

## **Measuring Website Quality: Asymmetric Effect of User Satisfaction**

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Website quality measurement tools have been largely static and have struggled to determine relevant attributes of user satisfaction. This study compares and contrasts attributes of user satisfaction based on usability guidelines seeking to identify practical easy-to-administer measurement tools. The website users assessed business school homepages according to six criteria and fulfilled a randomly assigned yet typical task. After completing the task, respondents assessed the same six website quality/satisfaction criteria again. The consumer-product relationship seems similar to the link between a user and a website. User satisfaction, just like consumer satisfaction, is asymmetric and non-linear. Content and navigation have been identified as key ingredients when users judged website quality, alerting web designers and website practitioners to focus more closely on those attributes. Similar lessons can be drawn for marketing professionals, who typically supervise or determine the content, structure and other website facets.

Keywords: Satisfaction, quality, asymmetric effect, website, usability

## 1. Introduction

Since its rapid expansion in the mid 1990s, there has been growing research interest in investigating key elements leading to website quality and positive user experience. Several studies emphasized the role of content (Huizingh, 2000) and attributes contributing to the effective use of website content (Palmer, 2002 – e.g. navigation, layout and website structure). The importance of information in today's information saturated world and the information role of websites has been increasing (D'Ambra, and Wilson, 2004). Providing information used to be an original idea, which gave the www its birth. Information could itself be seen as a special product with many specifics (e.g. Raban, 2007). Similarly, website usability has been defined as “the extent to which a product can be used by specified users to achieve specified goals with effectiveness, efficiency and satisfaction in a specified context of use” (ISO 9241-11: Guidance on Usability, 1998).

Areas of effectiveness and efficiency can be perceived as necessary yet insufficient conditions for attaining subsequent user satisfaction. Therefore, usability research has shifted its focus to user experience and user satisfaction (Hassenzahl and Tractinsky, 2006), two areas related to a number of diverse phenomena (Forlizzi and Battarbee 2004), including beauty and aesthetics (Lindgaard and Dudek, 2003). It is not website content but the emotional reaction to visual appeal which is much faster than intellectual reaction, linked with easily measurable website characteristics (Lindgaard, 2007). Such a strong initial emotional impression retains its importance, even for latter work with a particular website (Lindgaard et al., 2006). Empirical evidence indicates that users might be more satisfied with a visually appealing website than with a website which is usable but less visually attractive (Tractinsky and Zmiri, 2006). Hartmann, Sutcliffe and De Angeli (2007) even found a mismatch between website usability and overall user impression.

It remains debatable whether website user satisfaction can be compared to satisfaction with other products and services. Consumer product satisfaction shows various characteristics from which non-linearity and asymmetry have been assigned a prominent role (LaBarbera and Mazursky, 1983). Evidence of those characteristics has been gathered in services (Anderson et al., 1993), the automotive industry (Mittal

et al. 1998), food-processing (Oliva et al., 1995), banking (Colgate and Danaher, 2000), education (Söderlund, 1998), as well as in human relations (Taylor, 1991). An explanation of this asymmetry can be found in the Herzberg motivation theory (Herzberg et al., 1959) or in the Prospect Theory (Kahneman and Tversky, 1979).

The non-linear asymmetric effect has important implications for corporate practice – instead of focusing on the refinement of certain product attributes, companies should rather pay attention to removing inadequacies which impact negatively on user satisfaction. Satisfaction variables can be grouped according to their impact on overall consumer satisfaction into dissatisfiers, satisfiers, and hybrids, ascribing a different role to each measured variable and emphasizing the ever changing (longitudinal) nature of user satisfaction. Dissatisfiers are conditional requirements of quality – they lead to dissatisfaction if not fulfilled but do not positively influence customer satisfaction if present. Customers expect that product will serve its intended purpose. It is important not to attain a negative performance on these attributes. On the other hand, satisfiers increase customer satisfaction if delivered. Those factors are not expected but surprise customers and generate delight. Hybrids may or may not impact customer satisfaction in either direction (Matzler et al., 2004). Negative perception of one characteristic may outweigh a whole group of other positively perceived attributes (Mittal et al. 1998).

Characteristics of website assessment such as non-linearity and asymmetry of user satisfaction have been previously investigated using transaction and commercial websites (e.g. Jarvenpaa and Todd, 1997; Zhang and von Dran, 2000; McKinney et al., 2002; Rai et al., 2002; Cheung et al. 2005a). However, there are other types of websites (Fleming, 1998 – such as information, identity, education, community and entertainment www) and their end-user satisfaction can be determined differently. Website quality can play a mediating role in purchase intentions on commercial websites (Shukla, Sharma and Swami, 2010b). While transaction websites aim at closing the deal (therefore its satisfaction determinants range from the number of goods, clarity of presentation, availability of product related information to ease of purchasing), information websites primarily mediate and deliver information. Previous website quality studies focused on web portals (Yang et al., 2005) or educational websites (Cheung et al., 2005b). Other website types aim at strengthening community feeling or increasing product or brand affinity and hence would again require a different perspective on website quality.

## **2. Determinants of Information Website Quality**

Consumers decide on product quality (Grönroos, 2000). Quality in general means the ability of products to be used for their intended purpose (Juran and Gryna, 1998), which has been reflected when defining website quality – a website reaches high quality levels and satisfies its users if it is sought for the intended purpose it was designed and visited for (Bevan, 1995). A user-centred approach is a dominant logic of website usability. Usability parameters can vary according to the website purpose (for meta-analysis, e.g. Shneiderman et al., 2006).

The complete account on website quality can hardly be acquired without end-user testing (Bevan and MacLeod, 1994). User views and experiences can be best

researched through scenarios and assigned model tasks (Rosson and Carroll, 2001). Such scenarios must reflect the intended purpose of a website and its target users (Waite, 2006). The intended purpose of information based websites is to mediate access and deliver information (Swaminathan, Lepkowska-White and Rao, 1999). Quality information should be relevant, accessible (valid), interpretable, accurate and complete (Nicolaou and McKnight, 2006).

Previous research in which one particular educational website was tested by multiple users indicates that user satisfaction is non-linear and asymmetric (Cheung and Lee, 2009). Such findings may be biased towards the website under study. Similarly, satisfaction is not a one-time feature but evolves throughout the use of the product (Bernhardt, Donthu and Kenett, 2000) and hence is of a longitudinal nature.

Dimensions for website quality measurement reflect website multiple layers, features and components and user capacity to distinguish between various website characteristics. Important quality characteristics of information websites include relevance, up-to-dateness, accuracy, and completeness (Cheung and Lee, 2009); usefulness (content characteristics) measured by relevance, format, reliability, level and timeliness, as well as usability measured by ease of use, aesthetic appearance, navigation, terminology, and learnability (Tsakonas and Papatheodorou, 2006); or content, searching, links, navigation, page layout, readability, and graphics (Zafiroopoulos and Vrana, 2006; Scanlon et al., 1998). Table 1 provides website quality dimensions suggested in recent studies. Whereas several studies highlight content and presentation aspects of website quality, some add another dimension – the overall impression (Schenkman and Jonsson, 2000; Hartmann et al., 2007).

Table 1: Website Quality Dimensions

	Schenkman and Jonsson (2000)	Ranaweera, McDougall and Bansal (2005)	Zafiroopoulos and Vrana (2006)	Tsakonas and Papatheodorou (2006)	Hartmann, Sutcliffe, and De Angeli, (2007)	Shukla, Sharma and Swami (2010a)
<b>content related attributes</b>	meaningfulness comprehension	content	content searching	content	content	informativeness entertainment properties
<b>presentation related attributes</b>	complexity legibility order beauty	ease of use interactivity security/privacy	links navigation page layout readability graphics	navigation layout aesthetic appearance visual appeal	colour scheme layout	organisation of information elements organisation of entertainment elements
<b>overall impression</b>	overall impression				overall impression	

Web **content** is the traditionally trumpeted website quality criterion (Aladwani and Palvia, 2002). Website content is a reason why users visit the website and it determines user satisfaction (Huizingh, 2000). At the same time, content is a subjective category because the degree to which users are satisfied with the content differs from person to person (Herrera-Viedma et al., 2006). Web content is the most widely utilized attribute in website quality assessment (Aladwani and Palvia, 2002). It seems imminent for information websites that they need to offer the kind of information users seek and search for, hence content may serve as a hybrid –

increasing satisfaction when users find what they were looking for and decreasing user satisfaction when they do not succeed.

Quality attributes related to presentation which may not be specific to information websites and have been employed in various studies, include colours, visual appeal, layout, and navigation. Users expect all such characteristics to meet their expectations and are prerequisites for user satisfaction (Shneiderman et al., 2006). **Colours** play a prominent role in web design. Colours code information, add emphasis and impact on the aesthetic impression and feelings of beauty (Meier, 1998). The colour scheme is usually the first visual stimuli, forming the first user impression. Users gain their initial colour perception a couple of milliseconds after the first display (Lindgaard et al., 2006). Colours alone determine whether a website is likeable or not (Lindgaard, 2007). In addition, a colour scheme is usually displayed by web browsers before other website elements and content.

Although colours are important stimuli determining **visual appeal** (Knutson, 1998), visual appeal includes other aspects (Lavie and Tractinsky, 2004). Visual appeal is distinguished within the first few moments of viewing. Visual appeal can override other website attributes and strongly determine overall website assessment and user experience (Lindgaard et al., 2006). Visual appeal is closely connected to usability and website effectiveness (Jennings, 2000). Visual appeal can also have a strong influence on the overall impression of the website (Hassenzahl, 2004).

Website **layout** impacts on the effectiveness and way the website is used (Palmer, 2002). Layout should not be regarded as a purely performance based attribute related to usability (Hassenzahl, 2004), but as an important element stimulating user emotions through visual impression (Lindgaard et al., 2006). Layout contributes to website navigability and the ability to meet user expectations (Palmer, 2002). It can be argued that layout substantially contributes to the overall impression. Layout recommendations for web designers are key ingredients of usability guidelines (Sutcliffe, 2002).

Usability testing concentrates on the operational ease of website use, in terms of simplicity and clarity of navigation, clarity of links and availability of search functions (Spool et al., 1999). **Navigation** is a key website component (Page-Thomas, 2006; Katerattanakul and Siau, 1999). Good navigation enables better recall of website structure and enhances content accessibility, yet allows users to freely move through the website based on their preference. Good navigation enhances user ability to foresee website controls and go through it intuitively (Sutcliffe, 2002).

Being a complex measure, encompassing other surveyed dimensions, it could be viable to investigate whether user assessment is linked more to visual attributes (such as visual appeal or colours) or to content and website performance. Overall impression has been measured in other studies such as Aladwani and Palvia (2002) or Schenkman and Jonsson (2000) and blends together various previous components yet its assessment was found to be different from website usability (Hartmann et al., 2007). The overall positive experience can serve as a surprise factor for users leading to better and more positive quality perception when delivered.

Therefore we propose the following research model and formulate four hypotheses for determinants of website quality:

**H1:** Negative perceived performance will have a negative impact on user satisfaction with content.

**H2:** Positive perceived performance will have a positive impact on user satisfaction with content.

**H3:** Negative perceived performance will have a negative impact on user satisfaction with presentation attributes.

**H3.1:** Negative perceived performance will have a negative impact on user satisfaction with colours.

**H3.2:** Negative perceived performance will have a negative impact on user satisfaction with navigation.

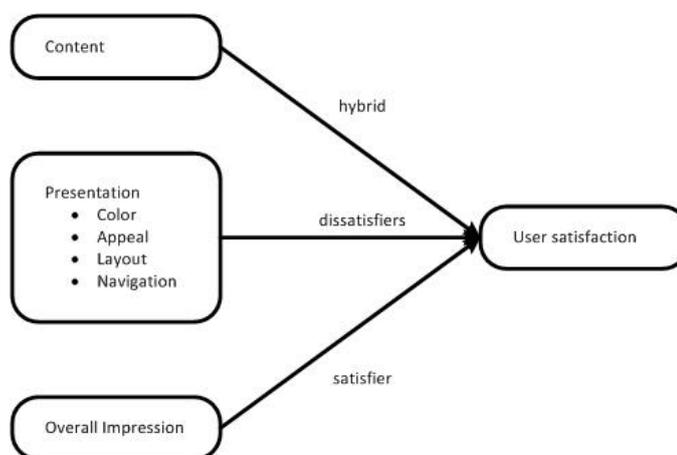
**H3.3:** Negative perceived performance will have a negative impact on user satisfaction with layout.

**H3.4:** Negative perceived performance will have a negative impact on user satisfaction with visual appeal.

**H4:** Positive perceived performance will have a positive impact on user satisfaction with overall impression.

Additionally, it can be questioned whether certain parameters of user satisfaction play a more significant role in user assessment than others. Zhang et al. (2001) found that overall the most significant features for website quality are completeness of information and navigation. It is anticipated that content and navigation will be the most influential components in website quality assessment.

Fig. 1 Research Model



### 3. Methodology

In order to best reflect on the specific needs of end-users, this research was designed to uncover specific website quality attributes perceived by a specific target group. Web presentations of tertiary education institutions are prime examples of information based websites (Lackaff and Cheong, 2008). We chose the websites of all the business schools in the Czech Republic. The list of accredited business schools comprising 44 institutions was supplied by the Czech Ministry of Education; 22 institutions were public and 22 were private with 15 schools located in the capital city of Prague.

Typically, business school websites contain hundreds to thousands of various sub-sites, which can be evaluated as parts of the main site. Sub-sites are frequently

similar in terms of design in order to maintain corporate identity (Shneiderman et al., 2006). Business school websites are publicly accessible and are aimed at various user groups. One of the key criteria for website assessment is that the evaluation should be undertaken only by the end users, which are targeted by web designers and website owners (Waite, 2006). The various users of business school websites can be distinguished between prospective, current and former students, academic and non-academic staff, industry specialists, the general public and prospective, current and former partners such as benefactors, investors and public authorities. These groups may vary in their needs and the type of information they seek. In the case of universities, the group with the most generated website traffic is the current students. Therefore, the respondents in this research were the students of one public business school in the Czech Republic and 30 respondents participated in the study. The respondents did not assess the website of their own business school which they presumably knew well prior to participating in the study. Each respondent evaluated each of the remaining 43 business school websites in the Czech Republic. The number of respondents has been found sufficient for exploratory and relational research (Weller, 1998).

Respondents (undergraduate business students in their final year, 15 respondents were male, 15 female) were asked to assess the quality of a website before and after a randomly computer generated pre-assigned task. The study was conducted in a controlled environment where researchers were always available to respond to any questions the participants may have had. The respondents received detailed instructions regarding the research study. All students had extensive previous user experience with websites although they were not professionals and not knowledgeable in the area of webdesign or website quality (the definition of website quality was not explained to the respondents). The participants assessed the websites in a random order generated by computer. All 1,320 responses in the dataset were obtained regularly, with no missing values.

Respondents were asked to assess the quality of a website before and after a randomly pre-assigned task. Websites were also displayed to participants in a random order – this prevented respondents from gaining the same experience throughout the study, which otherwise could cause variation in consumer satisfaction (Homburg et al., 2006). At the beginning, respondents were shown a website for five seconds (Lindgaard et al., 2006; demonstrated that key website attributes are recognized by a user within the first 50 milliseconds – our research allowed one hundred times the minimum suggested viewing time). The goal was to measure user views without direct experience with the website. Afterwards, the respondents expressed their agreement on six statements. The study sought answers on a five-step Likert-type (Likert, 1932) scale. Research items (quality attributes) were pre-tested with two focus groups (10 students with a similar demographic profile, different individuals from respondents). The groups debated their perception of website quality, understanding of items, and their ability to assess them separately.

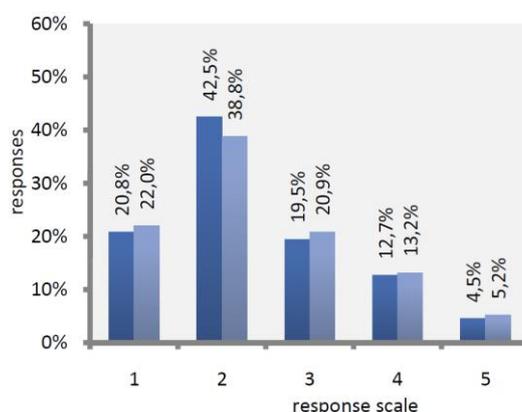
Then the respondents had to accomplish three specific tasks. The tasks were suggested by previous focus groups which defined typical activities undertaken by

students (seeking information about courses, lecturers, departments and services).<sup>1</sup> The success of each information activity was measured based on the correct (open-ended) answer to the task. Statistical testing revealed no difference for succeeding in various tasks (consistent succession rates across tasks). There was no instant feedback to the participants as to whether they were successful in completing the task or not. It was left to them to judge whether they succeeded. After the tasks, the respondents expressed their level of agreement with the same six statements as at the beginning of the survey (i.e. perception after direct experience). The aim was to establish whether and how the perception shifted in relation to success or failure in fulfilling the assigned task.

#### 4. Results

Verification, as to whether all attributes are perceived by users as being part of one global construct, was conducted based on Cronbach's Alpha (Cronbach, 1951). For this research model, it has been calculated at  $\alpha = 0.858$  which indicates high (for Cronbach's Alpha interpretation and values see e.g. Murphy and Davidshofer, 1998) internal consistency of our six-item model. Respondents most likely perceived all items as being part of one overall website quality. After verifying the internal consistency of the model, we have analyzed the responses before and after the user activity. The results are shown in the following diagrams (Fig. 2–7).

Fig. 2. Colours Evaluation before (Left Column) and after (Right Column) User Activity



<sup>1</sup> The tasks were: telephone or email contacts to lecturers of common subjects from the curricula taught at a school during the current semester; academic and professional degrees of key professors; whether a particular subject was taught during the current semester; number of credit hours devoted to a common subject from the curricula taught at a school during the current semester; library office hours; admissions and record office hours; duration of the exam period.

Fig. 3. Navigation Evaluation before (Left Column) and after (Right Column) User Activity

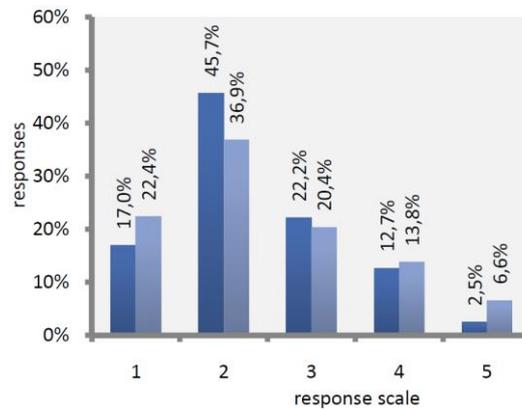


Fig. 4. Layout Evaluation before (Left Column) and after (Right Column) User Activity

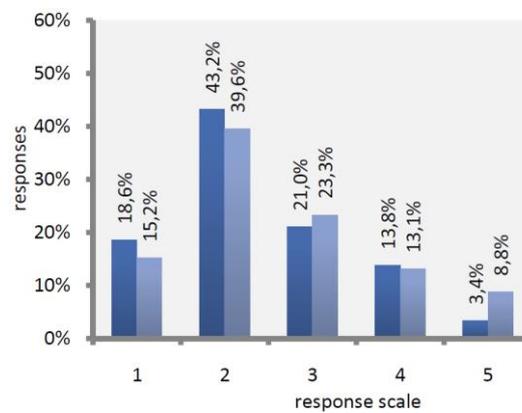


Fig. 5. Evaluation of Visual appeal before (Left Column) and after (Right Column) User Activity

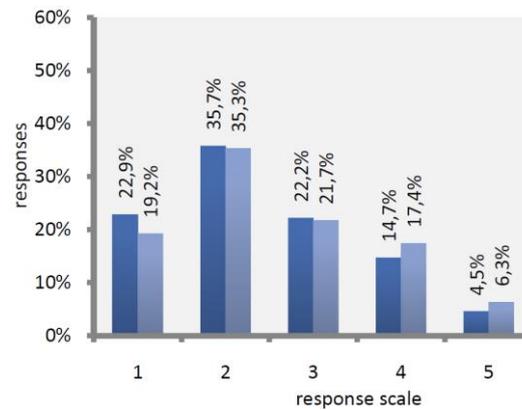


Fig. 6. Evaluation of Content before (Left Column) and after (Right Column) User Activity

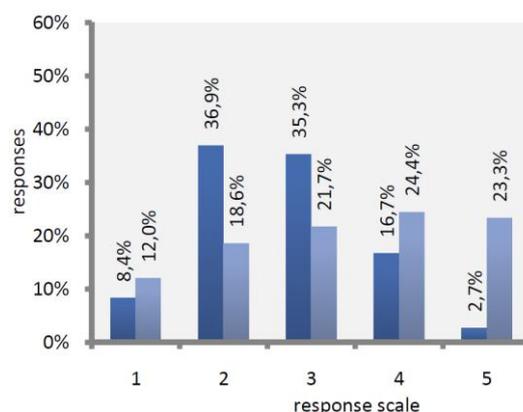
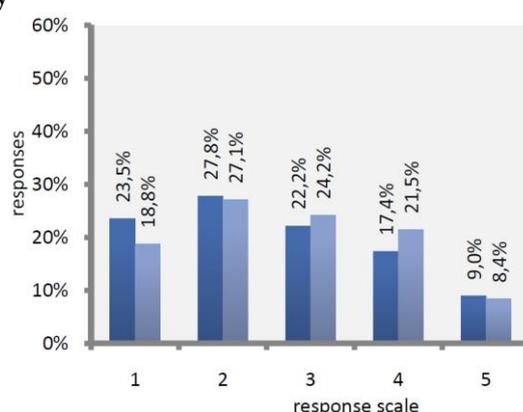


Fig. 7. Evaluation of Overall impression before (Left Column) and after (Right Column) User Activity



The key analysis was conducted in the relationship to the research hypotheses examining the match between user assessment before and after the activity. In case the hypothesis testing showed significant differences in the match, separate analyses were undertaken for those users who did and did not succeed in their activities. The dataset consists of category based ordinal variables; therefore, statistical tests often labelled as marginal homogeneity (Agresti, 1990) were employed. Results for the coincidence between user evaluations are outlined in the following table (Table 2).

Table 2: Marginal homogeneity hypothesis testing for undivided dataset

	Colours	Navigation	Layout	Visual appeal	Content	Overall impression
Std. MH Statistic	-0,616	-1,240	-3,927	-2,629	-8,198	-2,557
p-value (2-sided)	0,570	0,230	0,000	0,009	0,000	0,012
p-value (1-sided)	0,285	0,115	0,000	0,005	0,000	0,006

Marginal frequencies of all surveyed attributes have changed after the pre-assigned activity was completed (as the evaluations worsened hence the negative sign for MH statistics). When rating colours and navigation such a shift is not statistically significant; the distribution of individual frequencies before and after the activity is the same. To questions regarding layout, visual appeal, content and overall impression, evaluations have changed and the shift was supported with statistical testing. Marginal frequencies of paired measurements have changed significantly.

The following analysis divides respondents into two groups – one group has fulfilled the pre-assigned task successfully, while the other did not succeed (however,

feedback was not provided instantly and respondents did not explicitly know whether they had succeeded or not). The hypothesis testing for marginal homogeneity in the case of successful user activities is shown in the following table (Table 3).

Table 3: Marginal homogeneity hypothesis testing successful activities

	Colours	Navigation	Layout	Visual appeal	Content	Overall impression
Std. MH Statistic	1,327	2,424	0,951	0,261	1,580	0,071
p-value (2-sided)	0,211	0,018	0,376	0,845	0,127	1,000
p-value (1-sided)	0,105	0,009	0,188	0,423	0,064	0,500

To the question regarding navigation, there is a statistically significant improvement in user evaluation. However the user evaluation was more positive for all observed attributes, given the positive sign of MH statistics. The hypothesis testing for marginal homogeneity in the case of unsuccessful user activities is shown in the following table (Table 4).

Table 4: Marginal homogeneity hypothesis testing unsuccessful activities

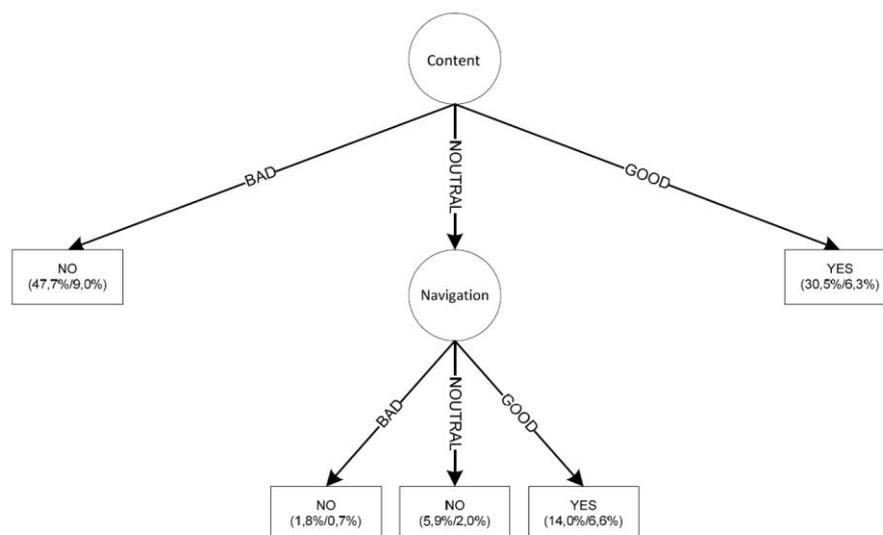
	Colours	Navigation	Layout	Visual appeal	Content	Overall impression
Std. MH Statistic	-1,919	-3,316	-4,478	-3,678	-11,049	-3,371
p-value (2-sided)	0,063	0,001	0,000	0,000	0,000	0,001
p-value (1-sided)	0,031	0,000	0,000	0,000	0,000	0,000

Again, to questions regarding visual appeal, layout, navigation, content and overall impression, there is a statistically significant shift in frequencies. User evaluations were less positive, given the negative sign of MH statistics. To questions regarding colours, the evaluation was less positive. However, the change was statistically insignificant.

Responses to overall website impression show that there is a difference in pre- and post-task evaluation. Although a positive experience with the website does not change user perception, the negative experience motivates users to judge the overall website impression less positively.

Subsequent analysis was employed to determine the most influential website quality attribute. This can be discerned based on previously presented analyses that navigation or content could be such factors. Classification methods of data mining can be used to decide, if certain levels of user satisfaction predict the success of user activities. In order to conduct this analysis, all evaluations were re-coded to a three-point ordinal scale (good, neutral, bad) from the original five point scale (1 and 2 = good, 3 = neutral, 4 and 5 = bad). Due to the experimental and exploratory nature of this study, the recoding could have provided a simpler analytical frame. Data-mining through decision trees based on the J48 algorithm and assisted by the WEKA system was applied in order to uncover prominent attributes. For the three-point scale, the analysis of undivided data prior to user activities produced the following results (Fig-8).

Fig. 8. Pruned tree for website attributes



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The numbers in the nodes represent the ratio of classified units in the branch and the ratio of incorrectly classified units in the node. The tree presented above correctly classifies 70.59% cases. This further confirms the prominent role of content for users of information websites and ascribes the second part to website navigation.

## 5. Discussion and Conclusion

The results suggest that users perceive high quality websites if they achieve what they visited the site for. This success in user activities is subconsciously reflected in website assessment (Seddon et al., 1997). Similarly, further evidence has been provided for the need to test websites based on typical scenarios and tasks (Rosson and Carroll, 2001). The importance of testing increases in the later stages of website development (Jacko et al., 2003). Post-task user evaluation worsened after the respondents actually worked with a particular homepage (see Table 4). However, for navigation and colours, this negative shift in assessment was not statistically significant. While better navigation led to a more positive website quality assessment, worse navigation decreased user satisfaction. Both effects crossed with each other. The colours evaluation showed a similar pattern, although statistically insignificant, which warrants further exploration in this issue. The internal consistency of the model (Cronbach Alpha) indicates that users are able to assess non-trivial constructs (such as content) and perceive them as a part of the website quality. Trivial website attributes (such as the colours) are evaluated similarly throughout the work with a website as users can depict them within the first few moments of their visit (Lindgaard et al., 2006).

Subsequent analysis did not prove that users would prefer websites with better colour schemes (sufficient contrast between background and foreground), although contrast measures are recommended in usability guidelines (Shneiderman et al., 2006). Assessing colours may be based on other motivations; 24 out of 43 selected websites utilized blue colouring and the blue colour is typically perceived as mediating feelings of trust and security (Madden et al., 2000). It may well then be preferred for information websites. Assessing navigation also generated unusual

results. In user satisfaction, navigation plays the role of a hybrid; negative website performance decreases user satisfaction, while a positive performance results in higher user satisfaction. The visual appeal, layout, content, and overall attractiveness lead to the conclusion of an asymmetric effect: a negative experience produces decreased satisfaction while a positive experience corresponds with expectations and hence does not change the satisfaction level. This asymmetric effect is most evident in the case of content evaluation. Such attributes could be labelled dissatisfiers. Assessment of colours did not differ throughout the experiment; hence it cannot be classified as a satisfier, dissatisfier, or hybrid. The results are outlined in the following table (Table 5).

Table 5: Results

	Content	Colours	Navigation	Layout	Visual appeal	Overall impression
Evaluation Before and After	WORSE**	EQUAL*	EQUAL*	WORSE**	WORSE**	WORSE*
Evaluation Before and After (Positive Experience)	EQUAL*	EQUAL*	BETTER*	EQUAL*	EQUAL*	EQUAL*
Evaluation Before and After (Negative Experience)	WORSE**	EQUAL*	WORSE**	WORSE**	WORSE**	WORSE**
Satisfaction variable	Dissatisfier	No effect	Hybrid	Dissatisfier	Dissatisfier	Dissatisfier
Hypothesis	H1 confirmed H2 rejected	H3.1 rejected	H3.2 confirmed	H3.3 confirmed	H3.4 confirmed	H4 rejected

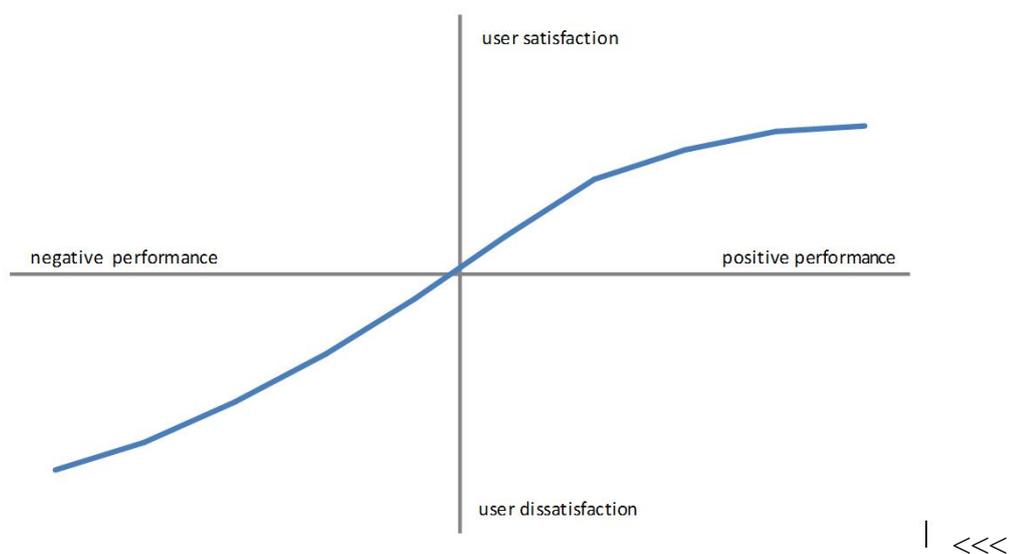
\*95% confidence level, \*\* 99% confidence level Users are optimistic when approaching a website – having a generally positive and open mind and expecting good website performance. As they work on typical tasks and spend some time on the page, their views usually change for the worse. All surveyed attributes except for the colours demonstrated this pattern, which should be familiar to web designers and academia alike.

This study provided evidence for the asymmetric effect of user satisfaction with information websites. Most attributes demonstrated an insignificant increase in user satisfaction when users succeeded in the task (as was perhaps expected), while low web performance (task not fulfilled) resulted in a significant slump in user satisfaction. Webdesigners and marketing managers alike should consider both importance and type of website characteristics. Webdesigners should pay close attention to dissatisfaction variables as negatively perceived performance may discourage or even deter website users. Once the dissatisfiers have been addressed, a website may attempt to bond with its users through improved hybrid variables. Satisfiers should be last on the agenda and would assist the organization to gain a competitive edge. However, our experiment did not identify satisfaction variables in the case of information websites. The results are consistent with the theory of consumer satisfaction asymmetry (LaBarbera and Mazursky, 1983) and document the analogies of consumer-product and user-website relationships. It remains a question

whether websites could be assessed only by marketing tools and which dimensions would apply to most web pages.

Similarly to the asymmetric and non-linear relationship between overall customer satisfaction and product performance (e.g. Mittal et al., 1998), the curve for user satisfaction on perceived web performance can be constructed. Such a curve describes the asymmetric effect as in the first quadrant (user satisfaction–positive performance) and outlines a smaller increase in user satisfaction and the third quadrant (user dissatisfaction–negative performance) shows a sharper decrease and higher dissatisfaction (Fig. 9). The goodness of fit for the constructed model is  $R^2=0.93$ .

Fig. 9. Asymmetric Effect of User Satisfaction with Information Websites



Decision-tree analysis identified content and navigation to be the most influential components in user-based website quality assessment. Future research studies or practitioners' evaluation metrics can possibly be limited to only these two items (e.g. Zhang et al., 2001) as they would still reflect more than 70% of the overall satisfaction model presented in this study.

Although the findings offer many supportive conclusions, they should be accepted with caution. The study examined only information websites and one particular target group (Dickinson, Arnott, and Prior, 2007). Other types of websites may produce different outcomes in regard to user satisfaction and asymmetry and/or may identify different items relevant for user-based evaluation. Further limitations can be related to the sample size and other sample characteristics, such as the geographical and cultural location of the Czech Republic, although user-based testing should only address target users and hence it reflects on cultural and demographic attributes (Brandon, 2001; Zahir et al., 2002). Subsequent research may wish to address such limitations.

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