cultural values) impacted its continued use. Lim ([44]), and Content ([17]) investigated the advantages of using three dimensional animation to enhance website characteristics. Hem ([29]) addresses the use of animations involving body parts to help patients understand what is wrong with them, and understand the healing process. Webb ([78]) describes the use of animation in an ophthalmology practice, which helped to boost the sale of optical products and services. Gao ([23]) and Chung-Hoon & Young-Gul ([14]) studied the effects of humor in e-commerce. Wagner ([73]) and Tao ([69]) studied the mental load involved in web use. Reed et al. ([59]) and Bucy et al. ([9]) explored the use of clipart in the light of website complexity.

The healthcare website user can be presented with the emotional interfaces in two ways, as follows. Picard and his colleagues ([56], [57]) have created new technologies that enable a computer to sense, understand and respond to human signs of confusion, frustration, anger, interest and joy. The computer is then able to respond with the appropriate emotional interface. Other researchers have presented the user with emotional interfaces pre-fabricated to evoke particular emotions. For example, Kim and Moon ([83]) discuss the development of an emotional interface through the

manipulation of clipart (form, size and motion manipulations) and color (tone, background, brightness and symmetry manipulations), that will evoke feelings of trustworthiness in users of an online banking interface, The second method seems to be the easiest path for deployment of emotional interfaces in healthcare systems. Since it is likely that healthcare website users are not in a happy or euphoric emotional state and would like to be comforted, emotional interfaces with appropriate events, agents and objects should be able to comfort the user, make him or her feel secure and entertained, and thereby cause a shift in the emotional state from negative to positive. This, in turn will motivate the users to stay, participate and return.

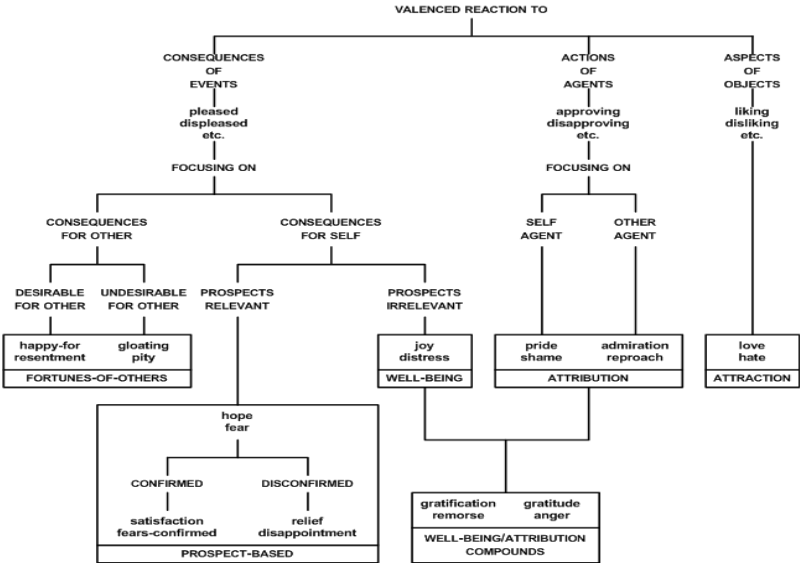

Fig. 1. Cognitive Structure of Emotions Theory*(Source: Ortony et al., 1988)*

5 Conclusion

This paper proposes to use Ortony's ([55]) theory to develop emotional interfaces involving events, agents, and objects that may transform the emotional state of the user from negative to positive. The development of emotional interfaces and websites has much relevance in this day and age of the Internet revolution, in which a larger proportion of the public than ever before, are turning to healthcare websites for information about diseases and treatments. Using emotional websites and interfaces in healthcare systems will permit a better connection with the users and make the user interaction entertaining and informative. This will further encourage the use of healthcare websites, and help to alleviate the pressure on the healthcare system, especially in the United States. Concrete guidelines must be developed in future research concerning how to induce positive emotions in a healthcare website.

References

1. Aldiri, K., Hobbs, D., Qahwaji, R.: Human Face of E-Business: Engendering Consumer Initial Trust Through the Use of Images of Sales Personnel on E-Commerce Web Sites. International Journal of E-Business Research 4(4), 58–78 (2008)
2. Allen, C.T., Machleit, K.A., Kleine, S.S.: A comparison of attitudes and emotions as predictors of behaviour at diverse levels of behavioral Experience. Journal of Consumer Research 18(4), 493–504 (1992)
3. Babin, B.J., Darden, W.R., Babin, L.A.: Negative emotions in marketing research: affect or artifact? Journal of Business Research 42(3), 271–285 (1998)
4. Bagozzi, R.P., Gopinath, M., Nyer, P.U.: The role of emotions in marketing. Journal of the Academy of Marketing Science 27(2), 184–206 (1999)
5. Barsky, J., Nash, L.: Evoking emotion: affective keys to hotel loyalty. Cornell Hotel and Restaurant Administration Quarterly 43 (2002)
6. Bilal, D.: Children's use of the yahooligans! web search engine: Cognitive, physical, and affective behaviors on fact-based search tasks. Journal of the American Society for Information Science 51(7), 646–665 (2000)
7. Bilal, D., Bachir, I.: Children's interaction with cross-cultural and multilingual digital libraries: Information seeking, success, and affective experience. Information Processing and Management: An International Journal 43(1), 65–80 (2007)
8. Birkmeyer, J.D., Birkmeyer, C.M., Wennberg, D.E., Young, M.P.: Leapfrog Safety Standards: The Potential Benefits of Universal Adoption. The Leapfrog Group, Washington, DC (2000)
9. Bucy, E.P., Lang, A., Potter, R.F., Grabe, M.E.: Formal features of cyberspace: Relationships between web page complexity and site traffic. Journal of the American Society for Information Science 50(13), 1246–1256 (1999)
10. Burke, K.: Humanizing the Web. Target Marketing 31(5), 23–24 (2008)
11. Caphis 2012: Consumer and Patient Health Information Society (CAPHIS), a section of the United States Medical Library Association (CAPHIS) (2012), http://Caphis.mlanet.org
12. Cao, M., Zhang, Q., Seydel, J.: B2c e-commerce web site quality: an empirical examination. Industrial Management & Data Systems 105(5/6), 645–661 (2005)
13. Carlos, F., Gurrea, R., Oraos, C.: The effect of product representation mode on the perceived content and continent quality of web sites. Online Information Review 33(6), 1103–1128 (2009)
14. Chung-Hoon, P., Young-Gul, K.: The effect of information satisfaction and relational benefit on consumers' online shopping site commitments. Journal of Electronic Commerce in Organizations 16(5), 20–25 (2006)
15. Chyna: The top 20 healthcare websites and how your patients are using them. Healthcare Executive 16(5), 20–25 (2001)
16. Website of Computers 14(2), 93–118, http://www.sciencedirect.com/science/article/B6V0D-44GF457-1/2/9601b14ed27badfe069784931ea7cc31
17. Content, T.: Preview automation can help businesses set deals. Knight Rider Tribune Business Review (September 27, 2004)
18. Cook, J., Finlayson, M.: The impact of cultural diversity on website design. SAM Advanced Management Journal 70(3), 15–45 (2005)
19. Cutshall, R.C.: An investigation of success metrics for the design of e-commerce websites. Doctoral Dissertation, University of North Texas. Retrieved from ProQuest Dissertations and Theses (2004)

20. Dash, J.: Healthcare moving sites beyond brochureware. Computerworld 34(18), 14–16 (2000)
21. Fiore, A.M., Jin, H.J., Kim, J.: For fun and profit: Hedonic value from image interactivity and responses towards an online store. Psychology and Marketing 22(8), 669–694 (2005)
22. Frijda, N.H.: The place of appraisal in emotion. Cognition and Emotion 7, 357–387 (1993)
23. Gao, Y.: An experimental study of the effects of interactivity and humor in e-commerce. Review of Business Information Systems 15(1), 9–14 (2011)
24. Gefen, D.: TAM or just plain habit?: A look at experienced online shoppers. Journal of Enduser Computing 15(3), 1–13 (2003)
25. Giuditta, G., Fabio, P.: Design of websites adaptable to emotion related aspects. Psychnology Journal 10(1), 23–38 (2010)
26. Hahn, R.W., Litan, R.E., Singer, H.J.: The economics of wireless net neutrality. Journal of Competition Law and Economics 3(3), 399–451 (2007)
27. Ha, L.: Crossing offline and online media: a comparison of online advertising on TV websites and online portals. Journal of Interactive Advertising 3(2), 33–48 (2003)
28. Hao, T., Jianghong, Z., Zhengyu, T., Fangzhen, Z., Wei, W.: Building the user emotional genetic model to generate new form in automobile concept design. Automobile Concept Design 3(2), 33–48 (2011)
29. Hem, B.: 3D animation gives patients new understanding of illness. Mcclatchy Tribune Business News (November 08, 2007)
30. Herrick, D.: Web replaces doctors as patients' top health information source. Health Care News (2009), http://healthcare.ncpa.org/commentaries/web-replaces-doctors-as-patients-top-health-information-source
31. Hills, P., Argyle, M.: Uses of the internet and their relationships with individual differences in personality. Computers in Human Behavior 19, 59–70 (2003)
32. Holbrook, M.B., Hirschmann, E.C.: The experiential aspects of consumption: consumer fantasies, feelings, and fun. Journal of Consumer Research 9(2), 132–140 (1982)
33. Houwer, J.D., Hermans, D.: Cognition and emotion. Psychology Press, New York (2010)
34. Hu, F.L., Chuang, C.C.: A study of the relationship between value perception and loyalty intention towards an e-retailer website. Journal of Internet Banking and Commerce 17(1) (2012)
35. Isbister, K.: Emotion and motion: Games as an inspiration for shaping the future of interfaces. Interactions, 24–27 (September-October 2011)
36. Kim, K.-S.: Effects of emotion control and task on web searching behavior. Information Processing and Management: An International Journal 44(1), 373–385 (2008)
37. Kim, D.J., Hwang, Y.: A study of mobile internet users' service quality perceptions from a user's utilitarian and hedonic value tendency perspectives. Information Systems Frontiers 2(3) (2010)
38. Kim, J., Forsythe, S.: Hedonic usage of product virtualization technologies in online apparel shopping. Distribution Management 35(6), 502–514 (2007)
39. Kohn, L.T., Corrigan, J.M., Donaldson, M.S. (eds.): To Err Is Human: A Safer Health Care System. National Academy Press (2000)
40. Laurel, B.: Computers as theatres. Addison-Wesley Publication (1993)
41. Lazarus, R.S.: Thoughts on the relations between emotion and cognition. American Psychologist 37, 1019–1024 (1982)
42. Lee, E.J.: Factors that enhance consumer trust in human computer interaction: An examination of interface factors and moderating influences. Doctoral Dissertation, University of Tennessee-Knoxville. Retrieved from ProQuest Dissertations and Theses (2002)
43. Litifi, M., Gharbi, J.E.: The moderating role of the type of product on the relation between perceived quality and satisfaction towards a commercial website. Romanian Journal of Marketing 2, 37–47 (2012)

44. Lim, H.S.: Three dimensional virtual try-on technologies in the achievement and testing of fit for mass customization. Doctoral Dissertation, North Carolina State University. Retrieved from ProQuest Dissertations and Theses (2009)
45. Lim, C.: Examining the influence of sensation seeking and gender on comsumers' emotional to visual stimuli in computer simulated slot machines. Doctoral Dissertation, University of Maryland-College Park. Retrieved from ProQuest Dissertations and Theses (2007)
46. Liao, C., To, P., Liu, C.C., Kuo, P.Y.: Factors influencing the intended use of web portals. Online Information Review 35(2), 237–254 (2011)
47. Lopatovska, I., Cool, C.: Online search: Uncovering affective characteristics of information retrieval experience. Presented at the 2008 ALISE Annual Conference (2008)
48. Mack, R., Blose, J.E., Pan, B.: Believe it or not- credibility of blogs in tourism. Journal of Vacation Marketing 14(2), 133–144 (2008)
49. Martin, D., O'Neill, M., Hubbard, S., Palmer, A.: The role of emotion in explaining consumer satisfaction and future behavioral intention. Journal of Services Marketing 22(3), 224–236 (2008)
50. Miranda, C.A.S., Mottin, A.C., Ribeiro, D.G.: Emotional design: Assigning attractive values in low technology casting products. Presented at the 17th World Congress on Ergonomics (2012)
51. Misra, R., Mukherjee, A., Peterson, R.: Value creation in virtual communities: The case of a healthcare website. International Journal of Pharmaceutical and Healthcare Marketing 2(4), 321–337 (2008)
52. Mosiah, A.: From monologue to dialogue: Using performative objects to promote collaborative mindfulness in computer mediated group discussions. Doctoral Dissertation, Indiana University. Retrieved from ProQuest Dissertations and Theses (2009)
53. Moustakis, V., Tsironis, L., Litos, C.: A model of website quality assessment. Quality Management Journal 13(2), 22–37 (2006)
54. Nass, C., Reeves, B.: The media equation. Cambridge University Press, Cambridge (1996)
55. Ortony, A., Clore, G.L., Collins, A.: The cognitive structure of emotions. Cambridge University Press, Cambridge (1988)
56. Picard, R.W.: Toward computers that recognize and respond to user emotion. IBM Systems Journal 39(3/4), 705–719 (2000)
57. Picard, R.W., Wexelblat, A. (Moderators): Nass, C.I., Picard, R.W., Warwick, K., Breazeal, C.: Panel Interview at CHI 2002, Minneapolis, Minnesota, USA, April 20-25 (2002)
58. Pillai, A., Mukherjee, J.: User acceptance of hedonic versus utilitarian social websites. Journal of Indian Business Research 3(3), 180–191 (2011)
59. Reed, D.B., Bielamowicz, M.K., Frantz, C.L., Rodriguez, M.F.: Clueless in the mall: A website on calcium for teens. Journal of the American Dietetic Association (Adolescent Nutrition Supplement) 3(2002), 73–76 (2002)
60. Scaglione, J.: Why web designers are choosing the emotional approach to attract more clients. Design (June 2012)
61. Scheirer, J., Fernandez, R., Klein, J., Picard, R.W.: Frustrating the user on purpose: A step towards building an affective computer. Interacting with Computers 14(2002), 93–118 (2002)
62. Scheirer, K.R.: Emotions as episodes of subsystem synchronization driven by a nonlinear appraisal process. In: Lewis, M.D., Granic, I. (eds.) Emotion, Development and Self Organization: Dynamic Systems Approaches to Emotional Development. Cambridge University Press, Cambridge (2000)
63. Schrepp, M., Held, T., Laugwitz, B.: The influence of hedonic quality on the attractiveness of user interfaces in business management software. Interacting with Computers 18, 1055–1069 (2006)

64. Sharples, H.: How animation boosts sales at e-commerce sites. Graphic Arts Monthly 71(6), 116–117 (1999)
65. Sicilia, M., Ruiz, S., Munuera, J.L.: Effects of interactivity in a website. Journal of Advertising 34(3), 31–45 (2005)
66. Smashing Media: Give Your Website Soul With Emotionally Intelligent Interactions. Emotional Design (Published on March 28, 2012), http://www.smashingmagazine.com
67. Smith, P.A.C., Sharma, M.: Rationalizing the promotion of non-rational behaviors in organizations. The Learning Organization 9(5), 197–201 (2002)
68. Sundar, S.S., Kalyanaraman, S., Brown, J.: Explicating web site interactivity: Impression formation effects in political campaign sites. Communications Research 30(1), 30–59 (2003)
69. Tao, C.C.: Cognitive processing during web search: The role of memory load in selective attention and inhibitory control. Doctoral Dissertation, Indiana University. Retrieved from ProQuest Dissertations and Theses (2006)
70. Tarafdar, M., Zhang, J.: Analyzing the influence of website design parameters on website usability. Information Resources Management Journal 18(4), 62–80 (2005)
71. Tuch, A.N., Roth, S.A., Hornback, K., Opwis, K., Bargas-Avila, J.A.: Is beautiful really usable?: Toward understanding the relation between usability, aesthetics and affect in HCI. Computers in Human Behavior 28(2012), 1596–1607 (2012)
72. Van Der Heijden, H.: User acceptance of hedonic information systems. MIS Quarterly 28(4), 695–704 (2004)
73. Wagner, N.M.: The impact of age on website usability. Doctoral Dissertation, McMaster University-Canada. Retrieved from ProQuest Dissertations and Theses (2011)
74. Wang, Y.J., Hong, S., Lou, H.: Beautiful beyond useful?: The role of web aesthetics. Journal of Computer Information Systems 50(3), 121–129 (2010)
75. Walters, A.: Designing for emotion. Stanford Speciality Books (2011)
76. Welzel, B., Michels, J., Hofman, T.: Cognitive interdependency between ergonomics and marketing. Emotional Ergonomics (2011)
77. Weber, D.O.: Websites of tomorrow: How the internet will transform healthcare. Health Forum Journal 42(3), 40–45 (1999)
78. Webb, J.A.: High-tech animation: Worthwhile tool for patient education. Opthalmology Times 31(11), 44–45 (2006)
79. Wilson, A.: Emanicipating the professions. John Wiley and Sons Publishers (1994)
80. Yeung, W.L., Lu, M.T.: Gaining competitive advantage through a functionality grid for website evaluation. Journal of Computer Information Systems 44(4), 67–77 (2004)
81. Zmassey, A.P., Khatri, V., Montoya-Weiss, M.M.: Usability of online services: The role of technology readiness and context. Decision Sciences 38(2), 277–308 (2007)
82. Zhartmann, J.B., Samra, Y.M.: Impact of personal values and innovativeness on hedonic and utilitarian aspects of website use: An empirical study among United States teenagers. International Journal of Management 25(1), 77–94 (2008)
83. Zkim, J., Moon, J.Y.: Emotional usability of customer interfaces: Focusing on cyber banking systems interfaces. Extended Abstracts on Human Factors in Computing Systems (March 1997)