Modelling user experience with web sites: Usability, hedonic value, beauty and goodness

Article *in* Interacting with Computers · May 2008

DOI: 10.1016/j.intcom.2008.03.001 · Source: DBLP

2 authors:

Paul van Schaik
Teesside University
178 PUBLICATIONS **2,786** CITATIONS
SEE PROFILE

Jonathan Ling
University of Sunderland
158 PUBLICATIONS **2,777** CITATIONS
SEE PROFILE

Modeling User Experience With News Websites

Gabor Aranyi
School of Computing, Teesside University, Middlesbrough, TS1 3BA, UK. E-mail: g.aranyi@tees.ac.uk

Paul van Schaik
School of Social Sciences and Law, Teesside University, Middlesbrough, TS1 3BA, UK. E-mail: p.van-schaik@tees.ac.uk

Although news websites are used by a large and increasing number of people, there is a lack of research within human-computer interaction regarding users' experience with this type of interactive technology. In the current research, existing measures of user-experience factors were identified and, using an online survey, answers to psychometric scales to measure website characteristics, need fulfillment, affective reactions, and constructs of technology acceptance and user experience were collected from regular users of news sites. A comprehensive user-experience model was formulated to explain acceptance and quality judgments of news sites. The main contribution of the current study is the application of influential models of user experience and technology acceptance to the domain of online news. By integrating both types of variable in a comprehensive model, the relationships between the types of variable are clarified both theoretically and empirically. Implications of the model for theory, further research, and system design are discussed.

Introduction

With the proliferation of personal computing since the early 1990s and the advent of the Internet, information technology has spread outside the workplace-context applied in domains, such as leisure (e.g., computer gaming and instant messaging; van der Heijden, 2004), electronic retail and marketing (Barwise, Elberse, & Hammond, 2002), and media "consumption" (e.g., online news; Chen & Corkindale, 2008). As a consequence, experiential factors, such as aesthetics and enjoyment, have begun to receive increasing attention in human-computer interaction (HCI) (Alben, 1996; Hassenzahl & Tractinsky, 2006), and user experience (UX) has become a major area of research (van Schaik & Ling, 2009). The concept of UX is predicated on the idea that interactive technologies not only deliver functional benefits, but they also deliver experiences, and users' intention to (re)live positive experiences is an important driver of the use and adoption of technology (Hassenzahl, 2003). A rationale for research in UX is that the success of interactive technologies is fundamentally connected to their ability to promote high-quality experiences, beyond their capacity to support the completion of instrumental tasks. Consequently, the main aim of UX research is to establish how positive experiences with interactive technologies can be promoted (Law & van Schaik, 2010).

Models of UX have been applied to a wide range of interactive technologies, such as mobile-telephone menu layouts (Thüring & Mahlke, 2007), MP3-player skins (Hassenzahl, 2004), and websites (e.g., Hartmann, Sutcliffe, & De Angeli, 2008; van Schaik & Ling, 2011; Zhou & Fu, 2007). However, there is a lack of knowledge about news sites, a specific type of interactive technology, in terms of UX constructs and their structural relationships. As Nielsen (2002) pointed out: "Many academics disdain research topics that are closely connected to real-world needs. For proof, look no further than the appalling lack of web usability research. There are more papers on unworkable, esoteric 3-D browsers than on how hundreds of millions of people use the biggest real-time collaborative system ever built." Research on the present topic is especially timely, because hundreds of millions of individuals are using news sites on a daily basis. Additionally, O'Brien and Lebow (2013) recently proposed that UX is a useful framework for studying interactions with online news media, and called for the joint consideration of both pragmatic and hedonic aspects to promote a broader conceptualization and evaluation of people's interaction with information-oriented websites.

There is a wealth of research on human-computer interaction and information systems (IS) regarding how people

Received February 6, 2014; revised May 7, 2014; accepted May 23, 2014

 • Published online 27 April 2015 in Wiley Online Library (wileyonlinelibrary.com). DOI: 10.1002/asi.23348

browse (e.g., Toms, 2000) and engage with online news (e.g., O'Brien, 2011a), with many employing experiential variables. For example, Arapakis, Lalmas, Cambazoglu, Marcos, and Jose (2013) assessed the sentimentality and polarity (positive/negative) of a large sample of online news articles and assessed their relationship with measures of user engagement, such as positive and negative affect, attention, and gaze behavior, while McCay-Peet, Lalmas, and Navalpakkam (2012) explored the impact of saliency of information on focused attention and (positive) affect in the context of online news. However, research in this area typically considers news articles and their properties to explore what drives engagement and satisfaction, while attributes of news sites as interactive artifacts are not systematically considered in how they contribute to users' experience. In other words, factors contributing to experience are considered at the level of news items, but not at the level of news sites as interactive products.

News sites, as a specific type of information-presenting web portal, differ from other types of website. Information-presenting web portals in general are sites that provide online information and information-related services, in contrast to transaction-based or retail-oriented websites that focus on online transactions (Yang, Cai, Zhou, & Zhou, 2005), which may differ significantly in terms of UX and quality criteria. For example, the secure and confidential management of credit-card details and the fulfillment of deliveries are of central importance in the case of transaction-based sites, whereas it might not be relevant at all in the case of information-presenting portals such as news sites. New sites have several characteristics, partly derived from their roots in print journalism, which justify their separate treatment from other types of website.

Since most major news providers in the Western world launched online versions of their newspapers in the middle of the 1990s (Hall, 2001), news websites have become a favored source of news for many (Allan, 2006). Ever since, the news sector has increasingly used the web as a publication platform and online news plays a significant role in how people acquire information about the world (Nguyen, 2008). At present, most news sites are not merely online versions of print newspapers. Developers spend a growing amount of effort on enhancing the interactivity of news sites, thereby promoting, for example, ease of access to a wide variety of news, communication among users, and user-generated content. The Internet is more than just another medium for journalism. Online news has a great influence on how people access information (e.g., quick access to frequently updated news from Internet-enabled portable devices), how news stories are created and published (e.g., collaborative publishing; Bruns, 2005), and on the roles of journalists and readers (e.g., participatory journalism; Deuze, Bruns, & Neuberger, 2007).

Due to the constantly increasing use of the Internet in the past two decades, and the more recent and rapid spread of Internet-enabled handheld devices (e.g., smart phones and tablets), ease of access to information in general and to (online) news in particular is increasing. For example, an estimated 78% of the population in North America had access to the Internet as of March 2011 (Internet World Stats, 2011) and 47% of the adults in the United States accessed local information and news on mobile phones or tablet computers in 2010 (Rosenstiel & Mitchell, 2011). As another example, 77% of households in Great Britain in 2011 had access to the Internet and 45% of users used a mobile phone to access the Internet (Office for National Statistics, 2011). Consequently, news sites can be accessed by the majority of readers potentially anytime and anywhere.

Hall (2001) argues that the monopoly of large media conglomerates (such as General Electric, the Walt Disney Company, and News Corporation) is harder to defend on the Internet than in the largely monopolized print and broadcast media, due to the large number of sources of information and the relative ease and low cost for anybody to publish on the web; therefore, these companies are forced back into a more competitive business environment when publishing online. As a consequence, transparency (Karlsson, 2011), trust in news providers (Kohring & Matthes, 2007), and experiential factors (e.g., enjoyment and mental workload) may play a greater role in the success of news websites. Therefore, news sites that provide high-quality experiences are expected to promote ongoing, repeated interaction. However, despite the growing importance of online news publishing in the media sector and a shifting focus towards experiential factors in HCI, there is a lack of academic research on news sites in terms of UX constructs and their structural relationships. Although the news sector has had an increasing presence on the web in recent years, there is a lack of knowledge about how news sites can be designed to promote a high-quality UX. It is therefore timely to investigate how various aspects of experience (e.g., antecedents, components, and outcomes of experience) are related in a model of UX with news websites.

Furthermore, we argue for the joint consideration of technology acceptance and UX for the primary reason that even if an artifact is highly usable and delivers high-quality experiences, its potential benefits in terms of effective and efficient task performance and enjoyment will not be realized if potential users are not willing to employ it. Modeling of acceptance can clarify how UX, together with previously established other factors, influences users' technology acceptance (see van Schaik & Ling, 2011). Modeling UX without considering acceptance may not be enough, because repeated visits to news sites (and conducting repeat business on websites in general) requires users' acceptance of the site. Research has found that technology acceptance variables (e.g., perceived usefulness) are antecedents of online loyalty (e.g., Cyr, Head, & Ivanov, 2006; Cyr, Hassanein, Head, & Ivanov, 2007). Therefore, an integrated approach to the study of UX and technology acceptance is justified (see van Schaik & Ling, 2011).

DOI: 10.1002/asi

Theoretical Background

Although the HCI and IS literature offers a wealth of models and theoretical frameworks for technology acceptance and UX, these models have not been previously applied to and tested using news sites as an interactive artifact. Models of technology acceptance include the technology acceptance model (TAM; Davis, 1989) and the unified theory of acceptance and use of technology (Venkatesh, Morris, Davis, & Davis, 2003). Models of UX include Hassenzahl's (2003) UX model and the components of UX (CUE) model (Thüring & Mahlke, 2007).

The scope of the original TAM (Davis, 1986) is restricted to explaining variation in intention to use and subsequent use behavior of computer systems from variation in the behavioral belief constructs of perceived usefulness and perceived ease of use (and the later-removed attitude construct). However, the model has been augmented with a wide range of variables over the past two decades to increase its explanatory power in different fields of application (see Venkatesh & Davis, 2000; Wixom & Todd, 2005). Additional variables include perceived enjoyment (Davis, Bagozzi, & Warshaw, 1992), internal and external control, intrinsic motivation and emotion (Venkatesh, 2000), design aesthetics (Cyr et al., 2006), user-interface design, and satisfaction (Cho, Cheng, & Lai, 2009). Notably, several of the mentioned variables address experiential aspects of technology acceptance. TAM has been successfully adopted in the study of web technologies (Lederer, Maupin, Sena, & Zhuang, 2000; Cho et al., 2009), and it is a well-established, robust, and powerful model for predicting user-acceptance; therefore, the constructs of the model and their established structural relationships are considered relevant to the current work. Although Chen and Corkindale (2008) applied the technology acceptance model to online news, their work did not include psychometric measurement of the model's components and testing of the model; rather, it was based on interviews with media experts. By contrast, the current study develops a measurement and a structural model of users' experience with news sites, rather than a model of acceptance based on the knowledge and intuition of news providers and developers of news sites.

UX models differ from models of technology acceptance most notably because of their direct focus on experiential aspects, frequently referred to as hedonic or noninstrumental attributes. Hassenzahl's UX model distinguishes pragmatic and hedonic aspects of user-perceived attributes of interactive technologies. While pragmatic attributes encompass utility and usability that allow for the manipulation of systems, hedonic attributes encompass factors that make interaction with a particular technology pleasurable by fulfilling human needs, such as autonomy, competency, stimulation (self-oriented), relatedness, and popularity (others-oriented) (Hassenzahl, 2008). Furthermore, Hassenzahl and Roto (2007) argue that while pragmatic attributes emphasize the fulfillment of behavioral goals (do-goals), hedonic attributes emphasize psychological well-being, in other words, be-goals, which stand closer to the self and are important drives of emotional product attachment.[1] Hassenzahl (2008) identified the ability of interactive products to support need fulfillment as a source of affective reactions in relation to the use of interactive technologies. Hassenzahl, Diefenbach, and Göritz (2010) assessed the relationships between the fulfillment of universal human needs, positive affect, and perceptions of product attributes. The study revealed significant relationships between need fulfillment and positive affect, and need fulfillment was related to hedonic quality perceptions. Furthermore, in accordance with the distinction between hygiene factors and motivator factors (Zhang & von Dran, 2000), the role of usability as a hygiene factor[2] was supported. Additionally, O'Brien (2011b) concluded that human-information interactions and UX share a common focus in recognizing the significance of needs and made a case for taking a UX approach to study information interactions.

The components of the user-experience (CUE) model (Thüring & Mahlke, 2007) aims to integrate the most important aspects of HCI by incorporating various facets of interaction characteristics, UX, and system appraisal. We chose this model as a basis for developing our own model in the current research, as it appears to be the most comprehensive published UX model to date. There are three types of UX components in the model: instrumental qualities, noninstrumental qualities, and emotional responses. Instrumental qualities concern usefulness and ease of use, and correspond to pragmatic attributes in Hassenzahl's UX model. Noninstrumental qualities concern aspects such as aesthetics, the "look-and-feel" of the system, and identification, and correspond to hedonic attributes in Hassenzahl's UX model. The category of noninstrumental qualities generally incorporates aspects that are important to users but are not connected to their performance with a system. Emotional reactions in the model are characterized with multiple components, such as subjective feelings, motor expressions, and cognitive appraisals (see Mahlke & Minge, 2008). The model treats UX components as consequences of interaction characteristics, which involve three groups of variables: characteristics of the interactive artifact, characteristics of the user, and task/context characteristics. Outcome variables in the model, which are, in turn, predicted from UX components, include both acceptance and overall evaluations. In summary, the CUE model seems to be an adequate conceptual framework for incorporating a wide range of technology-acceptance and UX components.

[1]Be-goals are derived from the fulfillment of human needs (e.g., stimulation and competence), whereas do-goals are related to achieving certain behavioral goals (e.g., reading news updates of a particular event). According to Carver and Scheier (1989), do-goals are derived from be-goals and do-goals are instrumental in achieving be-goals.

[2]According to Zhang and von Dran (2000), the absence of hygiene factors (such as usability) leads to dissatisfaction, but their presence does not lead to satisfaction. The presence of motivational factors (such as high-level aesthetics), on the other hand, leads to satisfaction and promotes the quality of UX.

DOI: 10.1002/asi

When TAM was augmented with experiential constructs, empirical evidence showed that the behavioral belief constructs of TAM and the product attributes of the Hassenzahl's UX model are separate underlying dimensions of users' experience (van Schaik & Ling, 2011). Additionally, Hassenzahl's UX model typically operates with overall beauty and goodness evaluations of interactive artifacts as outcomes of interaction, as opposed to behavioral intention in TAM. Therefore, it is reasonable to include factors of both technology acceptance and UX in a comprehensive model of UX with news sites in order to facilitate the prediction of UX outcomes.

Given the lack of UX research in this domain, the aim of the current study is to develop a model of users' experience with news sites. Rather than focusing on properties of (sets of) news items in accounting for positive experience, we consider user-perceived properties of news sites as interactive artifacts (or products). We use an empirically tested and comprehensive UX model (Thüring & Mahlke, 2007) as a basis for modeling UX with news sites, as well as a qualitative study (Aranyi, van Schaik, & Barker, 2012) of users' self-reported factors of experience with news sites to guide the selection of variables. In summary, the following sections address two main research questions: first, how are user-perceived properties of news sites related to users' experiences with the sites and, second, how do various facets of users' experiences relate to UX outcomes, such as overall quality judgments of news sites and intention to use?

Materials and Methods

Design

An online questionnaire was designed to collect responses to items as indicators of variables measuring aspects of users' experience with news sites. The selection of measures for modeling UX with news sites was guided by (a) an exploratory study that was conducted to identify self-reported factors of UX of participants using a particular news site under think-aloud instructions (Aranyi et al., 2012), and (b) by a literature review of models of technology acceptance and UX (see Aranyi, 2012). Protocol analysis of the think-aloud recordings in the exploratory study yielded five categories of experience: content, layout, information architecture, diversion, and impression. Standardized measures were identified from HCI and IS literature to address the measurement of each self-reported category of experience. The questionnaire was advertised through university newsletters and student e-mail lists at Teesside University. Additionally, answers were collected from Bangor University, City University London, and Kingston University. A prize-draw of £50 was used as an incentive.

Materials and Procedure

Because the exploratory study revealed significant differences in UX between regular and novice users of a particular news site (i.e., differences in experience attributable to level of adoption), and in an attempt to avoid the product as a fixed-effect fallacy (Monk, 2004), participants were asked to use a news site of their own choice, which they used regularly, before completing the interaction-experience questionnaire. Survey Monkey (http://www.surveymonkey.com), an online survey tool, was used to collect data.[3] Informed consent was collected by requiring participants to tick a series of checkboxes in order to carry on to the instructions. Participants were then instructed to open a new browser window and use a news site of their own choice for at least a couple of minutes before proceeding to the questions. After their use of a news site, participants completed a set of psychometric scales in the following order. Each of the scales measures one of the constructs that are used as variables in the structural model (that is derived in the following subsection, Structural Model).

The positive and negative affect schedule (PANAS; Watson, Clark, & Tellegen, 1988) was selected to assess users' affective reactions to using a news site. PANAS has been applied successfully and extensively in previous research related to positive experiences in general (Sheldon, Elliot, Youngmee, & Kasser, 2001) and experience with interactive systems in particular (Hassenzahl, 2008; Hassenzahl et al., 2010; Diefenbach & Hassenzahl, 2011; Partala & Kallinen, 2012), and it was used together with other measures (such as AttrakDiff2) selected for the current study. The abridged version of the AttrakDiff2 questionnaire (AttrakDiff2-SF; Hassenzahl & Monk, 2010; Hassenzahl et al., 2010) was selected to measure the user-perceived product-attributes of *pragmatic quality* and *hedonic quality*, and overall evaluations of *beauty* and *goodness*. A measure of *perceived enjoyment* was adopted from Sun and Zhang (2008), which can be used to measure intrinsic motivation in the context of HCI (Ryan & Deci, 2000), and research suggests that it has a direct effect on intention to use (Cyr et al., 2006). The perceived disorientation scale (Ahuja & Webster, 2001) was selected to assess the participants' level of *disorientation*, that is, their loss of sense of location in a hyperlinked structure (McDonald & Stevenson, 1998). The reliability, validity, and sensitivity of the perceived disorientation scale, in combination with other UX measures, were confirmed in two psychometric studies by van Schaik and Ling (2003, 2007).

To address the measurement of participants' perception of the user-interface, we selected a short, 3-item scale of *perceived user-interface design*, which is an important antecedent of continued usage intention (Cho et al., 2009). To assess the user-perceived aesthetic quality of news sites, an 8-item *perceived aesthetics scale* was selected (Porat & Tractinsky, 2012) that measures two dimensions of aesthetics: classical and expressive (Lavie & Tractinsky, 2004).

[3]The questionnaire was piloted with seven postgraduate researchers at our institution as respondents.

DOI: 10.1002/asi

Measures of two dimensions of information quality, *usefulness of content* and *adequacy of information*, and *accessibility* as a service-quality measure were adopted from the Yang et al. (2005) questionnaire of user-perceived service quality of information-presenting web portals.[4] A 2-item measure of behavioral intention was included as a technology-acceptance outcome variable (based on Venkatesh & Davis, 2000). Five subscales were adopted from Sheldon et al. (2001) to assess the fulfillment of psychological needs identified as tentatively relevant to news site use in the exploratory study: autonomy, competence, relatedness, stimulation, and popularity. Additionally, participants were asked to rate the relevance of the fulfillment of each need to their experience, based on the definitions of each need from Sheldon et al. (2001). All scales were measured using 7-point Likert scales, except for AttrakDiff2, which was measured with 7-point semantic differentials. The questionnaire ended with questions regarding Internet use behavior and demographics. Upon completing the questionnaire, participants had the opportunity to provide their e-mail address to enter the prize-draw. The full set of measures is presented in Appendix A1.

Participants

Participants had to be over 18 and fluent in English to be eligible for the study. Out of 522 respondents to the online questionnaire, 305 gave full responses to the user experience scales (120 male, 185 female; mean age = 24.63 years, SD = 7.52), and these were used in subsequent analyses. The average experience of Internet use was 9.66 years (SD = 3.19). Nearly two thirds of the participants used the British Broadcasting Corporation's (BBC)[5] news site before completing the questionnaire. Other news sites that were visited by more than 1% of participants before completing the questionnaire included *The Guardian* (6%), Sky News (4%), and *The Independent* (2%), 22% of the sites were reported by less than 1% of participants, and 2% used a site that was identified as an aggregator (e.g., Google News and Yahoo! News). A majority (94%) accessed the Internet on a daily or more frequent basis and 70% reported using the Internet for an hour or more per day. Nearly half (47%) reported daily or more frequent access to news sites and 56% used these sites for between 10 and 15 minutes duration per visit. Participants mainly used laptop computers (86%), desktop computers (47%), and mobile phones (31%) to access news sites.

Analysis Method

Along with factor analysis to explore the factor structure of the multidimensional scales, partial-least-squares path modeling (PLS) was used for the formulation of the measurement model and the structural model, for the following reasons (see Vinzi, Chin, Henseler, & Wang, 2010). PLS allows for the integrated analysis of a measurement model, which specifies the relationships between latent variables and their manifest variables, and a structural model, which specifies the relationships between latent variables. PLS has less stringent assumptions regarding the distribution of variables and error terms than covariance-based structural equation modeling (CB-SEM), and supports both reflective and formative measurement. The required sample size for PLS is also lower than that of covariance-based structural equation modeling. PLS maximizes the explained variance in dependent variables and it is suitable for estimating complex models (multistage models with a high number of latent variables and connections); therefore, it is adequate for prediction-oriented research involving a wide range of variables.[6] Latent variable scores in PLS are exact linear combinations of manifest variables, rather than average scores of manifest variables calculated for each latent variable with satisfactory internal consistency. Therefore, PLS provides more accurate scale values than the technique of averaging item scores. Moreover, recent research has shown that PLS performs at least as well as and, under various circumstances, is superior to, covariance-based structural equation modeling in terms of bias, root mean square error, and mean absolute deviation (Hulland, Ryan, & Rayner, 2010; Vilares, Almeida, & Coelho, 2010). All PLS analyses in the current study were conducted using the SmartPLS software (http://www.smartpls.de). Bootstrapping samples of 5,000 were used to test the significance of model parameters, as recommended by Henseler, Ringe, and Sinkovics (2009).

Analysis

Measurement Model

Following the exclusion of items and scales based on exploratory factor analyses of each multidimensional scale, a PLS measurement model of all remaining scales was tested by drawing all possible structural links between the constructs, with the inner-weighting option set to factorial scheme in the SmartPLS analysis software (Chin, 2010). Descriptive statistics and reliability coefficients of each scale retained for modeling are presented in Table 1. A detailed description of the measurement model, complete with the exploratory factor analyses, reports of item loadings

[4]Information-presenting web portals are sites that provide online information and information-related services, in contrast to transaction-based or retail-oriented websites that focus on online transactions. The interpretation of service quality may differ significantly between these two broad categories of website (e.g., the relevance of secure credit-card transactions).

[5]According to the Alexa Web Information Company (www.alexa.com), the BBC is the 11th highest-ranking news site in the world (with an overall global rank of 61), and the fifth-highest-ranking website and the highest-ranking news site in the United Kingdom (as of April 2014).

[6]Note that contrary to CB-SEM techniques, which focus on measurement-item covariance, PLS focuses on the variances of dependent variables (at item and construct level). Therefore, chi-square statistics and various goodness-of-fit indices for testing covariance structure do not apply to PLS analyses (Chin, 1998). The goodness of PLS structural models is assessed (mainly) with the amount of variance explained in dependent variables.

DOI: 10.1002/asi

TABLE 1. Descriptive statistics and reliability coefficients.

Construct	Number of items	Average variance extracted	Composite reliability	Mean	Standard deviation
Perceived aesthetics	8	0.58	0.92	4.80	1.09
Perceived disorientation	7	0.69	0.94	2.07	1.20
Perceived user-interface design	3	0.87	0.95	5.61	1.16
Usefulness of content	2	0.85	0.92	6.34	0.91
Adequacy of information	2	0.85	0.92	5.59	1.16
Accessibility	2	0.84	0.92	6.08	0.99
Pragmatic quality	4	0.53	0.81	5.49	1.04
Hedonic quality	4	0.60	0.86	4.76	1.09
Perceived enjoyment	3	0.82	0.93	4.96	1.24
Positive affect	10	0.46	0.89	3.77	1.16
Negative affect	10	0.46	0.89	1.94	0.92
Behavioral intention	2	0.94	0.97	6.26	1.18
Beauty	1	1.00	N/A	4.22	1.20
Goodness	1	1.00	N/A	5.44	1.32

Note. Means and standard deviations were calculated using latent-variable scores.

and cross-loadings, coefficients of convergent and discriminant validity, and scale intercorrelations are presented in Appendix A2.

In summary, statistical analysis supported the use of perceived aesthetics items as a one-dimensional measure. One item was removed from each of the scales *usefulness of content* and *adequacy of information*, because of high cross-loadings. Factor analyses of need-fulfillment subscales did not result in an interpretable structure; therefore, these scales were excluded from further analysis (see Appendix A2). In the PLS measurement model, the predictable-unpredictable (PQ2) item of *pragmatic quality* produced a low loading (.39), the item was retained based on psychometric considerations.[7] The scales *positive affect* and *negative affect* produced average variance extracted (AVE) values lower than .50 (recommended by Chin, 2010). However, the scales' construct validity was supported at the item level (i.e., consistently and markedly higher loadings than cross-loadings); therefore, they were retained for further analysis. The internal consistency, discriminant validity, and construct validity of each scale were supported and the factor structure of the measures was confirmed.

Structural Model

The CUE model (Thüring & Mahlke, 2007) was used as a framework to integrate each measure collected in the present study. According to this framework, the variables were arranged in three groups in a two-stage causal model: (a) interaction characteristics, which were limited to artifact characteristics in the present study[8]; (b) components of user experience, comprising emotional responses (positive and negative affect), perceptions of instrumental qualities and noninstrumental qualities; and (c) interaction outcomes, comprising system appraisal (goodness and beauty) and intention to use. An outline of the model is presented in Figure 1.

Hypotheses for structural modeling were derived from the literature from which the measures were collected. In the following sections, hypotheses and their test summaries are presented separately for two model stages, followed by the presentation of the full model with model parameters (magnitudes of variance explained, path coefficient, and effect size), and a general discussion of hypothesis tests and the model.

First stage: From perceived artifact characteristics to UX components. Components of UX at the first stage of the model contain variables of product attributes from Hassenzahl's UX model (pragmatic quality and hedonic quality), behavioral belief-constructs from TAM (usefulness of content and perceived enjoyment), and affective reactions (positive and negative affect), predicted from perceived artifact characteristics (aesthetics, user-interface design, disorientation, adequacy of information, and accessibility).

Visual aesthetics is considered an important noninstrumental product characteristic in the UX literature (see Lavie & Tractinsky, 2004; Hassenzahl & Tractinsky, 2006; Hartmann et al., 2008). Theoretically, *expressive aesthetics* is expected to be an antecedent of *hedonic quality*, because the latter is conceptualized as the pleasure-producing qualities of a particular artifact, and, as such, is a determinant of

[7]The item was retained, because (a) it had no significant cross-loadings (largest cross-loading was .15 on hedonic quality), (b) its loading on pragmatic quality was statistically significant ($t = 4.57$, $p < .001$), (c) the scale has been previously validated, and (d) including weaker items in PLS helps "to extract what useful information is available in the indicator to create a better construct score" (Barroso, Carrión, & Roldán, 2010, p. 433).

[8]According to Thüring and Mahlke (2007), additional categories of interaction characteristics are person and task/context characteristics. Tentative examples of measures to these categories are displayed in gray in Figure 1.

DOI: 10.1002/asi

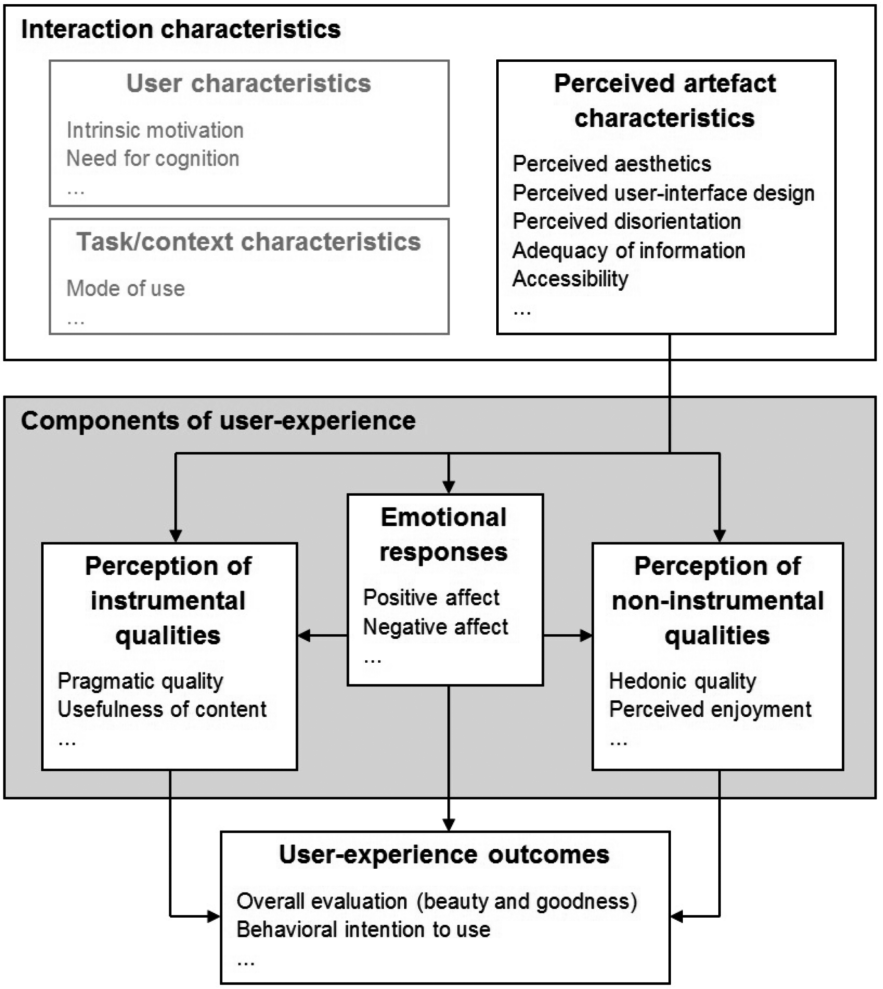

FIG. 1. Outline of a comprehensive model of user experience with news sites (based on Thüring & Mahlke, 2007).

perceptions of *beauty*. *Classical aesthetics*, on the other hand, emphasizes clearly and orderly design and is also expected to be connected to *pragmatic quality*, as it was found to be related to perceptions of usability (e.g., Lavie & Tractinsky, 2004; van Schaik & Ling, 2009). Aranyi et al. (2012) confirmed these connections between the classical and expressive aesthetics dimensions and product attributes. However, here the two aesthetics dimensions did not reproduce in the measurement model and a composite of the two scales was identified as a psychometrically justified solution to measure aesthetics. Therefore, in order to explore the relationships between perceived aesthetics and perceived product attributes, the following hypotheses are proposed:

H1a: *perceived aesthetics* is an antecedent of *hedonic quality*.

H1b: *perceived aesthetics* is an antecedent of *pragmatic quality*.

Regarding the role of aesthetics in technology acceptance, two studies (van der Heijden, 2004; Cyr et al., 2006) have independently established that *perceived aesthetics* is an antecedent of *perceived enjoyment*, as well as of *perceived usefulness* and *perceived ease of use*. Therefore, the following hypotheses are proposed:

H1c: *perceived aesthetics* is an antecedent of *perceived enjoyment*.

H1d: *perceived aesthetics* is an antecedent of *usefulness of content*.[9]

User-interface design concerns the presentation of the interface of a particular technology. The *perceived user-interface design* measure adopted for the current study (Cho et al., 2009) emphasizes the layout of a website, that is, whether the functional and graphic elements are presented appropriately. Presentation is part of product features in Hassenzahl's UX model (Hassenzahl, 2004), and therefore it is expected to influence the perception of product attributes. The layout of functional and graphic elements (e.g., textual and multimedia content and links) on the pages of a particular news site may influence perceived usability, and at the same time, it is fundamentally connected to the appearance

[9]Usefulness of content is used here as a proxy of perceive usefulness of a news site's content.

DOI: 10.1002/asi

of the site.[10] To examine the relationships between perceived user-interface design and perceived product attributes, the following hypotheses are proposed:

H2a: *perceived user-interface design* is an antecedent of *hedonic quality*.

H2b: *perceived user-interface design* is an antecedent of *pragmatic quality*.

In an adaptation of TAM to web technologies (Cho et al., 2009), *perceived user-interface design* is an antecedent of *perceived usefulness* and *perceived ease of use*. In their model, the effect of *perceived user-interface design* on perceived usefulness is mediated through *perceived functionality*. Because there is no measure of *perceived functionality* involved in the current study, a direct effect of *perceived user-interface design* is expected on *usefulness of content*. In the absence of a measure of *perceived ease of use* in the current study, *perceived user-interface design* is expected to have a direct effect on *perceived enjoyment*. Therefore, the following hypotheses are proposed:

H2c: *perceived user-interface design* is an antecedent of *perceived enjoyment*.

H2d: *perceived user-interface design* is an antecedent of *usefulness of content*.

Ahuja and Webster (2001) found that disorientation and ease of use are distinct, but strongly and negatively related constructs. In an experiment involving information retrieval tasks from a website, van Schaik and Ling (2003) confirmed that disorientation and ease of use are different constructs, and by manipulating orientation support, they found that *perceived disorientation* is a more sensitive measure than *perceived ease of use*. Because *pragmatic quality* is essentially the user-perceived usability of a particular artifact (Hassenzahl, 2004), it is reasonable to assume that disorientation affects the pragmatic quality perceptions of a particular artifact. Therefore, the following hypothesis is proposed:

H3: *perceived disorientation* is an antecedent of *pragmatic quality*.

The measures of *usefulness of content*, *adequacy of information*, and *accessibility* were adopted from the same instrument measuring user-perceived service quality of information-presenting web portals (Yang et al., 2005). In the development and validation of the original instrument, adequacy of information, along with *usefulness of content*, was conceptually presented as a determinant of information quality, whereas *accessibility* was a determinant of service quality. In turn, both information and service quality were determinants of acceptance of technology. *Usefulness of content*, however, is used here as a proxy of *perceived usefulness*. In an adoption of TAM for the domain of news sites (Chen & Corkindale, 2008), perceived core service quality (the quality and presentation of content) is described as an antecedent of *perceived usefulness*. It is therefore proposed that *adequacy of information*, as a measure of information quality, and *accessibility*, as a measure of service quality, are antecedents of *usefulness of content*, as a proxy of *perceived usefulness*, which, in turn, is a determinant of acceptance of technology. Thus, the following hypotheses are proposed:

H4a: *adequacy of information* is an antecedent of *usefulness of content*.

H4b: *accessibility* is an antecedent of *usefulness of content*.

In an integrated model of interaction experience for information retrieval in a web-based encyclopedia, van Schaik and Ling (2011) found that perceptions of product attributes (*pragmatic quality* and *hedonic quality*) are independent determinants of technology-acceptance constructs (*perceived usefulness*, *perceived ease of use*, and *perceived enjoyment*). In an attempt to replicate these findings by examining the relationships between technology-acceptance constructs and product attributes in the application area of online news, the following hypotheses are proposed:

H5a: *pragmatic quality* is a determinant of *usefulness of content*.

H5b: *pragmatic quality* is a determinant of *perceived enjoyment*.

H5c: *hedonic quality* is a determinant of *usefulness of content*.

H5d: *hedonic quality* is a determinant of *perceived enjoyment*.

Hassenzahl et al. (2010) found that *hedonic quality* is positively related to *positive affect* ($r = .46$, $p < .001$), and found support that it remains a significant predictor of *hedonic quality* after controlling for the effect of need fulfillment. Based on mediation and moderation analyses, the authors theorized that positive affect is an outcome of need fulfillment and "a legitimate predictor of hedonic quality" (p. 361). Similarly, they found that positive affect is positively correlated with *pragmatic quality* ($r = .28$, $p < .001$) and it was a significant predictor of *pragmatic quality*. Here, in the measurement model, the scale intercorrelation between *hedonic quality* and *positive affect* was medium ($r = .35$ $p < .01$), and the scale intercorrelation between pragmatic quality and positive affect was small ($r = .22$, $p < .01$). With regard to *negative affect*, an opposite effect is expected on product attributes. It is expected that *negative affect* experienced during the interaction results in lowered ratings of *pragmatic quality* and *hedonic quality*. To investigate the connections between affect and product attributes, the following hypotheses are proposed:

H6a: *positive affect* is an antecedent of *pragmatic quality*.

H6b: *positive affect* is an antecedent of *hedonic quality*.

H6c: *negative affect* is an antecedent of *pragmatic quality*.

H6d: *negative affect* is an antecedent of *hedonic quality*.

[10]Although the constructs perceived user-interface design and perceived aesthetics significantly overlap, the items of the two scales tap different aspects of interface design (see Appendix A1), their relative independence was supported in the measurement model (see Appendix A2), and they were used separately in previous research; therefore, the two constructs are considered here separately.

DOI: 10.1002/asi

TABLE 2. Hypothesis tests of the first stage of the model.

H	Predictor variable	Criterion variable	t^a	Supported (yes/no)
1a	Perceived aesthetics	Hedonic quality	***8.43	Yes
1b	Perceived aesthetics	Pragmatic quality	0.85	No
1c	Perceived aesthetics	Perceived enjoyment	***3.45	Yes
1d	Perceived aesthetics	Usefulness of content	–0.23	No
2a	Perceived user-interface design	Hedonic quality	1.85	No
2b	Perceived user-interface design	Pragmatic quality	***5.63	Yes
2c	Perceived user-interface design	Perceived enjoyment	***5.43	Yes
2d	Perceived user-interface design	Usefulness of content	1.69	No
3	Perceived disorientation	Pragmatic quality	***–3.51	Yes
4a	Adequacy of information	Usefulness of content	***7.00	Yes
4b	Accessibility	Usefulness of content	*2.40	Yes
5a	Pragmatic quality	Usefulness of content	0.94	No
5b	Pragmatic quality	Perceived enjoyment	0.14	No
5c	Hedonic quality	Usefulness of content	0.14	No
5d	Hedonic quality	Perceived enjoyment	**2.93	Yes
6a	Positive affect	Pragmatic quality	1.84	No
6b	Positive affect	Hedonic quality	*2.14	Yes
6c	Negative affect	Pragmatic quality	*–2.11	Yes
6d	Negative affect	Hedonic quality	–0.08	No
6e	Positive affect	Perceived enjoyment	***10.23	Yes
6f	Negative affect	Perceived enjoyment	**–2.69	Yes

Note. [a]Bootstrap, $N = 5000$.
*$p < .05$. **$p < .01$. ***$p < .001$.

Perceived enjoyment is, by definition, an intrinsic motivation variable (Sun & Zhang, 2008) that changes over time and across artifacts. In effect, it may be considered as a state-affect variable, and therefore it is expected to be connected to affective reactions measured in relation to the interaction with a particular artifact. Therefore, the following hypotheses are proposed:

H6e: *positive affect* is an antecedent of *perceived enjoyment*.

H6f: *negative affect* is an antecedent of *perceived enjoyment*.

Tests of hypotheses regarding the first stage of the model are presented in Table 2. Only supported hypotheses were retained for the full model.

With regard to Hypothesis 1a–d, perceived aesthetics was a significant predictor of noninstrumental UX components (*hedonic quality* and *perceived enjoyment*), but it did not predict instrumental UX components (*pragmatic quality* and *usefulness of content*). Contrary to *perceived aesthetics*, *perceived user-interface design* was a significant predictor of pragmatic quality (H2b). However, *perceived aesthetics* and *perceived user-interface design* were strongly correlated ($r = .60$, $p < .01$; see Appendix A2). When *perceived user-interface design* was removed from the model, the effect of *perceived aesthetics* on *pragmatic quality* became significant ($t = 4.05$, $p < .001$). These results suggest that *perceived aesthetics* and *perceived user-interface design* share a significant portion of variance, presumably the variance of classical-aesthetics items in the composite *perceived aesthetics* measure. The findings imply that interface aesthetics can promote user-perceived ease of use of news sites. Additionally, *perceived user-interface design* was a significant predictor of *perceived enjoyment* (H2c), but not of *hedonic quality* (H2a). Again, the lack of support for H2a can be attributed to the high amount of variance shared between *perceived user-interface design* and *hedonic quality*; when perceived aesthetics was removed, the path from perceived user-interface design and hedonic quality became significant ($t = 7.16$, $p < .001$). On the other hand, neither *perceived aesthetics* (H1d), nor *perceived user-interface design* (H2d) predicted *usefulness of content*, which implies that the perceived usefulness of news sites is not affected by interface aesthetics.

Indeed, instrumental UX components were predicted significantly by perceived artifact characteristics that are not related to interface aesthetics (H3–4). *Perceived disorientation* was a significant, negative predictor of pragmatic quality (H3); lower levels of disorientation while browsing a news site were associated with higher levels of user-perceived usability of the site. *Adequacy of information* (H4a) and *accessibility* (H4b) were both significant and positive predictors of usefulness of content.

Hypothesis 5a–d was included to test if product attributes are independent determinants of technology-acceptance constructs. Only H5d was supported: *hedonic quality* was a significant predictor of *perceived enjoyment*, which implies that the perception of pleasure-producing attributes of a news site positively affects users' situation-specific intrinsic motivation to use the site.

Hypothesis 6a–d was related to the relationship between experienced affect during the interaction and the perception of UX components. Overall, the pattern of relationships lends support to the distinction between hygiene and motivator factors as determinants of UX (Zhang & von Dran, 2000). *Positive affect* was a significant, positive predictor

DOI: 10.1002/asi

of *hedonic quality* (H6b) and *perceived enjoyment* (H6e), but not of *pragmatic quality* (H6a). On the other hand, negative affect was a significant, negative predictor of *pragmatic quality* (H6c), but it did not predict *hedonic quality* (H6d). *Negative affect* was also a significant, negative predictor of *perceived enjoyment* (H6f). In other words, positive affective responses were related to pleasure-producing product attributes and enjoyment, but not to instrumental product attributes, while negative affective was predominantly (negatively) related to instrumental product attributes, but also led to lower levels of enjoyment, without affecting the perception of pleasure producing product attributes.

Additionally, although interaction characteristics are not used to predict emotional responses in the original CUE model, the connections between measures of artifact characteristics and affect dimensions were tested to see if affect experienced during interaction could be connected to perceptions of designable product characteristics. As Hassenzahl (2006) points out, designers of interactive products cannot exert a high level of control over emotional responses in a particular design, but they can design to create the possibility of an experience to occur during future interactions. It is therefore useful to identify connections between artifact characteristics and emotional responses to aid designers. Regarding emotional responses, only two paths were significant: *perceived disorientation* to *negative affect* ($t = 4.11$, $p < .001$) and perceived aesthetics to *positive affect* ($t = 4.26$, $p < .001$). Therefore, only these paths from perceptions of artifact characteristics to affective reactions were retained for the complete model.

Second stage: From UX components to UX outcomes. The second stage of the model concerns the prediction of UX outcomes, composed of overall evaluative judgments (*beauty* and *goodness*) and *behavioral intention*, from instrumental UX components (*pragmatic quality* and *usefulness of content*), noninstrumental UX components (*hedonic quality* and *perceived enjoyment*), and affective reactions (*positive affect* and *negative affect*). Additionally, the effect of participants' existing use of news sites (*baseline use-frequency*) and *behavioral intention* on use behavior is also considered. Based on Hassenzahl's UX model (2003, 2004) and empirical studies that confirmed these in the context of website use (van Schaik & Ling, 2008, 2011), the following hypotheses are proposed:

H7a: *pragmatic quality* is a determinant of *goodness*.

H7b: *pragmatic quality* is not a determinant of *beauty*.

H7c: *hedonic quality* is a determinant of *goodness*.

H7d: *hedonic quality* is a determinant of *beauty*.

Additionally, in a study involving the integrated modeling of UX and TAM constructs with a website, van Schaik and Ling (2011) found that product evaluations (*beauty* and *goodness*) are not independent determinants of intention to use. Therefore, the following hypotheses are proposed:

H7e: *goodness* is not a determinant of *behavioral intention*.

H7f: *beauty* is not a determinant of *behavioral intention*.

Perceived usefulness in this study is characterized as the perceived usefulness of the content presented by the news portal a particular participant has been using. Therefore, *usefulness of content* was used as a proxy of *perceived usefulness* in this analysis. Based on the technology acceptance model (e.g., Davis, 1989; Venkatesh & Davis, 2000), the following hypothesis is proposed:

H8a: *usefulness of content* is a determinant of *behavioral intention*.

According to Sun and Zhang (2008), the effect of *perceived enjoyment* on *behavioral intention* is mediated through *perceived ease of use*. However, *perceived ease of use* was not included in the measurement model; therefore, a direct effect of *perceived enjoyment* on *behavioral intention* can be expected. Furthermore, research confirmed that *perceived enjoyment* is a direct determinant of *behavioral intention* (Cyr et al., 2006, 2007; van Schaik & Ling, 2011). Therefore, the following hypothesis is proposed:

H8b: *perceived enjoyment* is a determinant of *behavioral intention*.

To test the effects of affective reactions on interaction outcomes, the following hypotheses are proposed, in accordance with the hygiene and motivator factor distinction:

H9a: *positive affect* is a determinant of *beauty*.

H9b: *positive affect* is a determinant of *goodness*.

H9c: *negative affect* is a determinant of *goodness*.

H9d: *negative affect* is not a determinant of *beauty*.

H9e: *positive affect* is a determinant of *behavioral intention*.

H9f: *negative affect* is a determinant of *behavioral intention*.

Based on TAM (Davis, 1989), it is expected that *behavioral intention* is positively related to use behavior. Use behavior in the current study was assessed by how frequently a particular participant normally accessed the news site that he had been using during the study (frequency of use). However, the participants were all in the post-adoption stage (Magni, Taylor, & Venkatesh, 2010); in other words, they have already adopted the news sites they chose to use during the study. Because of this, their actual use-frequency of the particular news sites is expected to be less influenced by *behavioral intention*. Participants were asked to indicate how frequently they accessed news sites in general (*baseline use-frequency*), as well as the frequency of use of the particular news site they had been using during the study. The frequency of use of news sites in general is expected to be positively related to the frequency of use of a particular news site. Therefore, the following hypotheses are proposed:

H10a: *behavioral intention* is a determinant of *frequency of use*.

H10b: *baseline use-frequency* is a determinant of *frequency of use*.

DOI: 10.1002/asi

TABLE 3. Hypothesis tests of the second stage of the model.

H	Predictor variable	Criterion variable	t^a	Supported (yes/no)
7a	Pragmatic quality	Goodness	***4.35	Yes
7b	Pragmatic quality	Beauty	0.69	Yes
7c	Hedonic quality	Goodness	***8.25	Yes
7d	Hedonic quality	Beauty	***10.32	Yes
7e	Goodness	Behavioral intention	*2.47	No
7f	Beauty	Behavioral intention	0.00	Yes
8a	Usefulness of content	Behavioral intention	***4.14	Yes
8b	Perceived enjoyment	Behavioral intention	***4.54	Yes
9a	Positive affect	Beauty	**2.85	Yes
9b	Positive affect	Goodness	1.89	No
9c	Negative affect	Goodness	*–2.26	Yes
9d	Negative affect	Beauty	–0.62	Yes
9e	Positive affect	Behavioral intention	0.36	No
9f	Negative affect	Behavioral intention	–0.53	No
10a	Behavioral intention	Frequency of use	*2.32	Yes
10b	Baseline use-frequency	Frequency of use	***21.63	Yes

Note. [a]Bootstrap, $N = 5000$.
*$p < .05$. **$p < .01$. ***$p < .001$.

Note that the intention to use (or continue using) a particular news site in the future is not necessarily informative for predicting the frequency of use of that site. The frequency of use of news sites in general, however, is expected to be more strongly related to the frequency of use of particular sites. Therefore, we explore if *behavioral intention* still remains a significant predictor of use behavior after controlling for baseline use. Tests of hypotheses related to the second stage of the model are presented in Table 3.

Hypotheses proposed on the basis of Hassenzahl's UX model (H7a–d) were all supported: *hedonic quality* was a significant, positive predictor of both *goodness* (H7c) and *beauty* (H7d) ratings of news sites, while pragmatic quality predicted *goodness* (H7a), but not *beauty* (H7b) ratings. Contrary to the findings of van Schaik and Ling (2011), goodness was an independent predictor of *behavioral intention* (H7e not supported)[11]; however, *beauty* was not (H7f). In accordance with TAM, *usefulness of content* (H8a) and perceived *enjoyment* (H8b) were significant (positive) predictors of *behavioral intention*. Therefore, the assumptions of both Hassenzahl's UX model and TAM were supported for the second stage of the model.

With regard to the effects of affective reactions on interaction outcomes (H9a–f), *positive affect* was a significant (positive) predictor of both *beauty* (H9a), but not of *goodness* (H9b) ratings, while negative affect was a significant (negative) predictor of goodness (H9c), and not of beauty (H9d). Positive and negative affect ratings were not direct predictors of *behavioral intention* (H9e,f; however, the indirect effect of positive affect on behavioral intention through *perceived enjoyment* can be seen in Figure 2).

Behavioral intention was a significant predictor of frequency of use (H10a), even when controlling for baseline use-frequency (H10b). *Behavioral intention* alone accounted for 11% of the variance in *frequency of use*, but it only accounted for 1% of unique variance in *frequency of use* with *baseline use-frequency* included in the model. This suggests that in the post-adoption stage, the power of *behavioral intention* (the intention to use a particular artifact in the future) to predict the *frequency of use* of a particular new site is diminished; however, the relationship between the two variables remains significant.

Model parameters and discussion. Following the hypothesis tests, we only retained the significant paths in the model and conducted mediation analyses[12] to test if the effects of perceived artifact characteristics on interaction outcomes were fully mediated through UX components. *Perceived aesthetics* retained a direct effect on *beauty* ($t = 2.72$, $p < .01$); however, the indirect effect through positive affect and hedonic quality ($\beta = .33$) exceeded the direct effect ($\beta = .22$). Therefore, the direct path from *perceived aesthetics* to *beauty* was omitted for a simpler model structure. Similarly, perceived user-interface design retained a direct effect on behavioral intention after controlling for perceived enjoyment ($t = 4.19$, $p < 0.001$), suggesting partial mediation. The direct path of *perceived user-interface design* was

[11]However, this path was excluded from the final model (see the next section) for its low effect size ($f^2 = .03$) and in favor of a simpler model structure (i.e., to avoid including an additional model stage for a single, low effect-size path that contradicts previous research).

[12]Testing mediation effect includes a predictor variable, a target variable, and a mediator variable. Full mediation occurs when the inclusion of a significant mediator into a model changes the path from the predictor variable to the target variable to nonsignificant; partial mediation occurs when the direct effect of the predictor becomes smaller, but remains statistically significant, as a result of including a significant mediator variable into a model (see Chin, 2010).

DOI: 10.1002/asi

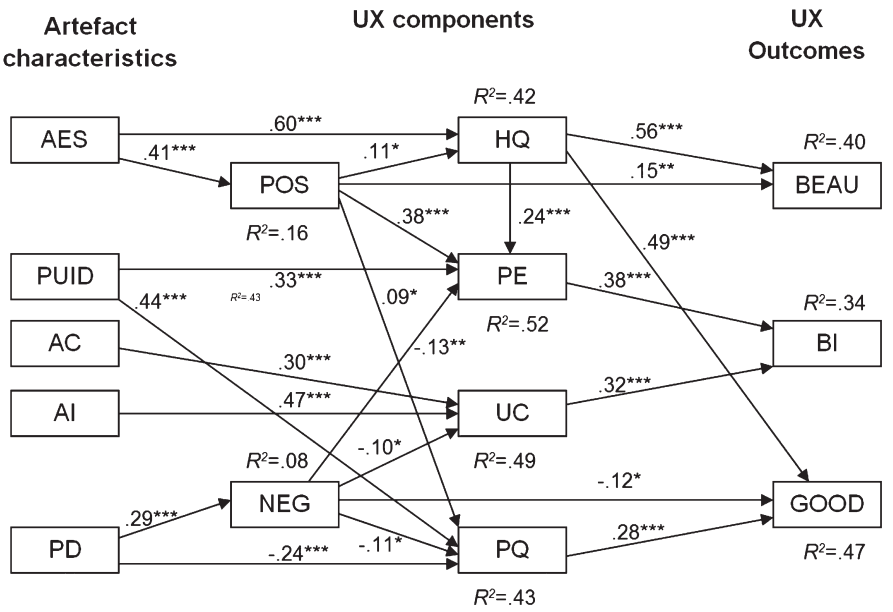

FIG. 2. Model of user experience with news sites. AES: perceived aesthetics. PUID: perceived user-interface design. AC: accessibility. AI: adequacy of information. PD: perceived disorientation. POS: positive affect. NEG: negative affect. HQ: hedonic quality. PE: perceived enjoyment. UC: usefulness of content. PQ: pragmatic quality. BEAU: beauty. BI: behavioral intention. GOOD: goodness. *$p < .05$. **$p < .01$. ***$p < .001$.

not included in the structural model to promote a clear separation of model stages; however, both the mediated and the direct effects are considered in the discussion.

The final model is presented in Figure 2. Details of the model parameters are presented in Table 4. Note that, according to Chin (1998), standardized path coefficients (β; also referred to as *impact*) should be around .20 (and ideally above .30) to be considered meaningful. Guidance for the interpretation of f^2 effect-size coefficients is provided in Table 4 (based on Cohen, 1988). Semipartial correlations squared (sr^2) in Table 4 indicate unique variance explained by a particular predictor. R^2 values indicate the proportion of variance explained in target (criterion) variables by all of their predictors.

While Figure 2 provides a general overview of the structural model, Table 4 allows examining UX components and interaction-outcome variables and their respective predictors separately. Four predictors explained 43% variance in *pragmatic quality*, but the impact and effect-size of affect dimensions were small. *Perceived user-interface design* had the highest impact on *pragmatic quality* with medium effect-size, which suggests a strong relationship between the layout of the interface and user-perceived usability. *Perceived disorientation* was negatively related to *pragmatic quality* with medium effect-size, which indicates that feeling lost on a news site decreases perceptions of its usability. *Pragmatic quality*, in turn, had a high impact on *goodness* ratings with medium effect size. Furthermore, *perceived user-interface design* and *perceived disorientation* were strongly and negatively correlated ($r = -.52$, $p < .01$), which indicates that disorientation in users may be attributed, in part, to interface layout.

Adequacy of information (as a measure of information quality) and *accessibility* (as a measure of service quality) accounted for 48% of the variance in *usefulness of content* (both with medium effect-size). These findings suggest that the perceived usefulness of a news site is strongly related to the adequacy of the content provided by the site, along with accessibility to this content (i.e., availability and loading time). In the four longitudinal studies of Venkatesh and Davis (2000), the variance explained in *perceived usefulness* in voluntary use settings ranged from 40% to 60%. Although they used different variables to predict *perceived usefulness*, the variance explained in the current study in *usefulness* of content falls between these values. *Usefulness of content*, in turn, had a strong impact on *behavioral intention* with medium effect-size.

The strongest predictor of *perceived enjoyment* was *positive affect* with medium effect-size, while *negative affect* had a considerably lower, but still significant impact with small effect-size. This finding indicates that positive affect experienced during news-site use drives intrinsic motivation to use the site. With regard to the source of affective reactions, *perceived aesthetics* was a predictor of *positive affect* (medium effect-size), and *perceived disorientation* was a predictor of *negative affect* (small effect-size). *Perceived user-interface design* (medium effect-size) and *hedonic quality* (small effect-size) also had considerable impact on *perceived enjoyment* (52% variance explained). By comparison, in the study of Cyr et al. (2006), 43% of variance in *perceived enjoyment* was accounted for by *design aesthetics* and *perceived ease of use*. In turn, *perceived enjoyment* had a strong impact on *behavioral intention* with medium effect-size.

DOI: 10.1002/asi

TABLE 4. Model parameters of the model of user experience with news sites.

Prediction of UX components					
Target variable (number of predictors)	Predictor variable	β	t^a	sr^2	Effect size (f^2)[b]
Pragmatic quality (4)	Perceived disorientation	–.24	***3.38	.04	.07
$R^2 = .43$	Perceived U-I design	.44	***6.84	.14	.24
	Negative affect	–.11	*2.11	.01	.02
	Positive affect	.09	*2.00	.01	.01
Usefulness of content (3)	Accessibility	.30	***3.97	.07	.13
$R^2 = .49$	Adequacy of Information	.47	***6.93	.17	.32
	Negative affect	–.10	*2.07	.01	.02
Perceived enjoyment (4)	Perceived U-I design	.33	***5.70	.08	.17
$R^2 = .52$	Negative affect	–.13	**3.01	.02	.04
	Positive affect	.38	***9.47	.12	.24
	Hedonic quality	.24	***3.97	.04	.09
Hedonic quality (2)	Perceived aesthetics	.60	***12.15	.30	.51
$R^2 = .42$	Positive affect	.11	*2.04	.01	.02
Positive affect (1)	Perceived aesthetics	.41	***7.87	$R^2 = .16$	.20
Negative affect (1)	Perceived disorientation	.29	***4.85	$R^2 = .08$	.09
Prediction of UX outcomes					
Target variable (number of predictors)	Predictor variable	β	t^a	sr^2	Effect size (f^2)[b]
Goodness (3)	Negative affect	–.12	*2.00	.01	.02
$R^2 = .47$	Pragmatic quality	.28	***5.05	.06	.11
	Hedonic quality	.49	***9.43	.19	.35
Behavioral intention (2)	Usefulness of content	.32	***4.53	.09	.14
$R^2 = .34$	Perceived enjoyment	.38	***5.95	.12	.18
Beauty (2)	Positive affect	.15	**3.08	.02	.04
$R^2 = .40$	Hedonic quality	.56	***10.85	.28	.46

Note. [a]Bootstrap, $N = 5000$.
[b]f^2: 0.02–0.14 small, 0.15–0.34 medium and 0.35–large.
*$p < .05$. **$p < .01$. ***$p < .001$.

Perceived aesthetics and *positive affect* together accounted for a 42% variance in *hedonic quality*. Perceived aesthetics had a large effect-size and accounted for the majority of the variance explained. In turn, *hedonic quality* (large effect-size) and *positive affect* (small effect-size) together accounted for 40% of variance in *beauty* judgments. Including the direct path from *perceived aesthetics* to *beauty* resulted in only 3% variance explained in beauty.

With regard to the prediction of outcome variables, *goodness* (47% variance explained) was affected by both *pragmatic quality* and *hedonic quality*, whereas beauty (40% variance explained) was not affected by *pragmatic quality*. Notably, the effect-size of *hedonic quality* on *goodness* was more than three times that of *pragmatic quality* ($f^2 = .35$ and .11, respectively), suggesting that *goodness* judgments of news sites in a free-browsing context may be predominantly grounded in hedonic aspects. Thirty-nine percent of variance in *behavioral intention* was accounted for by *perceived enjoyment*, *usefulness of content*, and *perceived user-interface design* (34% without the direct path from perceived user-interface design). This result is consistent with the findings of four longitudinal studies of Venkatesh and Davis (2000) applying the extended version of the technology acceptance model (TAM2), where 34%–52% of variance in intention to use was explained by technology acceptance constructs.

With regard to the role of affect in the model, *positive affect* was predominantly positively connected to the perception of noninstrumental qualities and *beauty* evaluation, and *negative affect* was predominantly negatively connected to the perception of instrumental qualities and *goodness* evaluation. These findings lend support to the distinction between hygiene and motivator factors as determinants of UX (Zhang & von Dran, 2000). *Negative affect* experienced during the interaction negatively affected perceptions of instrumental qualities and *goodness*, reducing the quality of experience, whereas *positive affect* was positively related to noninstrumental qualities and *beauty*, promoting the quality of experience. Furthermore, the connection of affect dimensions with perceived product characteristics helps to clarify sources of positive and negative affect that are rooted in system design.

DOI: 10.1002/asi

Implications and Future Work

The main aim of the study presented in this paper was to formulate a comprehensive model of user experience with news sites. Based on an exploratory study and a literature review, variables were collected to measure UX with news sites in an online study. Psychometric properties of the scales were confirmed, with the exception of the five need-fulfillment scales; consequently, these five scales were not analyzed. A structural model of UX with news sites was formulated and tested, based on the CUE model, with hypotheses drawn from the TAM and UX literature.

The current research contributes to knowledge predominantly by testing relationships between UX and TAM constructs for the use of news sites, and by bringing together constructs from both models in a comprehensive model to explain variation in UX outcomes. The paths were not only tested for their statistical significance, but a detailed description of interrelations was provided (in terms of path strength, effect size, and variance explained), interpreted and discussed in the light of theory and research literature, thereby providing further insight into the structure of factors contributing to the experience and acceptance of online news services.

Furthermore, the research presented here contributes to understanding the role of affect in the formulation of UX. Affective reactions were significant predictors of UX constructs and outcome measures, although their direct contribution to prediction was relatively small. However, in system design, promoting positive affective reactions and preventing negative reactions in users may be a goal in its own right. The relative independence of outcome variables from each other, in terms of being predicted from a different set of variables, supports the need to apply various outcome measures and a sufficiently wide range of components of interaction characteristics to predict them.

The model of UX with news sites is a specific-to-general model that operates with psychological constructs to account for the high-level outcomes of technology acceptance and overall quality judgments at the same time, including UX variables and affective reactions in an attempt to tap experiential and emotional aspects of UX. Although there are alternative ways of model specification in modeling UX, for example, general-to-specific inference-perspective models (see Hassenzahl & Monk, 2010; van Schaik, Hassenzahl, & Ling, 2012), we maintained the specific-to-general route applied by the TAM and UX models, because this allows us to focus on the prediction of high-level design goals (e.g., acceptance and evaluation).

The model links components of UX to perceptions of artifact characteristics that can be directly connected to and controlled by system design. Therefore, the model can be used in system evaluation to identify areas of improvement for design by mapping the impact (magnitude of path coefficient) of predictors of experience and outcome variables against the system's performance on the variables, producing impact-performance matrices (see Martensen & Grønholdt, 2003). Impact-performance analyses have been successfully applied in other domains (e.g., Martensen & Grønholdt, 2003; Höck, Ringle, & Sarstedt, 2010; Völckner, Sattler, Hennig-Thurau, & Ringle, 2010) and these analyses can be used to assist in design prioritization.

Impact-performance analyses can be applied to the entire model by ranking each predictor variable in terms of impact (standardized regression coefficient) and displaying the corresponding performance scores (rescaled to a common range, for example, 1–100 to aid comparability). Detailed analyses are not presented here, because the model was not developed for particular news sites. However, path coefficients and performance scores were calculated separately for the subsample of BBC users in the current study ($n = 202$) for demonstration purposes (only statistically significant paths will be included).[13]

For example, considering only users of the BBC in the current study, *hedonic quality*, a high-impact predictor of *goodness* ($\beta = .44$),[14] scored relatively low (performance = 61.58 on a 1–100 transformed scale), compared to the other, less strong predictor of *goodness* in the model, *pragmatic quality* ($\beta = .26$, performance = 73.92). Therefore, a recommendation can be made to expend effort on addressing interface aesthetics, which is a strong predictor of *hedonic quality* in the model ($\beta = .59$, performance = 62.63). Note that the perceived aesthetic rating of the BBC site was far from the maximum score of 100, which indicates plenty of room for design improvement.

Although the models presented in this paper do not identify physical design attributes to provide direct guidance for design improvement (e.g., Kim, Lee, & Choi, 2003; Cho, Park, Han, & Kang, 2011), guidance for improving aesthetics can be drawn from the existing HCI, design, and ergonomics literature, for example, by addressing visual complexity (Tuch, Presslaber, Stöcklin, Opwis, & Bargas-Avila, 2012), innovativeness (Carbon & Leder, 2005), the balance of novelty and prototypicality (Hekkert, Snelders, & van Wieringen, 2003), and principles of design aesthetics (Hekkert, 2006). Rather than offering direct guidance on how to improve certain design factors, a practical value of the current model-based approach lies in its utility for evaluation and design prioritization.

According to the model, better interface aesthetics is expected to lead to more positive affect experienced by users ($\beta = .31$) and higher levels of hedonic-quality attributions ($\beta = .59$), which in turn lead to higher overall *goodness* ($\beta = .44$) and *beauty* ($\beta = .48$) ratings of the site. At the same time, improving levels of *hedonic quality* is expected to lead to higher levels of *enjoyment in users* ($\beta = .32$), which in turn promotes their *intention to use* ($\beta = .28$). Generally, if a

[13]See Aranyi (2012) for examples of detailed impact-performance analyses of two news sites.

[14]Note that all β values in the current example are above .20; therefore, these paths are not just statistically significant, but also represent substantial effect size (Chin, 1998).

DOI: 10.1002/asi

UX variable with high impact scores relatively low on performance, a recommendation for improvement can be made by addressing the corresponding artifact characteristics and prioritizing the particular area in design (Martensen & Grønholdt, 2003). With regard to system evaluation and (re)design, a further practical utility of the current model lies in providing a basis for the selection of measures and their structural relationships to collect and analyze data involving a large number of participants, such as questionnaire surveys.

In the current study, variables of interaction characteristics only included measures of perceived artifact characteristics. However, user characteristics and task/context characteristics are considered important aspects of UX (Finneran & Zhang, 2003; van Schaik & Ling, 2012a) and their role needs to be addressed in further research. In Figure 1, proposed measures of interaction characteristics are presented in gray; their presence is acknowledged, but their measurement was not included in the current study. Several measures of person characteristics can be considered for inclusion if they were found to be connected to use of websites in previous studies. Examples include intrinsic motivation (van Schaik & Ling, 2012a) and need for cognition (Amichai-Hamburger, Kaynar, & Fine, 2007). Demographic properties of participants, such as age and level of education, may also be included among person characteristics to form different groups of users, for example, to specify "target audiences."

A task/context characteristic that may be involved in further studies is mode of use. According to Hassenzahl (2003), users of interactive systems in goal mode are pursuing specific goals during their use and their focus is on the attainment of a desired outcome, whereas in action mode their focus is on the action itself of using the system. Research suggests that users' perceptions of a particular system, and consequently their experience, are influenced by the mode in which they use the system (Hassenzahl & Ullrich, 2007; van Schaik & Ling, 2009, 2011). In the case of news-site use, participants in goal mode may look for specific pieces of information and search for certain types of content. Good organization of content and links with high information scent are expected to aid them in finding desired content. In action mode, users may browse a news site to see if anything catches their attention. In this case, exploration of the site may be promoted, for example, by an aesthetically stimulating graphical environment and interesting headlines.

As a further limitation, note that variables for modeling UX in the present study were selected based on categories of experience with a news site derived from an exploratory think-aloud study, and on the technology-acceptance, Hassenzahl's UX and CUE models. Consequently, certain aspects of UX modeling, such as flow (see van Schaik & Ling, 2012b) and time-scale properties of UX (e.g., van Schaik et al., 2012), are not addressed in the current model. Further research includes the testing of the model of user experience with news sites formulated in the current study in a controlled experimental setting and expanding the model by incorporating measures of additional UX aspects.

Conclusion

In summary, the present research applied UX modeling to the domain of online news, where, to our knowledge, UX has not been modeled before. We used partial-least-squares structural equation modeling to test a measurement model and a structural model of UX, based on data from an online questionnaire and the CUE model as a framework. The structural model integrated technology-acceptance and UX constructs form the HCI and IS literature, and included affective reactions as UX components to predict UX outcomes. In turn, UX components were predicted from perceptions of artifact characteristics. Structural relationships between the variables in the model were tested, quantified, and evaluated in the light of previous research and theory. Implications of the model to theory, artifact evaluation, and design prioritization were discussed. We look forward to seeing the CUE model being applied as a framework in future UX-modeling research in information science and technology, and other domains.

References

Ahuja, J.S., & Webster, J. (2001). Perceived disorientation: An examination of a new measure to assess web design effectiveness. Interacting with Computers, 14(1), 15–29.

Alben, L. (1996). Quality of experience: Defining the criteria for effective interaction design. Interactions, 3(3), 11–15.

Allan, S. (2006). Online news: Journalism and the internet. Maidenhead, UK: Open University Press.

Amichai-Hamburger, Y., Kaynar, O., & Fine, A. (2007). The effects of need for cognition on internet use. Computers in Human Behavior, 23(1), 880–891.

Aranyi, G. (2012). Developing a psychological model of end-users' experience with news web sites. Unpublished doctoral dissertation. Middlesbrough, UK: Teesside University. http://tees.openrepository.com/tees/handle/10149/236331

Aranyi, G., van Schaik, P., & Barker, P. (2012). Using think-aloud and psychometrics to explore users' experience with a news website. Interacting with Computers, 24(2), 69–77.

Arapakis, I., Lalmas, M., Cambazoglu, B.B., Marcos, M.C., & Jose, J.M. (2013). User engagement in online news: Under the scope of sentiment, interest, affect, and gaze. Journal of the Association for Information Science and Technology.

Barroso, C., Carrión, G.C., & Roldán, J.K. (2010). Applying maximum likelihood and PLS on different sample sizes: Studies on SERVQUAL model and employee behavior model. In V. E. Vinzi, W. Chin, J. Henseler, & H. Wang (Eds.), Handbook of partial least squares: Concepts, methods and applications in marketing and related fields (pp. 427–447). Berlin: Springer.

Barwise, P., Elberse, A., & Hammond, K. (2002). Marketing and the internet. In B.A. Weitz & R. Wensley (Eds.), Handbook of marketing (pp. 527–557). London: Sage Publishing.

Bruns, A. (2005). Gatewatching: Collaborative online news production. New York: Peter Lang.

Carbon, C.C., & Leder, H. (2005). The repeated evaluation technique (RET). A method to capture dynamic effects of innovativeness and attractiveness. Applied Cognitive Psychology, 19(5), 587–601.

DOI: 10.1002/asi

Carver, C.S., & Scheier, M.F., (1989). On the self-regulation of behavior. New York: Cambridge University Press.
Chen, Y.H., & Corkindale, D. (2008). Towards an understanding of the behavioral intention to use online news services: An exploratory study. Internet Research, 18(3), 286–312.
Chin, W.W. (1998). Commentary: Issues and opinion on structural equation modeling. MIS Quarterly, 22, vii–xvi.
Chin, W.W. (2010). How to write up and report PLS analyses. In V. E. Vinzi, W. Chin, J. Henseler, & H. Wang (Eds.), Handbook of partial least squares: Concepts, methods and applications in marketing and related fields (pp. 655–690). Berlin: Springer.
Cho, V., Cheng, T.C.E., & Lai, W.M.J. (2009). The role of perceived user-interface design in continued usage intention of self-paced e-learning tools. Computers & Education, 53(2), 216–227.
Cho, Y., Park, J., Han, S.H., & Kang, S. (2011). Development of a web-based survey system for evaluating affective satisfaction. International Journal of Industrial Ergonomics, 41(3), 247–254.
Cohen, J. (1988). Statistical power analysis for the behavioural sciences (2nd ed.). Hillsdale, NJ: Lawrence Erlbaum Associates.
Cyr, D., Hassanein, H., Head, M., & Ivanov, A. (2007). The role of social presence in establishing loyalty in e-service environments. Interacting with Computers, 19(1), 43–56.
Cyr, D., Head, M., & Ivanov, A. (2006). Design aesthetics leading to m-loyalty in mobile commerce. Information & Management, 43(8), 950–963.
Davis, F.D. (1986). A technology acceptance model for empirically testing new end-user information systems: Theory and results. Doctoral dissertation, Sloan School of Management. Cambridge, MA: MIT.
Davis, F.D. (1989). Perceived usefulness, perceived ease of use and user acceptance of information technologies. MIS Quarterly,13(3), 319–340.
Davis, F.D., Bagozzi, R.P., & Warshaw, P.R. (1992). Extrinsic and intrinsic motivation to use computers in the workplace. Journal of Applied Social Psychology, 22(14), 1111–1132.
Deuze, M., Bruns, A., & Neuberger, C. (2007) Preparing for an age of participatory journalism. Journalism Practice 1(3), 322–338.
Diefenbach, S., & Hassenzahl, M. (2011). The dilemma of the hedonic—appreciated, but hard to justify. Interacting with Computers, 23(5), 461–472.
Finneran, C.M., & Zhang, P. (2003). A person-artefact-task (PAT) model of flow antecedents in computer-mediated environments. International Journal of Human-Computer Studies, 59(4), 475–496.
Fornell, C., & Larcker, D.F. (1981). Structural equation models with unobservable variables and measurement error: Algebra and statistics. Journal of Marketing Research, 18(3), 328–388.
Hall, J. (2001). Online journalism: A critical primer. London: Pluto Press.
Hartmann, J., Sutcliffe, A., & De Angeli, A. (2008). Towards a theory of user judgement of aesthetics and user interface quality. ACM Transactions on Computer-Human Interaction, 15(4), 1–30.
Hassenzahl, M. (2003). The thing and I: Understanding the relationship between user and product. In M. Blythe, C. Overbeeke, A. Monk, & P. Wright (Eds.), Funology: From usability to enjoyment (pp. 31–42). Dordrecht, Netherlands: Kluwer.
Hassenzahl, M. (2004). The interplay of beauty, goodness, and usability in interactive products. Human-Computer Interaction, 19(4), 319–349.
Hassenzahl, M. (2006). Hedonic, emotional and experiential perspectives on product quality. In C. Ghaoui (Ed.), Encyclopedia of human-computer interaction (pp. 266–272). Hershey, PA: Idea Group Reference.
Hassenzahl, M. (2008). User experience (UX): Towards an experiential perspective on product quality. IHM 2008, Proceedings of the 20th International Conference of the Association Francophone d'Interaction Homme-Machine, 339, 11–15.
Hassenzahl, M., Diefenbach, S., & Göritz, A. (2010). Needs, affect, interactive products—facets of user experience. Interacting with Computers, 22(5), 353–362.
Hassenzahl, M., & Monk, A. (2010). The inference of perceived usability from beauty. Human-Computer Interaction, 25(3), 235–260.
Hassenzahl, M., & Roto, V. (2007). Being and doing: A perspective on user experience and its measurement. Interfaces, 72, 10–12.
Hassenzahl, M., & Tractinsky, N. (2006). User experience—a research agenda. Behaviour and Information Technology, 25(2), 91–97.
Hassenzahl, M., & Ullrich, D. (2007). To do or not to do: Differences in user experience and retrospective judgments depending on the presence or absence of instrumental goals. Interacting with Computers 19(4), 429–437.
van der Heijden, H. (2004). User acceptance of hedonic information systems. MIS Quarterly, 28(4), 695–704.
Hekkert, P. (2006). Design aesthetics: Principles of pleasure in product design. Psychology Science, 48(2), 157–172.
Hekkert, P., Snelders, D., & van Wieringen, P. (2003). Most advanced, yet acceptable: Typicality and novelty as joint predictors of aesthetic preference in industrial design. British Journal of Psychology, 94(1), 111–124.
Henseler, J., Ringe, C., & Sinkovics, R. (2009). The use of partial least squares path modelling in international marketing. In T. Cavusgil, R. Sinkovics, & P. Ghauri (Eds.), New challenges to international marketing. Advances in International Marketing, Vol. 20 (pp. 277–319). London: Emerald.
Höck, C., Ringle, C.M., & Sarstedt, M. (2010). Management of multi-purpose stadiums: Importance and performance measurement of service interfaces. International Journal of Services Technology and Management, 14(2), 188–207.
Hulland, J., Ryan, M.J., & Rayner, R.K. (2010). Modelling customer satisfaction: A comparative performance evaluation of covariance structure analysis versus partial least squares. In V. E. Vinzi, W. Chin, J. Henseler, & H. Wang (Eds.), Handbook of partial least squares: Concepts, methods and applications in marketing and related fields (pp. 307–325). Berlin: Springer.
Internet World Stats. (2011). Internet and Facebook usage in Europe. Retrieved from: http://www.internetworldstats.com/stats4.htm
Karlsson, M. (2011). The immediacy of online news, the visibility of journalistic processes and a restructuring of journalistic authority. Journalism, 12(3), 279–295.
Kim, J., Lee, J., & Choi, D. (2003). Designing emotionally evocative homepages: An empirical study of the quantitative relations between design factors and emotional dimensions. International Journal of Human-Computer Studies, 59(6), 899–940.
Kohring, M., & Matthes, J. (2007). Trust in news media: Validation of a multidimensional scale. Communication Research, 34(2), 231–252.
Lavie, T., & Tractinsky, N. (2004). Assessing dimensions of perceived visual aesthetics of web sites. International Journal of Human-Computer Studies, 60(3), 269–298.
Law, E., & van Schaik, P. (2010). Modelling user experience—an agenda for research and practice. Interacting with Computers, 22(5), 313–322.
Lederer, A.L., Maupin, D.J., Sena, M.P., & Zhuang, Y. (2000). The technology acceptance model and the World Wide Web. Decision Support Systems, 29(3), 269–282.
Magni, M., Taylor, M.S., & Venkatesh, V. (2010). "To play or not to play": A cross-temporal investigation using hedonic and instrumental perspectives to explain user intentions to explore a technology. International Journal of Human-Computer Studies, 68(9), 575–588.
Mahlke, S., & Minge, M. (2008). Consideration of multiple components of emotions in human-technology interaction. In C. Peter & R. Beale (Eds.), Affect and emotion in human-computer-interaction (pp. 51–62). Berlin: Springer.
Martensen, A., & Grønholdt, L. (2003). Improving library users' perceived quality, satisfaction and loyalty: An integrated measurement and management system. The Journal of Academic Librarianship, 29(3), 140–147.
McCay-Peet, L., Lalmas, M., & Navalpakkam, V. (2012). On saliency, affect and focused attention. In Proceedings of the SIGCHI Conference on Human Factors in Computing Systems (pp. 541–550). New York: ACM.
McDonald, S., & Stevenson, R.J. (1998). Effects of text structure and prior knowledge of the learner on navigation in hypertext. Human Factors, 40(1), 18–27.

Monk, A. (2004). The product as a fixed-effect fallacy. Human-Computer Interaction, 19(4), 371–375.
Nguyen, A. (2008). The penetration of online news. Saarbrücken, Germany: VDM Verlag.
Nielsen, J. (2002). Top research laboratories in human-computer interaction (HCI). Nielsen Norman Group, Retrieved from: http://www.useit.com/alertbox/20020331.html
O'Brien, H.L. (2011a). Exploring user engagement in online news interactions. Proceedings of the American Society for Information Science and Technology, 48(1), 1–10.
O'Brien, H.L. (2011b). Weaving the threads of experience into human information interaction (HII): Probing user experience (UX) for new directions in information behaviour. Library and Information Science, 1, 69–92.
O'Brien, H.L., & Lebow, M. (2013). Mixed-methods approach to measuring user experience in online news interactions. Journal of the American Society for Information Science and Technology, 64(8), 1543–1556.
Office for National Statistics. (2011). Internet access—households and individuals. Retrieved from: http://www.ons.gov.uk/ons/dcp171778_227158.pdf
Partala, T., & Kallinen, A. (2012). Understanding the most satisfying and unsatisfying user experiences: Emotions, psychological needs, and context. Interacting with Computers, 24(1), 25–34.
Porat, T., & Tractinsky, N. (2012). It's a pleasure buying here: The effects of web-store design on consumer's emotions and attitudes. Human-Computer Interaction, 27(3), 235–276.
Rosenstiel, T., & Mitchell, A. (2011). The state of the news media, 2011: An annual report on American journalism. Retrieved from: http://stateofthemedia.org
Roto, V., Law, E., Vermeeren, A., & Hoonhout, J. (Eds.). (2011). User experience white paper. Results from the Dagstuhl seminar on demarcating user experience, September 15-18, 2010. Retrieved from: http://www.allaboutux.org/files/UX-WhitePaper.pdf
Ryan, R.M., & Deci, E.L. (2000). Intrinsic and extrinsic motivations: Classic definitions and new directions. Contemporary Educational Psychology, 25(1), 54–67.
van Schaik, P., Hassenzahl, M., & Ling, J. (2012). Modeling user-experience from an inference perspective. ACM Transactions on Computer-Human Interaction, 19(2), Article 11.
van Schaik, P., & Ling, J. (2003). Using on-line surveys to measure three key constructs of the quality of human-computer interaction in web sites: Psychometric properties and implications. International Journal of Human-Computer Studies, 59(5), 545–567.
van Schaik, P., & Ling, J. (2007). Design parameters of rating scales for web sites. ACM Transactions on Computer-Human Interaction, 14(1), Article 4.
van Schaik, P., & Ling, J. (2008). Modelling user experience with web sites: Usability, hedonic value, beauty and goodness. Interacting with Computers, 20(3), 419–432.
van Schaik, P., & Ling, J. (2009). The role of context in perceptions of the aesthetics of web pages over time. International Journal of Human-Computer Studies, 67(1), 79–89.
van Schaik, P., & Ling, J. (2011). An integrated model of interaction experience for information retrieval in a web-based encyclopaedia. Interacting with Computers, 23(1), 18–32.
van Schaik, P., & Ling, J. (2012a). An experimental analysis of experiential and cognitive variables in web navigation. Human-Computer Interaction, 27(3), 199–234.
van Schaik, P., & Ling, J. (2012b). A cognitive-experiential approach to modelling web navigation. International Journal of Human-Computer Studies, 70(9), 630–651.
Sheldon, K.M., Elliot, A.J., Youngmee, K., & Kasser, T. (2001). What is satisfying about satisfying events? Testing 10 candidate psychological needs. Journal of Personality and Social Psychology, 80(2), 325–339.
Sun, H., & Zhang, P. (2008). An exploration of affect factors and their role in user technology acceptance: Mediation and causality. Journal of the American Society for Information Science and Technology, 59(8), 1–12.
Thüring, M., & Mahlke, S. (2007). Usability, aesthetics and emotions in human-technology interaction. International Journal of Psychology, 42(4), 253–264.
Toms, E.G. (2000). Understanding and facilitating the browsing of electronic text. International Journal of Human-Computer Studies, 52(3), 423–452.
Tuch, A.N., Presslaber, E.E., Stöcklin, M., Opwis, K., & Bargas-Avila, J.A. (2012). The role of visual complexity and prototypicality regarding first impression of websites: Working towards understanding aesthetic judgments. International Journal of Human-Computer Studies, 70(11), 794–811.
Venkatesh, V. (2000). Determinants of perceived ease of use: Integrating control, intrinsic motivation, and emotion into the technology acceptance model. Information Systems Research, 11(4), 342–365.
Venkatesh, V., & Davis, F.D. (2000). A theoretical extension of the technology acceptance model: Four longitudinal field studies. Management Science, 46(2), 186–204.
Venkatesh, V., Morris, M.G., Davis, F.D., & Davis, G.B. (2003). User acceptance of information technology: Toward a unified view. MIS Quarterly, 27(3), 425–478.
Vilares, M.J., Almeida, M.H., & Coelho, P.S. (2010). Comparison of likelihood and PLS estimators for structural equation modelling: A simulation with customer satisfaction data. In V.E. Vinzi, W. Chin, J. Henseler, & H. Wang (Eds.), Handbook of partial least squares: Concepts, methods and applications in marketing and related fields (pp. 289–305). Berlin: Springer.
Vinzi, V.E., Chin, W.W., Henseler, J., & Wang, H. (Eds.). (2010). Handbook of partial least squares: Concepts, methods and applications in marketing and related fields. Berlin: Springer.
Völckner, F., Sattler, H., Hennig-Thurau, T., & Ringle, C. M. (2010). The role of parent brand quality for service brand extension success. Journal of Service Research, 13(4), 379–396.
Watson, D., Clark, L.A., & Tellegen, A. (1988). Development and validation of brief measures of positive and negative affect: The PANAS scales. Journal of Personality and Social Psychology, 54(6), 1063–1070.
Wixom, B.H., & Todd, P.A. (2005). A theoretical integration of user satisfaction and technology acceptance. Information Systems Research, 16(1), 85–102.
Yang, Z., Cai, S., Zhou, Z., & Zhou, N. (2005). Development and validation of an instrument to measure user perceived service quality of information presenting Web portals. Information & Management, 42(4), 575–589.
Zhang, P., & von Dran, G.M. (2000). Satisfiers and dissatisfiers: A two-factor model for website design and evaluation. Journal of the American Society for Information Science, 51(14), 1253–1268.
Zhou, H., & Fu, X. (2007). Understanding, measuring, and designing user experience: The causal relationship between the aesthetic quality of products and user affect. In J.A. Jacko (Ed.), Human-computer interaction. Interaction design and usability (pp. 340–349). Berlin: Springer.

Appendix A1: Psychometric Scales Used in the Study

Positive and negative affect schedule (PANAS)

During the use of the site I felt. . .

POS1	Interested	NEG6	Irritable
NEG1	Distressed	POS6	Alert
POS2	Excited	NEG7	Ashamed
NEG2	Upset	POS7	Inspired
POS3	Strong	NEG8	Nervous
NEG3	Guilty	POS8	Determined
NEG4	Scared	POS9	Attentive
NEG5	Hostile	NEG9	Jittery
POS4	Enthusiastic	POS10	Active
POS5	Proud	NEG10	Afraid

Response format: 7-point Likert scale with anchor points *not at all*, *moderately* and *extremely*.

DOI: 10.1002/asi

AttrakDiff2-SF

PQ1	Confusing	—	Structured
PQ2	Unpredictable	—	Predictable
PQ3	Impractical	—	Practical
PQ4	Complicated	—	Simple
HQ1	Dull	—	Captivating
HQ2	Tacky	—	Stylish
HQ3	Cheap	—	Premium
HQ4	Unimaginative	—	Creative
BEAUTY	Ugly	—	Beautiful
GOODNESS	Bad	—	Good

Response format: 7-point semantic differential.

Perceived enjoyment (PE)

PE1	I find using this news site to be enjoyable.
PE2	The actual process of using this news site is pleasant.
PE3	I have fun using this news site.

Response format: 7-point Likert scale with anchor points *strongly disagree*, *neutral* and *strongly agree*.

Perceived disorientation (PD)
During the use of the site. . .

PD1	I felt lost.
PD2	I felt I was going around in circles.
PD3	It was difficult to find a page I had previously viewed.
PD4	Navigating between the pages was a problem.
PD5	I didn't know how to get to my desired location.
PD6	I felt disoriented.
PD7	After browsing for a while I had no idea where to go next.

Response format: 7-point Likert scale with anchor points *strongly disagree* and *strongly agree*.

Perceived user-interface design (PUID)

PUID1	The layout of the site is user-friendly.
PUID2	The layout of the site is in good structure.
PUID3	Overall, the user-interface design of the site is satisfactory.

Response format: 7-point Likert scale with anchor points *strongly disagree*, *neutral* and *strongly agree*.

Perceived aesthetics (AES)

CA1	Clean
CA2	Pleasant
CA3	Symmetrical
CA4	Aesthetic
EA1	Original
EA2	Sophisticated
EA3	Spectacular
EA4	Creative

Response format: 7-point Likert scale with anchor points *strongly disagree* and *strongly agree*. CA: classical aesthetics. EA: expressive aesthetics.

Usefulness of content (UC), adequacy of information (AI) and accessibility (AC)

UC1	The site provides relevant information.
UC2	The site provides up-to-date information.
UC3	The site provides unique content.
AI1	The site provides comprehensive information.
AI2	The site provides complete content.
AI3	The site provides sufficient information.
AC1	The pages of the site are accessible.
AC2	The pages of the site load quickly.

Response format: 7-point Likert scale with anchor points *strongly disagree*, *neutral* and *strongly agree*.

Behavioral intention (BI)

BI1	I intend to use the site in the future.
BI2	I predict that I will use the site in the future.

Response format: 7-point Likert scale with anchor points *strongly disagree* and *strongly agree*.

Need fulfilment

During my use of the news site I felt. . .

AUT1	that my choices were based on my true interests and values.
AUT2	free to do things my own way.
AUT3	that my choices expressed my "true self."
COMP1	that I was successfully completing difficult tasks and projects.
COMP2	that I was taking on and mastering hard challenges.
COMP3	very capable in what I did.
REL1	a sense of contact with people who care for me and whom I care for.
REL2	close and connected with other people who are important to me.
REL3	a strong sense of intimacy with the people I spent time with.
STIM1	that I was experiencing new sensations and activities.
STIM2	intense pleasure and enjoyment.
STIM3	that I have found new sources and types of stimulation for myself.
POP1	that I was a person whose advice others seek out and follow.
POP2	that I strongly influenced others' beliefs and behavior.
POP3	that I had strong impact on what other people did.

Response format: 7-point Likert scale with anchor points *strongly disagree* and *strongly agree*. The presentation order of the items was randomized.

Need fulfilment relevance

How important were the following feelings to you in relation to using the news site?

RELAUT (Autonomy)	Feeling like you are the cause of your own actions rather than feeling that external forces or pressures are the cause of your actions.
RELCOMP (Competence)	Feeling that you are very capable and effective in your actions rather than feeling incompetent or ineffective.
RELREL (Relatedness)	Feeling that you have regular intimate contact with people who care about you rather than feeling lonely and uncared for.
RELPOP (Popularity)	Feeling that you are liked, respected and have influence over others rather than feeling like a person whose advice and opinions nobody is interested in.
RELSTIM (Stimulation)	Feeling that you get plenty of enjoyment and pleasure rather than feeling bored and understimulated.

Response format: 7-point Likert scale with anchor points *not important at all* and *extremely important*.

DOI: 10.1002/asi

Appendix A2: Measurement Model Details

A2.1. Exploratory Factor Analyses of Multidimensional Scales

Before analysis of the measurement model using PLS, including all psychometrically measured variables selected for the study, a series of factor analyses were conducted to explore the factor structure of the multidimensional scales separately. Factor analyses were conducted using the same extraction and rotation methods that were used in the research publications from which the scales for derived from.

For the two dimensional measure of *perceived aesthetics*, principal component extraction was used with the explicit extraction of two factors (for classical and expressive aesthetics) and varimax rotation ($KMO = .90$; Bartlett: $\chi^2(28) = 1321.71$, $p < 0.001$; total variance extracted: 70%). Only one principal component had an eigenvalue over one and the rotated solution failed to reproduce the original factor structure of the measure. Furthermore, the rotated solution contained several high cross-loadings and simple structure was not achieved. Oblique rotation (direct oblimin) led to a similar structure. However, a single-factor solution with 60% of extracted variance resulted in a simple structure. All items loaded highly on one component and the resulting scale showed satisfactory internal consistency (Cronbach's alpha = .90). The item-loadings of the factor solutions are presented in Table A2.1.

TABLE A2.1. Component matrices of perceived-aesthetics items.

	Factor (varimax rotation)		Factor (direct oblimin rotation[a])		Single-factor
	1	2	1	2	solution
Sophisticated	.84	.14	.92	−.16	.77
Creative	.76	.39	.79	.14	.85
Clean	.76	.11	.82	−.16	.67
Aesthetic	.72	.44	.74	.20	.84
Pleasant	.67	.44	.67	.23	.80
Original	.63	.54	.62	.34	.83
Symmetrical	.09	.87	.–04	.89	.58
Spectacular	.45	.75	.38	.64	.81

Note. Extraction method: principal components.
[a]The pattern matrix is presented; loadings are regression coefficients.

In order to determine whether a two-factor or a single-factor solution should be used for aesthetics in the measurement model, the factor structure of *perceived aesthetics* was examined using PLS. All perceived aesthetics items produced high cross-loadings on both subscales. The latent variables *classical aesthetics* and *expressive aesthetics* were highly correlated ($r = .80$). The square of the correlation between the two subscales ($r^2 = .64$) was larger than the average variance extracted (*AVE*) of the classical aesthetics subscale (*AVE* = .58), which indicates a lack of discriminant validity, according to the Fornell-Larcker criterion (Fornell & Larcker, 1981). However, a combined *perceived aesthetics* latent variable with all items included from both subscales retained a satisfactory amount of variance from the items (*AVE* = .57) and exhibited satisfactory internal consistency (composite reliability = .91). Therefore, *perceived aesthetics* was treated as a one-dimensional measure in further analyses, measured by the eight scale items.

The measures of *usefulness of content* (UC), *adequacy of information* (AI) and *accessibility* (AC) were adopted from the same instrument (Yang et al., 2005), where the factor structure was established using factor analysis with principal component extraction and varimax rotation. Therefore, the same analysis was used in the current study, with the explicit extraction of three factors ($KMO = .84$; Bartlett: $\chi^2(28) = 1040.06$, $p < 0.001$; total variance explained: 75%). There were two problematic items: UC3 loaded highly on the factor containing the items of *adequacy of information* without loading on the factor containing the other two *usefulness-of-content* items, and AI3 loaded on all three factors. These items were removed and the same analysis was repeated with two items for each scale. The analysis resulted in a simple structure with 84% of variance explained by the factor solution (see Table A2.2); therefore, this solution was used in further analyses.

TABLE A2.2. Rotated component matrix of selected usefulness of content, adequacy of information and accessibility items.

		Factor		
		1	2	3
UC1	The site provides relevant information.	.25	.86	.22
UC2	The site provides up-to-date information.	.26	.85	.23
AI1	The site provides comprehensive information.	.85	.24	.23
AI2	The site provides complete content.	.87	.25	.15
AC1	The pages of the site are accessible.	.34	.36	.74
AC2	The pages of the site load quickly.	.12	.16	.93

Note. Extraction method: principal components. Rotation: varimax.

For the assessment of the factor structure of the positive and negative affect schedule (PANAS), principal component extraction method was used, with the explicit extraction of two factors, and varimax rotation (see Table A2.3). The factor solution had a moderate fit ($KMO = .86$; Bartlett: $\chi^2(190) = 2151.59$, $p < 0.001$; total variance explained: 46%), because of the relatively low amount of explained variance. There were four main components with eigenvalue greater than 1, but the scree-plot indicated the plausibility of extracting two factors, because of the marked drop of eigenvalues after the second component (eigenvalues: 1. = 5.44, 2. = 3.85, 3. = 1.19 and 4. = 1.07). Nevertheless, simple structure was achieved with all positive-affect items loading on one factor and all the negative-affect items loading on the other. All cross-loadings were well below .30 and the scale inter-correlation was low ($r = .20$, $p < .01$), suggesting good discriminant validity. The internal consistencies of the

DOI: 10.1002/asi

positive and negative scales were satisfactory (Cronbach's alpha .87 and .88, respectively).

TABLE A2.3. Rotated component matrix of PANAS items.

		Factor	
Scale	Item	1	2
Positive affect	Inspired	.81	.01
	Enthusiastic	.75	–.02
	Determined	.75	.18
	Active	.74	.08
	Proud	.71	.08
	Excited	.69	.07
	Attentive	.66	.04
	Strong	.60	.15
	Alert	.56	.16
	Interested	.55	–.17
Negative affect	Distressed	–.06	.76
	Afraid	–.01	.74
	Upset	.03	.70
	Scared	.14	.69
	Ashamed	.05	.68
	Nervous	.08	.67
	Jittery	.18	.61
	Hostile	.18	.60
	Irritable	–.00	.59
	Guilty	.01	.54

Note. Extraction method: principal components. Rotation: varimax.

Hassenzahl et al. (2010) used principal component analysis with varimax rotation and the explicit extraction of two factors to test the factor structure of AttrakDiff2-SF. Therefore, the same analysis was carried out on the items of the *pragmatic quality* and *hedonic quality* scales (four items each). The analysis resulted in a satisfactory solution ($KMO = .81$; Bartlett: $\chi^2(28) = 695.22$, $p < 0.001$; total variance explained: 59%), with items loading on the appropriate factors (see Table A2.4). The internal consistencies of the *pragmatic quality* and *hedonic quality* scales were satisfactory (Cronbach's alpha .70 and .78, respectively). Scale inter-correlation was moderate ($r = .45$, $p < .01$), but smaller than the internal consistencies, which indicates discriminant validity.

TABLE A2.4. Rotated component matrix of AttrakDiff2 items.

		Factor	
Scale	Item	1	2
Hedonic quality	Unimaginative—Creative	.81	.03
	Tacky—Stylish	.77	.19
	Dull—Captivating	.74	.29
	Cheap—Premium	.71	.10
Pragmatic quality	Impractical—Practical	.28	.77
	Confusing—Structured	.30	.75
	Unpredictable—Predictable	–.17	.67
	Complicated—Simple	.27	.66

Note. Extraction method: principal components. Rotation: varimax.

Similar to the original study of Sheldon et al. (2001) and that of Hassenzahl et al. (2010), principal component extraction with varimax rotation was used to identify the underlying factor structure of the items of the five selected needs (three items each). Only two components had eigenvalues greater than 1 and the resulting solution with the explicit extraction of five components failed to reproduce, or even to resemble, the original factor structure (see Table A2.5). Direct oblimin rotation yielded very similar results, and a two-factor solution based on the eigenvalues did not result in an interpretable structure.

Both Sheldon and colleagues (2001) and Hassenzahl and colleagues (2010) asked their participants to recall "peak experiences." However, in the current study, need fulfillment was assessed after use, so the participants were asked to report on the everyday experience of browsing a news site. It may be that the fulfillment of universal needs, as measured by these scales, is less salient in less satisfying, but nonetheless pleasurable or otherwise rewarding, experiences. It may also be that the statements of the scales are more suitable for the description of outstanding or extraordinarily satisfying experiences, and do not apply to more common experiences, such as the use of news sites. Finally, in the aforementioned previous studies, participants were asked to report on an exceptional experience of their past (cumulative account of experiences), whereas in the current study they commented on a "fresh" experience (episodic account of an experience) (see Roto, Law, Vermeeren, & Hoonhout, 2011, for time-scale considerations in interaction-experience measurement). The immediate reflection on a common experience may differ from the recollection of a memory of an outstanding experience. Because of the unsuccessful reproduction of their original factor structure, the need-fulfillment scales were excluded from further analysis.

TABLE A2.5. Rotated factor matrix of the selected need-fulfillment scales.

	Factor				
Item	1	2	3	4	5
Popularity 2	.86				
Popularity 3	.84				
Relatedness 1	.83	.32			
Relatedness 3	.82				
Relatedness 2	.81				
Competence 2	.78		.37		
Popularity 1	.72			.32	
Competence 1	.67		.31		.35
Stimulation 1	.62		.57		
Autonomy 1		.80			
Autonomy 3	.47	.68			
Stimulation 3	.38		.73		
Stimulation 2	.48	.40	.56		
Competence 3				.88	
Autonomy 2				.30	.86

Note. Extraction method: principal components. Rotation: varimax. Loadings < .30 suppressed.

DOI: 10.1002/asi

*A2.2. PLS Measurement Model*Coefficients of reliability and convergent validity are presented in Table A2.6. Cross-loadings of items are presented in Table A2.7. Coefficients of discriminant validity are presented in Table A2.8.

TABLE A2.6. Coefficients of reliability and convergent validity.

Construct/indicator	Average variance extracted	Composite reliability	Loading	Standard error	t^a
Perceived aesthetics	0.58	0.92			
CA1			*0.64	0.05	12.87
CA2			0.83	0.02	46.27
CA3			*0.58	0.05	10.53
CA4			0.85	0.02	49.36
EA1			0.80	0.02	32.09
EA2			0.72	0.04	16.16
EA3			0.78	0.03	29.20
EA4			0.85	0.02	50.40
Perceived disorientation	0.69	0.94			
PD1			0.88	0.02	51.93
PD2			0.85	0.03	31.10
PD3			0.73	0.04	16.67
PD4			0.81	0.03	23.45
PD5			0.85	0.02	35.20
PD6			0.89	0.02	43.42
PD7			0.80	0.03	24.46
Perceived user-interface design	0.87	0.95			
PUID1			0.92	0.01	70.38
PUID2			0.95	0.01	130.37
PUID3			0.93	0.01	86.83
Usefulness of content	0.85	0.92			
UC1			0.93	0.01	64.68
UC2			0.90	0.03	31.87
Adequacy of information	0.85	0.92			
AI1			0.92	0.01	62.96
AI2			0.92	0.01	66.88
Accessibility	0.84	0.92			
AC1			0.92	0.02	59.96
AC2			0.92	0.02	51.93
Pragmatic quality	0.53	0.81			
PQ1			0.85	0.02	42.02
PQ2			*0.39	0.09	4.57
PQ3			0.81	0.04	21.20
PQ4			0.76	0.03	21.81
Hedonic quality	0.60	0.86			
HQ1			0.80	0.03	30.97
HQ2			0.80	0.03	31.52
HQ3			*0.69	0.06	11.13
HQ4			0.81	0.03	28.35
Perceived enjoyment	0.82	0.93			
PE1			0.92	0.01	77.86
PE2			0.92	0.01	67.50
PE3			0.88	0.01	58.13
Positive affect	0.46	0.89			
POS1			*0.64	0.04	15.25
POS2			*0.68	0.04	15.84
POS3			*0.58	0.05	11.56
POS4			0.71	0.04	19.30
POS5			*0.68	0.04	15.99
POS6			*0.59	0.05	10.85
POS7			0.78	0.02	32.19
POS8			0.71	0.04	17.41
POS9			*0.68	0.04	15.37
POS10			0.70	0.04	19.12
Negative affect	0.46	0.89			
NEG1			*0.66	0.06	10.23
NEG2			*0.56	0.09	6.53
NEG3			*0.67	0.06	10.60
NEG4			*0.67	0.08	8.33
NEG5			*0.66	0.06	10.59
NEG6			*0.69	0.05	14.01
NEG7			0.74	0.05	14.27
NEG8			0.70	0.05	13.19
NEG9			0.72	0.05	13.14
NEG10			0.70	0.07	9.88
Behavioral intention	0.94	0.97			
BI1			0.97	0.01	129.60
BI2			0.97	0.01	79.72

Note. [a]Bootstrap, $N = 5000$.
*Loading < 0.70.

DOI: 10.1002/asi

Of the items of *pragmatic quality*, PQ2 (unpredictable—predictable) had a low loading (.39). When excluded from the analysis, the average extracted variance (*AVE*) of the *pragmatic quality* scale increased to .66 from .53, and the scale's composite reliability (*CR*) increased to .85 from .81. However, the sale's CR and AVE were still acceptable with PQ2 included. Furthermore, the examination of the cross-loadings of PQ2 revealed that it did not load highly on any other scales and its second highest loading after *pragmatic quality* was on *hedonic quality* with 0.15. Therefore, PQ2 was retained in order to facilitate comparison with previous studies. Square roots of *AVE* values exceeded values of scale inter-correlations, supporting discriminant validity for each scale, according to the Fornell-Larcker criterion (Fornell & Larcker, 1981). According to Henseler et al. (2009), the loading of each reflective measurement item should be .70 or higher (50% or more variance shared by the item and the construct). Note that several items in Table A2.7 had lower loadings than .70; however, given a lack of cross-loadings, these items were retained to facilitate comparison with previous studies.

TABLE A2.7. Item cross-loadings (continued next page).

	Scale																
Item	AC	AES	AI	ATT	BUSE	BEAU	BI	GOOD	HQ	NEG	PD	PE	POS	PQ	PUID	UC	USE
AC1	0.92	0.40	0.50	0.13	0.12	0.17	0.35	0.29	0.25	–0.12	–0.45	0.31	0.19	0.46	0.55	0.55	0.14
AC2	0.92	0.34	0.40	0.04	0.13	0.14	0.38	0.31	0.23	–0.11	–0.43	0.33	0.17	0.43	0.45	0.45	0.14
AI1	0.50	0.52	0.92	0.06	0.08	0.21	0.36	0.30	0.35	–0.08	–0.26	0.34	0.34	0.36	0.42	0.60	0.12
AI2	0.41	0.50	0.92	0.06	0.10	0.21	0.35	0.36	0.40	–0.17	–0.20	0.34	0.24	0.33	0.36	0.56	0.13
ATT	0.09	0.15	0.06	1.00	0.14	0.19	0.07	0.15	0.15	0.13	–0.01	0.19	0.21	0.09	0.13	0.03	0.13
BEAU	0.17	0.54	0.23	0.19	0.13	1.00	0.24	0.54	0.61	–0.03	–0.11	0.41	0.34	0.32	0.36	0.14	0.17
BI1	0.39	0.42	0.38	0.05	0.31	0.25	0.97	0.40	0.35	–0.11	–0.39	0.49	0.28	0.42	0.54	0.46	0.36
BI2	0.37	0.37	0.37	0.09	0.28	0.22	0.97	0.41	0.36	–0.19	–0.39	0.47	0.24	0.41	0.48	0.44	0.28
CA1	0.49	0.64	0.52	0.06	0.21	0.22	0.37	0.34	0.32	–0.09	–0.31	0.32	0.24	0.41	0.47	0.48	0.20
CA2	0.46	0.83	0.51	0.15	0.16	0.47	0.44	0.55	0.57	–0.10	–0.29	0.60	0.41	0.41	0.60	0.45	0.23
CA3	0.18	0.58	0.26	0.12	0.12	0.27	0.17	0.21	0.27	0.07	–0.03	0.26	0.26	0.17	0.27	0.19	0.18
CA4	0.35	0.85	0.43	0.13	0.21	0.51	0.38	0.43	0.56	–0.07	–0.22	0.46	0.32	0.34	0.53	0.30	0.25
EA1	0.24	0.80	0.42	0.12	0.18	0.40	0.27	0.31	0.45	0.03	–0.10	0.37	0.26	0.22	0.39	0.27	0.20
EA2	0.29	0.72	0.45	0.05	0.03	0.29	0.33	0.35	0.47	–0.03	–0.19	0.34	0.25	0.25	0.42	0.39	0.03
EA3	0.15	0.78	0.36	0.18	0.14	0.53	0.18	0.40	0.56	0.10	–0.02	0.39	0.38	0.20	0.36	0.16	0.24
EA4	0.28	0.85	0.42	0.06	0.18	0.49	0.30	0.38	0.58	–0.03	–0.19	0.46	0.32	0.30	0.51	0.31	0.22
GOOD	0.32	0.50	0.36	0.15	0.24	0.54	0.42	1.00	0.62	–0.18	–0.35	0.53	0.30	0.52	0.47	0.34	0.27
HQ1	0.26	0.50	0.36	0.14	0.13	0.42	0.30	0.55	0.80	–0.01	–0.26	0.47	0.31	0.43	0.38	0.30	0.20
HQ2	0.17	0.47	0.32	0.12	0.08	0.51	0.28	0.42	0.80	–0.01	–0.16	0.40	0.28	0.36	0.36	0.24	0.09
HQ3	0.18	0.38	0.25	0.14	0.12	0.33	0.30	0.45	0.69	–0.08	–0.19	0.29	0.18	0.27	0.25	0.25	0.08
HQ4	0.20	0.60	0.33	0.09	0.13	0.62	0.28	0.49	0.81	0.02	–0.18	0.45	0.34	0.33	0.40	0.22	0.16
NEG1	–0.01	–0.01	–0.04	0.11	–0.11	0.01	–0.10	–0.14	0.04	0.66	0.15	–0.16	0.01	–0.11	–0.06	–0.08	–0.11
NEG10	–0.03	0.01	–0.07	0.13	0.01	–0.01	–0.02	–0.12	0.06	0.70	0.10	–0.02	0.10	–0.06	0.02	–0.12	0.03
NEG2	0.08	–0.03	0.03	0.04	–0.08	0.01	–0.01	–0.01	0.10	0.56	0.02	–0.08	0.09	–0.03	0.04	–0.03	–0.01
NEG3	–0.02	–0.03	–0.03	0.06	0.09	–0.08	–0.07	–0.15	–0.02	0.67	0.24	–0.07	0.07	–0.10	–0.10	–0.09	0.10
NEG4	0.00	0.08	0.00	0.12	0.04	0.00	–0.03	–0.05	0.03	0.67	0.09	0.03	0.16	–0.10	0.05	–0.06	0.07
NEG5	–0.05	–0.01	–0.11	0.15	0.09	0.03	–0.03	–0.07	0.03	0.66	0.14	–0.04	0.17	–0.11	0.00	–0.12	0.11
NEG6	–0.12	–0.08	–0.21	0.08	0.06	–0.06	–0.06	–0.15	–0.05	0.69	0.19	–0.05	0.09	–0.16	–0.06	–0.13	0.04
NEG7	–0.09	–0.04	–0.14	0.00	0.04	–0.04	–0.14	–0.13	–0.02	0.74	0.21	–0.08	0.12	–0.22	–0.10	–0.21	0.09
NEG8	–0.07	–0.02	–0.02	0.11	–0.06	0.02	–0.07	–0.16	–0.08	0.70	0.26	–0.10	0.15	–0.14	–0.10	–0.10	–0.01
NEG9	–0.20	0.00	–0.11	0.10	0.01	–0.01	–0.26	–0.12	–0.03	0.72	0.30	–0.06	0.19	–0.21	–0.17	–0.20	0.05
BUSE	0.14	0.20	0.10	0.14	1.00	0.13	0.30	0.24	0.15	0.03	–0.16	0.37	0.26	0.23	0.19	0.09	0.81
PD1	–0.41	–0.24	–0.23	–0.04	–0.20	–0.18	–0.39	–0.42	–0.29	0.28	0.88	–0.41	–0.19	–0.58	–0.53	–0.27	–0.19
PD2	–0.38	–0.23	–0.29	–0.05	–0.14	–0.13	–0.35	–0.40	–0.30	0.28	0.85	–0.37	–0.19	–0.48	–0.43	–0.32	–0.12
PD3	–0.35	–0.09	–0.21	0.08	–0.03	0.02	–0.24	–0.11	–0.10	0.16	0.73	–0.12	–0.04	–0.25	–0.31	–0.19	–0.03
PD4	–0.43	–0.14	–0.16	–0.05	–0.11	0.00	–0.28	–0.18	–0.15	0.19	0.81	–0.18	–0.07	–0.35	–0.34	–0.23	–0.05
PD5	–0.38	–0.17	–0.19	–0.03	–0.11	–0.05	–0.29	–0.25	–0.16	0.25	0.85	–0.25	–0.09	–0.40	–0.44	–0.19	–0.11
PD6	–0.46	–0.18	–0.17	0.02	–0.12	–0.10	–0.42	–0.25	–0.19	0.31	0.89	–0.26	–0.11	–0.43	–0.46	–0.26	–0.10
PD7	–0.39	–0.23	–0.17	0.03	–0.16	–0.08	–0.32	–0.25	–0.20	0.18	0.80	–0.32	–0.14	–0.36	–0.42	–0.20	–0.20
PE1	0.29	0.47	0.34	0.15	0.34	0.33	0.52	0.48	0.46	–0.15	–0.33	0.92	0.45	0.42	0.51	0.37	0.38
PE2	0.38	0.51	0.34	0.22	0.33	0.39	0.42	0.50	0.50	–0.04	–0.38	0.92	0.48	0.43	0.55	0.36	0.35
PE3	0.27	0.50	0.33	0.15	0.32	0.39	0.40	0.46	0.47	–0.07	–0.24	0.88	0.53	0.30	0.46	0.29	0.35
POS1	0.30	0.35	0.35	0.07	0.26	0.21	0.49	0.35	0.38	–0.09	–0.33	0.51	0.64	0.39	0.37	0.38	0.27
POS10	0.11	0.29	0.19	0.19	0.14	0.27	0.05	0.14	0.19	0.19	0.01	0.32	0.70	0.08	0.18	0.10	0.17
POS2	0.10	0.30	0.19	0.13	0.25	0.32	0.18	0.19	0.26	0.16	–0.06	0.45	0.68	0.11	0.17	0.09	0.26
POS3	0.10	0.25	0.15	0.14	0.07	0.24	0.07	0.12	0.15	0.23	–0.05	0.21	0.58	0.05	0.09	0.05	0.14

DOI: 10.1002/asi

TABLE A2.7. *(Continued)*

	Scale																
Item	AC	AES	AI	ATT	BUSE	BEAU	BI	GOOD	HQ	NEG	PD	PE	POS	PQ	PUID	UC	USE
POS4	0.06	0.24	0.19	0.15	0.21	0.23	0.12	0.18	0.22	0.09	–0.08	0.41	0.71	0.14	0.15	0.16	0.20
POS5	0.03	0.27	0.14	0.16	0.13	0.28	0.07	0.21	0.23	0.10	–0.02	0.34	0.68	0.13	0.13	0.09	0.15
POS6	0.16	0.18	0.15	0.15	0.09	0.10	0.09	0.12	0.20	0.21	–0.12	0.24	0.59	0.16	0.23	0.14	0.02
POS7	0.10	0.32	0.27	0.15	0.23	0.26	0.20	0.26	0.28	0.10	–0.07	0.44	0.78	0.17	0.21	0.20	0.22
POS8	0.04	0.26	0.15	0.17	0.15	0.27	0.03	0.12	0.17	0.30	0.01	0.22	0.71	0.09	0.12	0.11	0.14
POS9	0.15	0.23	0.20	0.17	0.12	0.20	0.17	0.16	0.22	0.13	–0.13	0.29	0.68	0.13	0.25	0.20	0.12
PQ1	0.43	0.45	0.37	0.10	0.20	0.29	0.36	0.51	0.38	–0.16	–0.48	0.46	0.29	0.85	0.60	0.36	0.22
PQ2	0.07	0.01	0.01	–0.02	0.09	0.12	0.12	0.11	0.15	–0.12	–0.10	0.04	0.04	**0.39**	0.07	0.11	0.05
PQ3	0.38	0.26	0.31	0.07	0.19	0.18	0.41	0.38	0.34	–0.22	–0.38	0.33	0.21	0.81	0.43	0.40	0.14
PQ4	0.38	0.23	0.23	0.06	0.16	0.32	0.27	0.39	0.39	–0.13	–0.40	0.24	0.09	0.76	0.44	0.25	0.19
PUID1	0.52	0.50	0.38	0.15	0.16	0.31	0.48	0.44	0.41	–0.10	–0.47	0.51	0.29	0.59	0.92	0.43	0.21
PUID2	0.49	0.58	0.42	0.12	0.20	0.33	0.51	0.43	0.42	–0.09	–0.49	0.55	0.30	0.55	0.95	0.42	0.25
PUID3	0.51	0.59	0.40	0.10	0.16	0.37	0.50	0.44	0.44	–0.12	–0.49	0.51	0.28	0.55	0.93	0.46	0.17
USE	0.15	0.26	0.13	0.13	0.81	0.17	0.33	0.27	0.18	0.06	–0.15	0.40	0.27	0.22	0.22	0.10	1.00
UC1	0.51	0.42	0.59	0.10	0.12	0.15	0.42	0.39	0.30	–0.17	–0.30	0.39	0.28	0.40	0.50	0.93	0.11
UC2	0.49	0.34	0.57	–0.05	0.02	0.09	0.43	0.23	0.29	–0.20	–0.24	0.29	0.19	0.35	0.34	0.90	0.07

Note. Gray background indicates the loadings of items belonging to a particular scale. Bold numbers indicate loadings smaller than .50. AC: accessibility. AES: aesthetics. AI: adequacy of information. ATT: attribution. BUSE: baseline use frequency. BEAU: beauty. BI: behavioral intention. GOOD: goodness. HQ: hedonic quality. NEG: negative affect. PD: perceived disorientation. PE: perceived enjoyment. POS: positive affect. PQ: pragmatic quality. PUID: perceived user-interface design. UC: usefulness of content. USE: use frequency.

TABLE A2.8. Coefficients of discriminant validity and inter-correlation between the scales.

	AC	AES	AI	ATT	BUSE	BEAU	BI	GOOD	HQ	NEG	PD	PE	POS	PQ	PUID	UC	USE
AC	0.92																
AES	**.41	0.76															
AI	**.49	**.55	0.92														
ATT	.09	*.15	.06	1.00													
BUSE	*.14	**.20	.10	*.14	1.00												
BEAU	**.17	**.54	**.23	**.19	*.13	1.00											
BI	**.39	**.41	**.39	.07	**.30	**.24	0.97										
GOOD	**.32	**.50	**.36	**.15	**.24	**.54	**.42	1.00									
HQ	**.26	**.64	**.41	**.15	**.15	**.61	**.37	**.62	0.78								
NEG	–.12	–.03	–.14	*.13	.03	–.03	*–.16	**–.18	–.02	0.68							
PD	**–.48	**–.23	**–.25	–.01	**–.16	–.11	**–.40	**–.35	**–.26	**.30	0.83						
PE	**.34	**.54	**.37	**.19	**.37	**.41	**.49	**.53	**.52	–.10	**–.35	0.91					
POS	**.20	**.41	**.32	**.21	**.26	**.34	**.27	**.30	**.36	**.18	–.16	**.54	0.68				
PQ	**.48	**.39	**.37	.09	**.23	**.32	**.43	**.52	**.45	**–.22	**–.51	**.42	**.25	0.73			
PUID	**.54	**.60	**.43	*.13	**.19	**.36	**.53	**.47	**.45	–.11	**–.52	**.56	**.31	**.60	0.93		
UC	**.55	**.42	**.63	.03	.09	*.14	**.46	**.34	**.32	**–.20	**–.29	**.38	**.26	**.41	**.47	0.92	
USE	**.15	**.26	*.13	*.13	**.81	**.17	**.33	**.27	**.18	.06	*–.15	**.40	**.27	**.22	**.22	.10	1.00

Note. Diagonal elements are square root of average variance extracted for each variable. Off-diagonal elements are correlation coefficients. AC: accessibility. AES: aesthetics. AI: adequacy of information. ATT: attribution. BUSE: baseline use frequency. BEAU: beauty. BI: behavioral intention. GOOD: goodness. HQ: hedonic quality. NEG: negative affect. PD: perceived disorientation. PE: perceived enjoyment. POS: positive affect. PQ: pragmatic quality. PUID: perceived user-interface design. UC: usefulness of content. USE: use frequency.
*$p < .05$. **$p < .01$.

DOI: 10.1002/asi