Framing the User Experience:
Information Biases on Website Quality Judgement

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ABSTRACT

Understanding the complexities of users' judgements and user experience is a prerequisite for informing HCI design. Current user experience (UX) research emphasises that, beyond usability, non-instrumental aspects of system quality contribute to overall judgement and that the user experience is subjective and variable. Based on judgement and decision-making theory, we have previously demonstrated that judgement of websites can be influenced by contextual factors. This paper explores the strength of such contextual influence by investigating framing effects on user judgement of website quality. Two experimental studies investigate how the presentation of information about a website influences the user experience and the relative importance of individual quality attributes for overall judgement. Theoretical implications for the emerging field of UX research and practical implications for design are discussed.

Author Keywords

User experience, judgement and decision making, framing effect, quality models

ACM Classification Keywords

H5.2. Information interfaces and presentation (e.g., HCI): User Interfaces – *Theory and methods*.

INTRODUCTION

Understanding user judgement and users' experiences with interactive systems is an important prerequisite for informing HCI design [3, 21]. Recent user experience (UX) research has become increasingly aware of the complexity of users' experiences [22] and the importance of understanding this complexity for design [3, 6].

While traditional usability focuses on users' tasks and accomplishments, UX emphasises a more holistic approach [9, 10] including non-instrumental aspects such as a system's look and feel [24, 28]. Thereby, UX accentuates the importance of the subjectivity of users' experiences and quality judgements. These personal interpretations of a system's quality will influence future interaction with the system and may be communicated to other users with the potential of influencing their subjective experience [9].

Much UX research has focused on aesthetics and initial user perceptions of the interfaces and web sites; however, the nature of information presentation has received less attention. Information presentation can be vital in lead messages in websites and in inter-site links and recommendations. In this paper we investigate the subtle biases that might be introduced in expression of textual messages within websites and recommendations from broker sites or other users.

In previous work, we have demonstrated the subjectivity and variability of user judgement based on decision-making theory [25]. We found that personal background as well as contextual factors influenced judgement of website quality and decisions based on the website [2, 4, 6, 27]. Furthermore, these studies showed how the relative importance of individual quality attributes for overall appreciation of a system changed according to the decision context, specifically the criticality of the decision that users had to make [6].

This paper explores the strength of the decision context in influencing judgement, by investigating framing effects with website quality evaluation. Framing effects have been studied in various domains [17, 26, 29], although there has been very little HCI-related work [e.g. 13]. It is hypothesised that users change their judgements and preferences as a result of having been primed with positively versus negatively framed information about objectively equivalent choices. We further investigate how prior information about a website can influence the relative importance of individual quality attributes for users' overall judgement of the website, as well as whether viewing versus interacting with a website affects users' judgement and decision making in general, and framing effects in particular.

The paper first introduces the theoretical background on framing in the context of judgement of website quality. Then, two experimental studies are reported. Finally, we conclude with a discussion of theoretical implications of the results for the emerging field of UX research, as well as practical implications for design.

THEORETICAL BACKGROUND

Framing effect

Studies of the framing effect investigate how accentuating positive versus negative views of objectively equivalent events, items, or information affects judgement and decision making. Framing effects essentially demonstrate information presentation biases, where the same information can lead to different judgements and decisions according to whether it is presented in a positive or in a negative frame. According to Levin et al. [17], three types of framing effect can be distinguished: risk framing, goal framing, and attribute framing.

Risky choice frames are the most commonly studied framing effects [26, 29]. They hypothesise that choices between a sure and a risky option of equal expected value depend on whether the options are formulated in positive or negative terms. The original demonstration by Tversky and Kahneman's Asian Disease problem [29] showed that participants who were given the positively framed version (choice between sure saving of 1/3 of lives vs. 1/3 chance of saving all lives and 2/3 chance of saving no lives) were more likely to select the sure option than participants who were given the negatively framed version (choice between sure death of 2/3 of lives vs. 1/3 chance of no-one dying and 2/3 chance of everyone dying), who were more likely to select the risky option.

Goal framing is used in persuasive communication [23]. In the positive frame the gain or benefit of an event or issue is emphasised. The negative frame focuses on the event's potential to avoid a loss. In contrast to risk framing, there is no choice to be made between a risky and a sure option. The two frames aim towards achieving the same goal and the question is which frame is the more powerful enhancer.

In *attribute framing*, an attribute of an event or object is subject to the framing manipulation [1, 15, 16, 19]. The event or object is then evaluated in terms of favourability (good - bad). The hypothesis is that a positive frame will yield a more positive rating of the event or object than the negative frame (Figure 1).
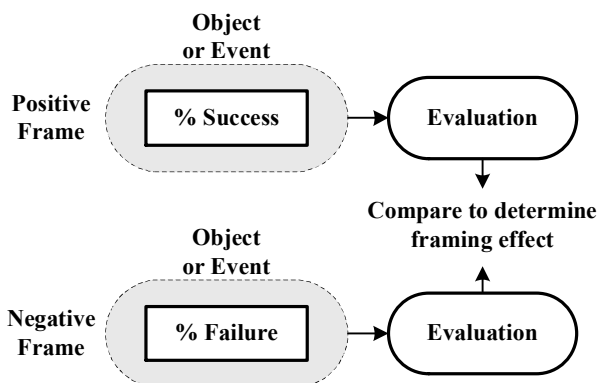

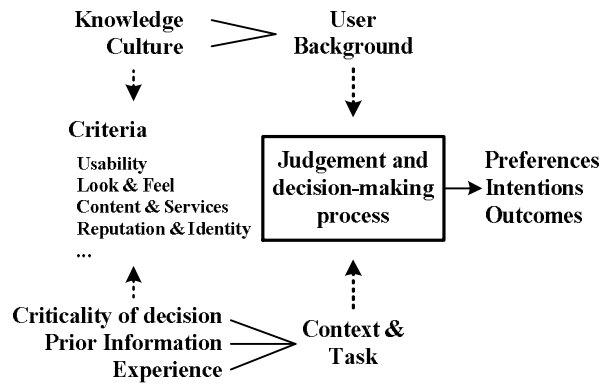**Figure 1. Attribute framing paradigm (from [17])**

Figure 2. Framework of user judgement and decision making (adapted from [6])

Most recent studies on attribute framing involved consumer judgement of product evaluation such as toasters [1], condoms [19], or ground beef [15, 16]. For instance, Levin [15] showed that perceptions of the quality of ground beef depend on whether beef is labelled as 75% lean or 25% fat. It was rated as significantly better tasting and less greasy when it was labelled as % lean (positive frame) compared to % fat (negative frame).

A subsequent study [16] showed that the attribute framing effect persists with direct product experience, i.e. participants were given information about the beef and tasted it. However, the framing effect was less strong when the product was actually experienced compared to the previous description-only study.

Levin and Gaeth [16] suggest that attribute framing influences the encoding and representation of information in associative memory, whereby positive encoding highlights the positive aspects of the information, while negative encoding highlights the negative aspects.

Attribute framing of website quality

This paper investigates framing effects in the context of website quality evaluation. In current UX research, a number of multi-dimensional models of quality hypothesise that a variety of quality aspects can contribute to overall appreciation of a system. Such models combine, for instance, usability, service quality, and aesthetics [14], pragmatic quality (utility and usability) and hedonic quality (stimulation and identity) [7, 8], or ease-of-use, usefulness, attractiveness, and enjoyment [30].

In this study we will focus on usability; look and feel; and content and service quality as three important and well-recognised quality aspects that are common to most empirical work in this area [e.g. 2, 8, 11, 12, 14, 27, 30].

In previous work [6], we have proposed a theoretical framework of judgement of interactive systems quality (Figure 2) based on Adaptive Decision Making (ADM) theory [25], in which such website quality attributes function

as evaluation criteria for overall judgement and decision making. ADM theory asserts that people's decision making is adaptive and sensitive to task, context, and their background and experience. In particular, we showed that a user's personal background as well as contextual factors influenced judgement of website quality and decisions made about a website [2, 6, 27].

While these previous studies have shown how users adapted their judgement and decision making based on *different* task scenarios, this paper investigates whether users' judgement and decision making are susceptible to more subtle changes, in particular between *objectively equivalent* scenarios, which are merely presented differently. This was implemented as a series of attribute framing experiments, where the participants were given prior information about a website attribute, for instance about its usability. Whereas one group of participants received positively framed information (e.g. 90% of users experiencing ease of use), the other group received equivalent information, but framed negatively (e.g. 10% of users experiencing difficulty in use). We further investigate how highlighting a particular quality attribute (e.g. usability) in such prior information affects the relative importance of that attribute for overall appreciation of the website.

First impressions vs. Interaction experience
The paper reports two experiments which were modelled after two attribute-framing studies by Levin et al.: The first experiment replicates Levin's study [15] on attribute framing with ground beef without product experience (description-only), adapted for website quality. The second experiment is based on a subsequent study by Levin and Gaeth [16] on attribute framing of ground beef with product experience. The original studies found that while the framing effect persisted in both cases, it was significantly lower with actual product experience than in the description-only study.

To explore the effect of exposure in more detail, in the second experiment we introduced two conditions with different degrees of exposure. In the first condition, participants were restricted to briefly viewing a screenshot of the website's homepage. In the second condition, participants could browse and interact with the website. This allowed investigating differences between a first impression of the website and user judgement after interacting with the system.

HYPOTHESES
H1. *Framing effect*: ratings of perceived website quality will be significantly higher in the positive frame than in the negative frame.

H2. *Exposure effect*: the strength of the framing effect will be reduced with increasing exposure to the website.

H3. *Shift in relative importance*: the relative importance of individual evaluation criteria for overall judgment will change according to which attribute was accentuated in prior information about the website.

EXPERIMENT 1 - WEBSITE EXPECTATIONS
The first experiment investigated framing effects on judgement of website quality. In this experiment, one attribute of a hypothetical website, such as its usability, was described to participants. They were then to report their expectations about the quality of such a website. It was hypothesised that participants would rate such a website more or less favourably, depending on whether the objectively equivalent descriptions of the website were formulated in positive or in negative terms. Framing effects were investigated for three website quality attributes: usability; look and feel; and content and service quality.

Methods
The study adopted a 3 (attribute: usability, look & feel, content & service quality) x 2 (frame: positive, negative) between-subjects design.

Procedure
The study was conducted using an unsupervised online survey consisting of 8 questions on 2 pages. The questionnaire required about 2 minutes to complete. In the first page of the survey, participants were briefed that "this study investigates users' expectations of websites" and demographic data was collected (sex, age-group, profession, proficiency in English). Participants were not told about the framing hypotheses.

Participants then were given information about a hypothetical website's quality. They were randomly assigned to receive information about usability, look and feel, or content and service quality. For each attribute, participants were randomly assigned to be given either positively framed information or the equivalent information negatively framed, e.g. "You know that: 10% of users experience difficulty using the website." The sentences used for framing are summarised in Table 1. Participants were neither given any other information, nor exposed to any website.

Usability
10% of users experience difficulty using the website.
90% of users experience the website as easy to use.

Look & feel
10% of users find the website visually unattractive.
90% of users find the website visually attractive.

Content & service quality
10% of the information on the website is unreliable.
90% of the information on the website is reliable.

Table 1. Negatively and positively framed information for each quality attribute

Participants were then asked to rate such a website on a 2-item, 7-point Likert scale for overall quality ("Overall, I would rate such a website...", "Overall, I would like such a website..."), as well as for the respective quality attribute that they had received information about, e.g. expected usability. Expected attribute quality was measured with Lavie and Tractinsky's measurement instruments [14], modulated on 7-point Likert scales. They propose a model of website quality consisting of usability, service quality, classic- and expressive aesthetics. Classic aesthetics refers to traditional aesthetic notions emphasising orderly and clear design, while expressive aesthetics is associated with the design's creativity and originality. The order of scale items was randomised between subjects.

Participants
Participants were recruited by e-mail invitation and by advertising in online student-forums. 67 participants completed the questionnaire of which 63 responses were valid (51% female; 87% in age-group 18-35; 87% students; 94% English 'advanced' or 'mother tongue').

Results
The subject population was divided into three groups based on which quality attribute (usability, look & feel, content & service quality) they had received information about. The results were analysed separately for each group.

Scale indexes were computed as the means of the individual scale items for each scale. All scales showed high reliability (Cronbach's Alpha > .90). Univariate analyses of variance were conducted separately for overall quality as well as for all of the respective evaluation criteria (usability, classic aesthetics, expressive aesthetics, service quality) as dependent variables and frame (2: positive, negative) as between-subjects factor.

Usability
For participants who were given information on the usability of the website, there was a significant main effect of frame as factor and usability as dependent variable ($F_{(1,19)} = 6.33$; $p < .05$; $\eta_p^2 = .25$). Subjects who were given positively framed information on the usability of the website gave significantly higher ratings (mean = 6.27; SD = .60) than participants who were given the same information, but negatively framed (mean = 4.77; SD = 2.19). The analysis with overall quality as dependent variable showed no significant difference between the negative and positive frames.

Look & feel
For participants who had received information on the look and feel of the website, there was a significant main effect of frame as factor and expressive aesthetics as dependent variable ($F_{(1,20)} = 4.74$; $p < .05$; $\eta_p^2 = .19$).

There was no significant difference between groups in the analysis with classic aesthetics as dependent variable. Subjects in the positive framed condition rated expressive aesthetics significantly higher (mean = 4.91; SD = 1.70) than participants in the negative framed condition (mean = 3.39; SD = 1.46).

The analysis with overall quality as dependent variable showed a main effect of frame ($F_{(1,20)} = 11.00$; $p < .01$; $\eta_p^2 = .36$), with overall ratings higher in the positively framed condition (mean = 5.93; SD = .53) than in the negatively framed condition (mean = 3.70; SD = 1.72).

Content & service quality
For participants that were given prior information on the content and service quality of the website, there was a significant main effect of frame as factor and service quality as dependent variable ($F_{(1,19)} = 4.81$; $p < .05$; $\eta_p^2 = .20$). Subjects who were given positively framed information on service quality of the website rated its service quality significantly higher (mean = 5.42; SD = 1.07) than participants who were given the same information, but negatively framed (mean = 3.82; SD = 1.87). The analysis with overall quality as dependent variable showed a main effect of frame as factor ($F_{(1,19)} = 14.47$; $p < .01$; $\eta_p^2 = .43$), with a positive frame yielding higher ratings (mean = 5.56; SD = .86) than the negative frame (mean = 3.58; SD = 1.30).

Conclusion
The results demonstrate attribute-framing effects for website quality consistent with results from previous studies in other domains [1, 15]. For all attribute frames, subjects who received positively framed information about a website attribute indicated higher expected quality ratings for the respective evaluation scale, with the exception of classic aesthetics ratings which were not affected by framing prior information. Overall quality judgement was influenced by framing of prior information about look and feel and service quality, but not for usability (Figure 3).
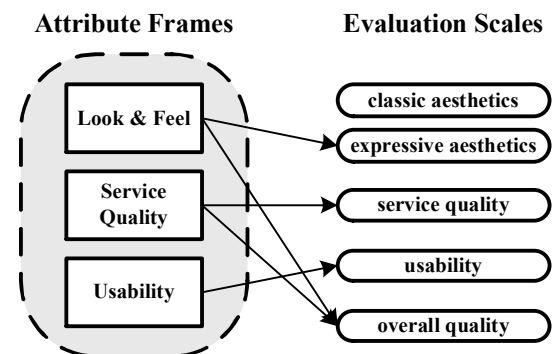
Figure 3. Effect of attribute frames on evaluation criteria ratings in Experiment 1

EXPERIMENT 2 - WEBSITE EXPERIENCE

The second experiment expanded the first by adding website exposure, in contrast to the previous information-only setup. The effect of website exposure was investigated in two conditions: viewing a screenshot of the website's homepage; and in a free-browsing session where the participants interacted with the website.

Equivalent to the first experiment, participants were given equivalent, but positively or negatively framed, prior information about one attribute of the website and subsequently asked to evaluate it. The primary hypothesis was that participants would rate the respective website attribute more- or less-favourably according to whether prior information about that attribute was formulated in a positive or negative frame.

As in the first experiment, participants received prior information about *one* quality attribute only. However, as in this study participants experienced the website, they were asked to rate the website's quality in *all* attribute dimensions in the site evaluation. This allowed investigating whether framing the information about one quality attribute had any effect on judgement of other attributes. We further hypothesised that accentuating a particular attribute in prior information would increase the relative importance of that attribute for participants' judgement of overall quality.

For instance, participants who were given information about the website's usability would give more importance to usability in their overall quality judgement, while for participants who received prior information about look and feel, the perceived aesthetic quality rating would be the most important predictor for overall judgement.

Methods

The study followed a 3 (attribute: usability, look & feel, content & service quality) x 2 (frame: positive, negative) x 2 (exposure: screenshot, browsing) between-subjects design. Additionally, there was a control group of participants who received no prior information before experiencing the website (both for screenshot and browsing conditions).

The study was conducted using the CHI 2008 website (as it was on 1 July 2007) as experimental stimulus (Figure 4). A copy of the website was made and the content frozen so that the website did not differ between participants in any way. The website consisted of 13 pages with content and 8 pages that were under construction (displaying a "coming soon" message). The only change that was made to the original, was to remove links that pointed to external websites (such as acm.org) to ensure that participants could not accidentally leave the pages of the CHI website while browsing.

Procedure

The study was conducted using an unsupervised online survey consisting of 13 questions on 3 pages. The questionnaire required about 5 minutes to complete.

Figure 4. The CHI 2008 website as used in Experiment 2

In the first page of the survey, participants were briefed that "this study investigates users' opinions of websites" and demographic data was collected (sex, age, profession, proficiency in English). Participants were not told about the framing hypotheses.

Participants were then randomly assigned positive or negative frame and to receive information about either the website's usability, its look and feel, or its content and service quality, e.g. "10% of users have difficulty using this website". See Table 1 for a complete list of sentences used for each attribute and frame.

Next, participants were randomly assigned to exposure conditions. Half of the participants were instructed that they would be seeing a 10-second screenshot of a website's homepage and then be asked to evaluate the website, while the other group was instructed that they would be exploring a website for 1 minute and would then be asked to evaluate it.

The screenshot and browsing intervals were chosen after a series of pilot studies with 12 participants with the aim of selecting intervals that would assure that participants would be viewing / browsing the website for the entire interval, as the study was conducted as a non-supervised online survey.

For the screenshot, we followed recommendations from the eye-tracking literature, which have found 10 to 15 second intervals to be an appropriate interval in studies that record first impressions based on website screenshots [20]. For the browsing condition, we approximated the minimum time-span after which pilot study participants became bored with interacting with the website in a free-browsing session (i.e. with no particular task other than to familiarise themselves with the website to be able to subsequently evaluate it).

While viewing or browsing the website the remaining time was displayed above the website (Figure 4). The viewing / browsing session was stopped automatically after the allocated time was up, upon which the participants were instructed to resume the survey.

After experiencing the website, participants proceeded to the final part of the survey where they were asked to report their opinions or expectations based on their current impression of the website. Participants were asked to evaluate the website with a two-item overall quality scale ("Overall, I rate this website...", "Overall, I like this website..."), as well as an evaluation for each attribute dimension. Attribute quality was measured using Lavie and Tractinsky's scale items for usability, classic and expressive aesthetics, and service quality [14]. All items were measured on 7-point Likert scales. The order of scale items was randomised between subjects.

A final question recorded whether this had been the first time that participants had seen the CHI 2008 website.

Participants
Participants were recruited by e-mail invitation and advertising in online student-forums. 392 participants took part in the study, 376 of 392 responses were complete and valid. 16 participants had previous experience with the CHI 2008 website and were not considered in the results analysis (N = 360; 51% male; 92% in age-group 18-35; 89% students; 93% English 'advanced' or 'mother tongue').

Results
The subject population was divided into three groups based on which quality attribute (usability, look & feel, content & service quality) they had been given information about, as well as a fourth control group which consisted of participants who had received no prior information before evaluating the website. The results were analysed separately for each group.

Framing and exposure effects
Scale indexes were computed as the means of the individual scale items for each scale. All scales showed high reliability (Cronbach's Alpha > .80). Univariate analyses of variance were conducted separately for all evaluation criteria (usability, classic aesthetics, expressive aesthetics, service quality, overall quality) as dependent variables, with frame (2: positive, negative) and exposure (2: screenshot, browsing) as between-subjects factors.

Usability
For participants who were given prior information about the usability of the website, there was a significant main effect of frame as factor and usability as dependent variable ($F_{(1,94)} = 5.79$; $p < .05$; $\eta_p^2 = .06$). There was also a significant main effect of frame as factor in the ANOVA with service quality as dependent variable ($F_{(1,92)} = 12.238$; $p < .01$; $\eta_p^2 = .12$). Subjects who were given positively framed information on usability rated the usability of the website significantly higher (mean = 4.81; SD = 1.21) than subjects who were given the same, but negatively framed information (mean = 4.23; SD = 1.16).
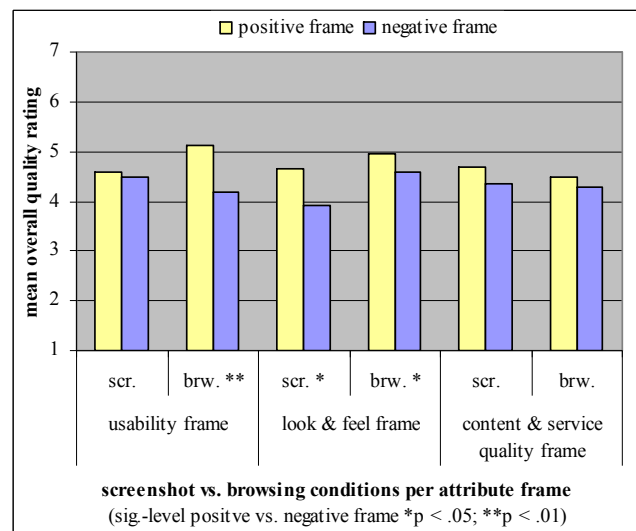

Figure 5. Mean overall quality ratings per condition and participant group

Similarly, service quality was rated higher in the positively framed condition (mean = 4.53; SD = .99) than in the negatively framed condition (mean = 3.89; SD = .96). There was no significant effect of exposure in both analyses.

The analyses with classic aesthetics and expressive aesthetics as dependent variables did not show any significant effects of frame or exposure for this group.

The analysis with overall quality as dependent variable showed a main effect of frame as factor ($F_{(1,94)} = 7.30$; $p < .01$; $\eta_p^2 = .07$) with a significant frame * exposure interaction ($F_{(1,94)} = 4.85$; $p < .05$; $\eta_p^2 = .05$). There was no significant difference in mean ratings of overall judgement in the screenshot condition, but a significant difference in the browsing condition (Figure 5), where participants who were given positively framed information rated the overall quality of the website higher (mean = 5.11; SD = .85) than participants who were given negatively framed information (mean = 4.17; SD = 1.23).

Look & feel
For participants that were given prior information on the look and feel of the website, there was a significant main effect of frame as factor and expressive aesthetics as dependent variable ($F_{(1,103)} = 4.18$; $p < .05$; $\eta_p^2 = .04$) with no significant effect of exposure. Subjects who were given positively framed information rated the expressive aesthetics significantly higher (mean = 3.57; SD = 1.16) than participants who were given the same information but negatively framed (mean = 3.08; SD = 1.31).

There was a significant effect of exposure in the analyses with classic aesthetics ($F_{(1,103)} = 5.62$; $p < .05$; $\eta_p^2 = .05$), usability ($F_{(1,104)} = 7.41$; $p < .01$; $\eta_p^2 = .07$), and service quality ($F_{(1,100)} = 10.07$; $p < .01$; $\eta_p^2 = .09$) as dependent variables respectively. Participants who were asked to evaluate the website after browsing it rated the classic

aesthetics (mean = 4.79; SD = 1.11), usability (mean = 5.11; SD = 1.29), and service quality (mean = 4.73; SD = 1.18) higher than participants who evaluated the website after viewing a screenshot (classic aesthetics mean rating = 4.22; SD = 1.37; usability mean rating = 4.45; SD = 1.24; service quality mean rating = 4.06; SD = .96). There was no significant effect of frame in the analyses with these evaluation criteria as dependent variables.

The analysis with overall quality as dependent variable showed main effects of frame ($F_{(1,104)}$ = 7.77; p < .01; η_p^2 = .07) and exposure ($F_{(1,104)}$ = 5.36; p < .05; η_p^2 = .05) with no significant interaction. Overall ratings were higher in the positively framed condition (mean = 4.81; SD = 1.06) than in the negatively framed condition (mean = 4.24; SD = 1.08); and higher after browsing (mean = 4.76; SD = 1.14) than after viewing a screenshot (mean = 4.31; SD = 1.02).

Content & service quality
For participants given prior information on the content and service quality of the website, there was a significant main effect of frame as factor and service quality as dependent variable ($F_{(1,81)}$ = 8.98; p < .01; η_p^2 = .10). Subjects who were given positively framed information on service quality of the website rated its service quality significantly higher (mean = 4.33; SD = 1.03) than participants who were given the same information, but negatively framed (mean = 3.67; SD = .93). There was no significant effect of exposure.

Neither the analyses with other evaluation criteria as dependent variables, nor with overall quality as dependent variable, showed any significant effects for this group.

Control condition
For the control group of participants given no prior information on the website before experiencing and evaluating it, univariate analyses of variance were conducted separately for each evaluation criterion (usability, classic aesthetics, expressive aesthetics, service quality, overall quality) as dependent variables and exposure (2: screenshot, browsing) as between-subjects factor. None of these analyses showed any significant effect of exposure as factor, i.e. there were no significant differences in ratings for any evaluation criteria between the participants who evaluated the website after viewing a screenshot and those who evaluated the website after having browsed it.

The mean ratings per evaluation criterion of the control group were generally between the ratings of participants who had received positively framed information for that quality attribute (highest ratings) and those who had received the same information, but negatively framed (lowest ratings) as depicted in Figure 6.
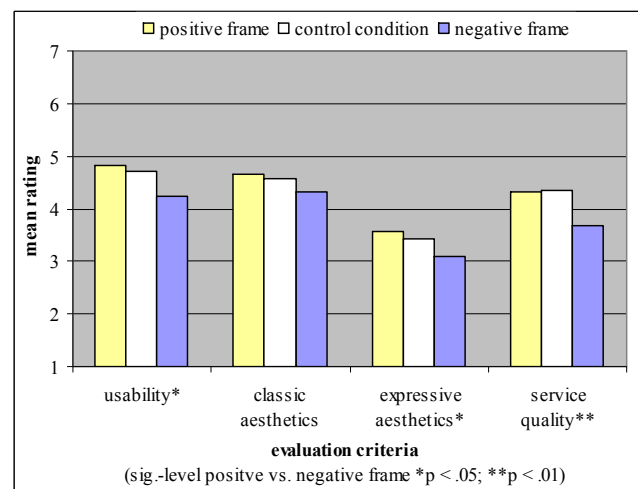

Figure 6. Mean ratings of evaluation criteria for positive frame, control group, and negative frame

Relative Importance
To analyse the relative importance of individual evaluation criteria for overall judgement, stepwise linear regressions were carried out for each participant group with overall judgement as dependent variable and the evaluation criteria (usability, classic aesthetics, expressive aesthetics, service quality) as independent variables.

For participants who were given prior information on the usability of the website, the regression results suggest that usability was the most important predictor for overall judgement (R_{sq} = .35). No other factors contributed. For participants who had received information on the look and feel of the website, the regression results suggest that classic aesthetics was the most important predictor for overall judgement (R_{sq} = .33), followed by a model of classic and expressive aesthetics (R_{sq} = .39), and a model of classic aesthetics, expressive aesthetics, and usability (R_{sq} = .41). For participants who were given information on the content and service quality of the website, the regression results suggest that classic aesthetics was the most important predictor for overall judgement (R_{sq} = .49), followed by a model of classic and expressive aesthetics (R_{sq} = .54), and a model of classic aesthetics, expressive aesthetics, and service quality (R_{sq} = .57). For the control group with no prior information, the regression results suggest that classic aesthetics was the most important predictor for overall judgement (R_{sq} = .54).

Conclusion
For all attributes, there was a framing effect on the evaluation of the 'framed' attribute, e.g. participants who received positively framed information on usability then rated the usability of the website significantly better than those who had received the objectively equivalent, but negatively framed information. However, framing prior information on one quality attribute did not affect the ratings of any other quality attributes, with exception of the usability frame affecting service quality ratings (Figure 7).
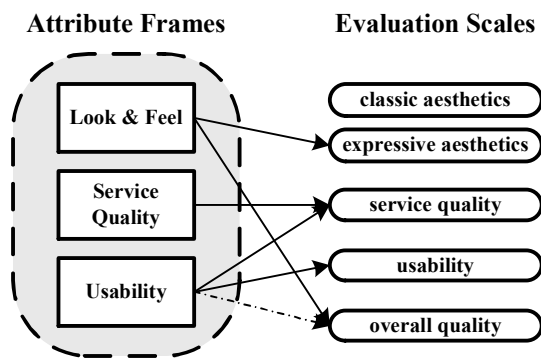
Attribute Frames   **Evaluation Scales**

Figure 7. Effect of attribute frames on evaluation criteria ratings in Experiment 2

Framing of overall quality judgement showed a more complex picture and varied between groups, depending on which quality attribute they had received prior information about. Participants who were given information on usability differed in their overall rating only in the browsing condition, whereas for participants who had received information on the look and feel, framing affected their overall judgement in both screenshot and browsing conditions. There was no difference in judgement of overall website quality for participants who had received prior information on the website's content and service quality.

The regression results indicate that prior information about a website not only had a significant effect on judgement of website quality, but also on the relative importance of individual evaluation criteria for overall judgment. The most important predictor for overall quality changed according to which quality attribute was accentuated in prior information about the website.

DISCUSSION

Attribute framing of website quality

The results demonstrate framing effects on judgement of website quality both when participants had received only a description of the website and with various levels of exposure to the website. Participants consistently rated the quality of the website better or worse according to whether objectively equivalent prior information about the website's quality had been formulated in a positive or negative frame.

This is consistent with findings of attribute framing studies in other product domains [17]. The only exception was that in both studies ratings of classic aesthetics [14], which emphasises low-level perceptual properties of the system ("clear", "clean", "pleasant", "symmetrical", "aesthetic"), were not susceptible to any framing.

As the results of the second experiment demonstrate, prior information about one quality attribute did not have any significant effects on ratings of any other individual attributes. The only exception was that participants who were given positively versus negatively framed information on usability significantly differed in their service quality ratings. This may be due to the scale used to assess service quality [14] which emphasised perceived reliability ("reliable", "makes no mistakes", "provides reliable information"), that participants might have associated with a website's usability. While the results demonstrate attribute-framing effects for judgement of individual website quality attributes, corresponding to the findings of related studies in other domains [15, 16], the inconsistencies in judgement of overall quality make it difficult to interpret the strength of framing prior information of individual quality attributes on judgement of overall website quality. However, the significant differences in the effects of prior information between attributes reinforce the need for multi-dimensional models of quality that include the investigation of multiple quality attributes and their effect on overall judgement and decision making.

Website exposure

The framing effect was smaller when participants were exposed to the website than in the information-only experiment (Table 2). The difference in effect sizes between framing without and with exposure to the website is consistent with findings of related previous studies [16] that show that the mean difference in rating scores between the positively framed and the negatively framed conditions decreases with exposure to the stimulus. This can be explained with the averaging model of information integration [16], which hypothesises that the effect of one source of information decreases when combined with another source of information.

Rating scale	Experiment 1 (description-only; N=67)			Experiment 2 (with website exposure; N=360)		
	Positive	Negative	Difference[a]	Positive	Negative	Difference[a]
Usability[b]	6.27	4.78	1.49*	4.81	4.23	.58*
Classic Aesthetics[c]	5.14	3.97	1.17	4.66	4.32	.34
Expressive Aesthetics[c]	4.91	3.39	1.52*	3.56	3.08	.48*
Service Quality[d]	5.42	3.82	1.60*	4.32	3.67	.65**

[a] difference between the mean rating score in the positive and the negative framing conditions (* p < .05; ** p < .01)

[b, c, d] mean rating only includes participants with prior information on [b] usability / [c] look & feel / [d] content & service quality

Table 2. Mean rating scores for quality criteria in description-only and website-exposure experiments

It is to be noted that the two experiments here were conducted with a significantly different sample size (N=67 vs. N=360), so the significance levels of the difference in mean sizes in the first experiment were lower, although the mean difference was greater.

However, the second experiment did not find consistent significant differences in judgement between participants who evaluated the website after only seeing a ten-second screenshot and participants who interacted with the website in a one-minute browsing session. Only aesthetics ratings differed between screenshot and browsing, which was due to participants seeing more of the website in the browsing condition, which generated higher ratings for browsing participants, across positive, negative, and no-frame (control group) conditions.

This extends results of recent research about the importance of first impressions of websites [18]. However, it is noteworthy that while our study's comparison does contrast viewing-only with interacting, the browsing session only lasted 1 minute and thus may be labelled only an "extended second impression". Further work that addresses the short-, medium-, and long-term temporal dynamics of judgement of website quality in more detail is necessary [5].

Relative importance of evaluation criteria

In previous studies [6] we had shown that the relative importance of individual quality attributes for overall appreciation of a system can shift according to different decision contexts. The results of the regression analyses of the second experiment, where participants were asked to rate the website in all quality dimensions, show that focusing on a particular attribute in prior information about a website can cause such changes in relative importance. Highlighting a particular quality attribute in the information prior to experiencing the website changed the most important predictor for overall judgement between groups. For instance, for participants who were given prior information on usability, 35% of the variance in overall judgement could be explained by ratings of usability as most important predictor, whereas for participants who had received prior information about the look and feel of the website, classic and expressive aesthetics accounted for 40% of the variance in overall quality.

Conclusion

In conclusion, we found that even subtle manipulations in the decision context can influence users' judgements of individual quality attributes and overall quality judgement, as well as the relative importance of individual evaluation criteria for overall judgement. This further demonstrates the subjectivity and variability of users' experiences and judgements advocated in UX research, and in particular the powerful influence of decision context. This study goes beyond previous results that demonstrated shifts in judgement and relative importance according to *different* task scenarios [2, 6, 27], by demonstrating the effect of subtle

framing manipulations, which cause differences in user judgment between *objectively equivalent* scenarios, when they are merely formulated differently.

In the wider context of HCI design and evaluation, the results imply that context and prior information about websites are powerful influences for the user's subsequent experience and judgement of perceived quality. The results demonstrate that not only the information itself, but also different presentation of equivalent information, will influence future appreciation of a website. This advocates a careful consideration of the decision context (prior knowledge, wording of questions) and the inclusion of contextual factors in models of perceived quality.

The perceived quality and impact of a website depend not only on direct properties of the design, but also on external sources of judgement [6], such as the brand or reputation of the organisation behind the website, or recommendations by other users. For designers, the results imply to check value laden information within websites for possible biases. In persuasive technology the implications are to present positive information first to foster a favourable attitude to a subsequent choice, but reverse the order with negative information to dissuade users. Designers of recommenders, web broker sites, and training materials need to beware of potential biases in information presentation sequence that could colour users' subsequent judgements. Finally, as expressions of trade-off positive versus negative opinion are pervasive in many CMC and e-community systems, individual users and moderators should be aware of presentation biases.

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