Usability RoadMap to Overcome Quality Gaps

Abstract

Designing usable websites becomes the subject of major importance with the growth of e-Commerce applications and the wide range of offers the web suggests. In order to reach potential customers and maintain their loyalty under the conditions of high competition, organizations need to constantly control usability of the websites representing them. In this paper we present an incremental approach to the analysis of a website's usability fulfilled in three main steps. The purpose of our study is to obtain an efficient and effective process for identifying and realizing the improvements and re-engineering of the website. In order to illustrate the approach, we describe the results of its application to the website of a tourist destination, the Italian province Alto Adige - South Tyrol.

1. Introduction

Usability plays a critical role for the success of a website. For many sectors websites are mandatory to support companies and organizations strategies and activities and to this end sites undergo continuous changes and revisions. New content and functionalities have to be added, existing ones have to be regularly updated, new sections or localized versions have to be adopted to meet business goals and to adapt the site to emergent trends and new users' habits. In such a context, maintaining usability at an adequate level is an extremely challenging task.

Although many models intended to evaluate usability of a website have been developed, there is a need in proposals establishing a systematic way to improve usability of websites. In fact, on the one hand, there exist a number of projects with specific technical suggestions that can be interpreted as a *bottom-up* approach to usability, where the focus is drawn to basic aspects and features, often independent from goals and domain of the website, defined in general-purpose quality models. Normally, bottom-up methods implicitly assume a linear "waterfall-style" usability process. On the other hand, we can find methodologies that consider usability as the central point for development of a website, as the user centered design. However, this *top-*

down approach turns out to be difficult to contextualize in individual projects. The trade-off between bottom-up and top-down approaches could be dealt with a usability evaluation process that helps to identify the sequence of techniques to be applied in a specific application. The process must be described in such a way as to be understood and used by both the management and the web development teams. The first one has to invest in the usability of the website, given that the improved usability increases the success of the website in business terms. Whereas, developers need specific suggestions on how the site should be revised.

In this paper we propose an incremental process to evaluate the usability of websites according to a to a lightweight, goal-driven approach. The main objective is to apply techniques of increasing complexity to address the cost-benefit trade-off at each step of the evaluation. The new incremental process also allows addressing usability issues as an ongoing activity according to the "continuous improvements" or kaizen vision [9] and also to the Plan-Do-Check-Act quality cycle [6]. To illustrate the feasibility and the efficacy of the approach we report the results of its application to a complex tourist website, which plays a strategic role for a region of the north of Italy.

The rest of the paper is structured as follows: the original incremental approach is introduced in Section 2; Section 3 presents the evaluation results for the website of the Italian region Alto Adige – South Tyrol; the conclusions are summarized in Section 4.

2. The Incremental Method for Evaluation of the Usability of Websites

The evaluation of a website's usability involves numerous aspects related to components of different nature ranging from graphic design to availability of languages for the strategic targets of the company or organization, from usage an appropriate terminology to the possibility to correctly visualize the Web pages in the most popular browsers. Thus, there are many partially non-orthogonal factors, related to different science disciplines whose influence may overlap both negatively and positively. For instance, the graphic look may help the user to quickly identify the content of

interest on a Web page, but increases download time.

In theoretical perspective, the website usability constitutes one of the quality dimensions of a site and, in order to draw attention to the viewpoint of the user-navigator is frequently referred as the quality in use [10]. In a systemic vision, usability contributes to the quality of a website with other six dimensions, as defined in the meta-model 7Loci [12], namely: *Identity*, *Content*, *Services*, *Identification*, *Maintenance* and *Feasibility*. Taking into account these general considerations, the main assumptions of the proposed approach are following:

- Usability is one of dimensions of website quality and is evaluated in the context of other aspects. In particular, we adopted the 7Loci model.

- There are numerous types of quality and the usability concerns the quality in use in the first place, but it can't be disjoint from the expected quality and therefore from the requirements that the website must satisfy for various targets [4].

- The analysis of the quality and usability of a website involves various expertises and increasing costs for evaluation techniques depending on the required level of detail [3]. It is therefore appropriate to adopt a method that allows using techniques 'adequate' for each level avoiding the use of too sophisticated instruments where they are unnecessary. In this way, we can reduce the costs and maximize output, thus contributing both to the effectiveness and efficiency.

The last observation naturally requires devising an evaluation framework for usability of websites in several stages. In this work, we proposed a process based on three phases. Each phase is characterized by different objectives, increasing complexity and costs:

1. An inspective evaluation, on the basis of the meta-model 7Loci [12] carried out by experts in the website quality and the domain the website belongs to, i.e., marketing and tourism. Experts can refer to (a) recognized best practices, checklists and standards, (b) domain specialized quality schema or (c) quality schema for specific categories of websites in a given domain. The aim is to fulfill a preliminary systematic evaluation of all the dimensions that characterize a website in order to obtain useful information for the third step of the evaluation process, which focuses on the usability of the site. Problems identified in the first step have to be addressed before going on to the following ones as these problems represent a kind of noise in respect of any kind of testing activity. This phase takes into account the strategies of the organization that ordered the website and the goals of the site, as all the dimensions of the 7Loci meta-model have to be analyzed in the context of the given website.

2. A comparative evaluation, where the given website is compared to competitors' websites in order to position the results of the inspective evaluation in the competitive context. The results of this phase can be crucial for management decisions with respect to the investments necessary for the maintenance and the revision of the website. Moreover, comparing to competitors it is possible to address one of the 4 fundamental quality principles Four Absolutes of Quality Management^{TM}: "quality means conformance to requirements, not goodness" [5].

3. A test with a panel of customers, identified on the basis of the (most important or critical) site's target, in order to study most crucial aspects related to the usability in a controlled experiment. The goal is to elicit eventual difficulties met by the user during the navigation of the website given predefined tasks. Such tasks are selected among those related to the website's crucial functionalities and, therefore, strategic for the success of the company business model. This last step can be integrated with an accessibility evaluation according to the guidelines of the Stanca law for Public Administration and recommended also for other websites in Italy [11], European accessibility laws [8], [7], or American accessibility standards [1], [2].

These three steps are intended to optimize the effort necessary to improve the usability of the website by binding them to the explicit objectives of the company, objectives that in turn depend on its strategy and on customers' and users' goals. In particular, the first step allows to 'contextualize' the usability evaluation of the website with respect to the other dimensions determining its overall quality. For example, a website that does not allow the tourist to understand the nature of the site may force the user to leave it even if there is no navigation and usability problem in the strict sense. An example is the site with weakly characterized Identity, for instance, a portal of the agency of regional tourist promotion vs. a commercial website for the same destination.

Another critical aspect for the realization of a usable website is the analysis of the targets to which it is addressed and therefore the abilities to take advantage of the potentialities of the Web differentiating content and services for different audience. For example, to promote a destination on a new market it is necessary to decide to which extent is sufficient to realize a translation of the site (or of its main sections or of the reservations interfaces) to the other language, or if it must be localized adapting the contents to

the culture and the specific requirements of the target that characterizes such market.

However, the last step is the most critical, because usability experiments involve the realization of specific projects with adequate human and time resources and in general are more expensive than any other heuristic or inspective techniques [3].

Activities and results of each step have to be documented in order to optimize the information content of the communication with the stakeholders. In some projects the management can play the role of mediator between the usability and the website development teams, and also between both the teams and the owners and sponsors of the website. The following table 1 illustrates the most relevant characteristics of each step, as regards scope, techniques, automation level, main roles, costs and output.

An important question is when a usability project should start. Most crucial factors that may trigger such a project are changes in the web business model, unsatisfied web-based business goals, decreasing online competitive advantage, and many others. From a methodological viewpoint, another issue is how the usability project can fit with the website lifecycle. For developing new websites, the answer depends on the lifecycle model adopted. A hybrid approach, that suggests an agile user-cantered web engineering process, would perfectly fit with the "inspection-comparison-testing" cycle as the one proposed in the present paper. More linear and classical lifecycle models can benefit from usability evaluation at different stages of the development.

The following section illustrates the application of the incremental approach articulated in three steps on the example of the projects realized for the website www.suedtirol.info of the Alto Adige – Suedtirol in 2005.

3. Evaluation of the Tourist Website of Alto Adige - South Tyrol

3.1 Premise

The website of a tourist destination plays a fundamental role in the promotion of the offer and beyond that, in the definition of the alternatives of vacation from part of the tourist. All the data confirm the increase of the number of those who refer to the Web rather than to traditional channels for collection of information useful to decide where to spend vacations, and, even if to a smaller extent, to reserve related services. Indeed, the world e-travel and e-tourism market has always played a leading role in the e-commerce and has developed significantly over the last few years. Online travel related sales accounted for a 19.5% share of the global retail travel sector in 2006, the majority of which were made via online travel agents (http://www.travelindustrydeals.com/news/3241).

The website www.suedtirol.info belongs to the tourist society of the autonomous province Alto Adige – South Tyrol. This province is a part of the Italian region Trentino, where the alpine tourism plays a very important role. The site www.suedtirol.info is managed by the company Sinfonet s.c.r.l., whose mission is development, communication and intermediation of the tourist destination of Alto Adige – South Tyrol. The main goal of the website www.suedtirol.info is to bring potential guests to Alto Adige. However, the need in offering adequate services to maintain the high percentage of loyal tourists (70%) should not be neglected. More specifically, in the launch project of the website, Sinfonet has identified three target groups of users in the following order of priority:

- *Indecisive*: a client familiar with the destination and with the site; navigates freely looking for new information; allows to be guided by the offers and content of the site;

- *New visitor*: a user that is not familiar with Alto Adige; needs additional guidance and orientation; reaches the website by means of advertisements on the Internet or on traditional communication channels;

- *Quick traveler*: a client well familiar with the site; primarily interested in lodging search and booking online.

The first version of the www.suedtirol.info website went online in 2002 and was characterized by an innovative graphic design, different from the traditional three column layouts of portals, and by some original marketing choices, for instance, the presence of the areas related to shared emotion groups, only partially corresponding to different tourist segments.

In the following subsection we describe the three steps of the evaluation process in some details in order to give a clear idea of the variety of the issues that must be tackled and to illustrate passages that are difficult to be found in the existing literature.

3.2 Step #1: Inspective Evaluation

The inspective evaluation of the website www.suedtirol.info proceeded in two phases that were correspondingly realized by means of:

1. A standard evaluation schema: a preliminary evaluation based on a grid derived from the 7Loci model, aiming at obtaining a general idea on strongest and weakest dimensions;

2. A detailed evaluation: intended to identify aspects that need to be improved to increase the overall quality.

Table 1. Phases of the usability process

| Phase	Scope	Techniques	Automation level	Roles	Costs	Output
1	All webpages	Inspective: heuristics, domain checklists, standards, best practices, etc.	Low, average	Quality and domain experts	Low, average	Critical points and priorities report
2	Competitors' websites	Inspective, performance measurement, etc.	Low, average	Quality and domain experts	Low, average	Comparison tables
3	Strategical functionalities; transactional interfaces	Controlled experiments, tests, interviews	Low	Users	High	Audio and video files, cards
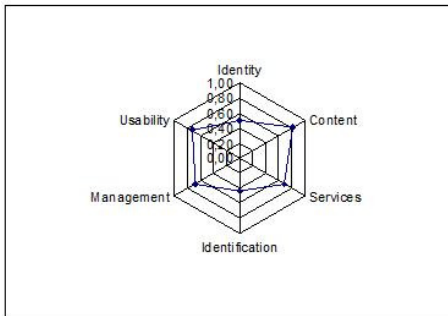
Figure 1. Quality of the website www.suedtirol.info

The first evaluation of the website was fulfilled using a schema with the first six dimensions of the 7Loci model. The seventh dimension, Feasibility related to project management issues of a website, was not considered in this evaluation because: first, it was not requested by Sinfonet; second, this dimension is traversal with respect to the others and can be seen as meta property. The schema contains 26 questions with the reply choices from 0 to 3 interpreted as follows: 0 - unacceptable, 1 - poor, 2 - acceptable, 3 - completely. Scores has been assigned taking into account information on www.suedtirol.info, Sinfonet, and on the missions and functions of tourist boards. See a fragment of the collected feedback in Table 2 (verbatim translation from Italian). The following diagram (Fig. 1) represents the final result of this evaluation for www.suedtirol.info. In particular, we can notice that the most critical aspects are related to the dimensions Identity and Identification of the model 7Loci.

From the methodological viewpoint, if these results will be used to choose the priorities of contribution for the various dimensions of the site, it is necessary to weigh the obtained scores in order to take into account the significance that the tourist agency associates with the questions of each dimension. It is important in fact to emphasize that the results of the table is read in relative and not absolute way. In other words, the comparison should not be made regarding the maximum score, but regarding the score corresponding to the "profile" of quality established for a given version of www.suedtirol.info. Another way to consider the significance of each aspect for www.suedtirol.info in a certain moment of its evaluation, alternatively to the numerical weights, consists in classifying them as requirements that the site must, would have to, and could satisfy, respectively, following a generally used practice in requirements engineering. The first category includes those which are considered fundamental by the agency and integral for its strategies (compulsory); the second one consists of the aspects which are useful, but are less urgent (recommended); the third one contains those that are appreciated, but the not essential (optional).

Second step analyses the problems noted by the experts in the evaluation using the standard table. As a result, the critical points of the website have been elaborated in detail. Such points of weakness have been classified in three groups according to the priorities of contribution suggested in the previous sub-paragraph. In particular, we identified three aspects that have a significant impact on the total quality of the site – *compulsory*; other nine points which would be useful to integrate – *recommended*, and several aspects that could be improved – *optional*. For the lack of space we only focus on the first group of issues.

The most problematic points identified by the experts were: (1) weak website identity; (2) the three areas of the site that were not understood as directed to three different segments; (3) a non intuitive navigational logic of the website. The first problem is caused by the lack of connotation of the website www.suedtirol.info as the official marketing site of Alto Adige is unacceptable. In fact, one of the experts started evaluating another website trying to find the address of the site independently. Such a technique is a frequent practice among advanced navigators and can indicate an important problem with the authority of the site. The second issue relates to the lack of understanding of the site's thematic sections as three user segments, which is mainly caused by inappropriate literal translation of the corresponding titles. For instance, Italian word "familiarmente" was not understood as "being with the family" as it was intended by the site. Instead, a more spread meaning of this word is "with familiarity, with confidence". Finally,

Table 2. Main inspective evaluation results according to the standard schema

Identity dimension	Score	Some critical observations
Brand: does the website have a strong identity?	2	Inconsistency in the use and interpretation of the logo
Image: Does the website transmit a sound image of the company?	1	The nature of the company behind the site is not clear
Design: Is the websites graphics attractive to the users?	2	Original design, but not straightforwardly intuitive. The left section is not always used properly to indicate current location and what are other functions available, while the right section has certain "random" data in some pages
Personalization: Does the website adapt to different user categories?	1	The three fields of the site are not easily recognizable as different modes of adapting to three types of tourists (names were defined "pedantic" by one of the experts; in the Italian version names were less successful than in the German ones)

Table 3. Comparison of the quality of www.suedtirol.info to the website of tourist organizations of Trentino, Tyrol and Carinthia

Dimension	South Tyrol	Trentino	Tyrol	Carinthia
Content	0.78	0.81	0.81	0.63
Services	0.83	0.92	0.83	0.58
Identity	0.80	1.00	1.00	0.87
Identification	0.42	0.75	0.92	0.83
Management	0.88	0.88	0.88	0.63
Usability	0.89	0.89	0.83	0.78

difficulty of comprehending the logic of the site is partially related to the previously discussed issue: as the functionality of the three sections, which the organization of contents is based on, is not catch, all the navigation of the site becomes more difficult to the user. Another reason is the complexity of the graphical design of the site. Although the design itself was estimated as original and elegant by all the experts, the rules of inner and external coherence were not complied enough to reduce the cognitive effort required for navigation.

3.3 Step #2: Comparison with Competitors' Websites

The website www.suedtirol.info has been compared to the sites of the three competitors adjacent regions: Trentino (http://www.trentino.to), Tyrol (http://www.tirol.at) and Carinthia (http://www.kaernten.at). These websites were identified by the management of Sinfonet as major competitor destinations. For the comparative evaluation of the sites, we used a table consisting of approximately one hundred Boolean questions. The results of the comparative evaluation are summarized in Table 3 and represented in the next radar diagrams. The first observation that can be drawn from the obtained data is that the performances of the first three sites do not differ substantially, except for the dimension of Identification.

Focusing on the site of South Tyrol, this analysis confirms, together with the evaluation based on the standard table, that the most critical dimension is Identification. The comparison for Identity seems less problematic than is resulted from the first evaluation step. However, it is necessary to remember that this type of comparison is approximate. In fact, even reducing the subjectivity and facilitating the comparison, the Boolean questions do not cater for qualitative differences.

On the basis of this comparative evaluation a number of suggestions for the website were drawn, mainly for the Content dimension. In particular, the need to reach openning new markets and increase the number of casual visitors required a greater attention to the presentation of the region in general. It would be necessary to provide a tourist unfamiliar with the destinations a unified general picture, describing its geography, the main cultural and historical aspects, etc. This idea still remains implicit in the actual versions of all the analyzed sites. In addition, it may be advantageous to use feedback of testimonials in specific sections (e.g., for sports); add references to some historical events, or describe environment and culture issues characterizing the destination. Also bibliographical references or sites describing in detail the history of the region or other specific topics are appreciated by tourists attracted by the destination. Other useful information that can be used during the stay must be elaborated. For instance, the information about local restaurants was weakly covered by the analyzed websites and difficult to find.

3.4 Step #3: Evaluation with a Panel of Users

The third phase of the evaluation project of the website www.suedtirol.info has involved an experiment that appealed directly to the users, instead of experts, with the purpose to obtain more specific and precise information on the usability of the site. This type of experiments allow to gather information on the customer behaviour during navigation of the site in realistic contexts of use in order to identify difficulties or obstacles that make the users to abandon the site or prevent the customers from achieving their goals, and as a consequence reducing the success of the

website. However, the experiments with the users bring in some risks, the most important is obtaining much information, but not being able to fully interpret or use it effectively to improve the site. Moreover, given that experiments are expensive in terms of human resources as well as time consuming - their realization must be defined and planned with large attention [3].

In the case of the tourist destination Alto Adige South Tyrol, we decided to realize a controlled experiment: (a) after having completed all steps of the inspective phase; (b) on the basis of data recorded in the log files on the behavior of the users on site; and (c) in the perspective of the company goals for the site. The first systematic evaluation allowed to eliminate many of the anomalies and problems present in the site.

The data extracted from the log files demonstrated that the most demanded pages and sections during the year 2004 were:(1) Search of the hotel availability; (2) Packages offered; (3) Calendar events; (4) Weather. At last, the main objective of the management of Sinfonet for the development of the new website www.suedtirol.info was to increase the reservations online and the sale of the packages. The results of the experiment were analyzed focusing both on the achievement of the four assigned tasks, as well as the how they have been realized. Problems related to the time constraints and user satisfaction were identified from the record of the test and the final questionnaire.

In summary, the realization of the experiments with the users allowed to identify serious usability problems of the site for all the tasks. In some cases the identified problems differ for the two targets and didn't allow the subjects to complete the task. The majority of the difficulties met were caused by the online reservation forms. One of the most important issues is the need to specify a locality even where the tourist could not still make a decision. Usually, the subject had not yet got the idea about the locality or did not have any specific preferences. Therefore, it is desired that the website suggest some suitable solutions. Another reason is the lack of any result for all of the specified conditions of accommodation, though the key parameters could be satisfied. Booking a vacation package turned out to be particularly problematic, where nearly all the subjects completed the task violating the parameters indicated in the experiment (number of nights, budget, and others). This was caused mainly by insufficient flexibility of the reservation system with respect to the topic chosen by the tourist (sport, cultural, or other). Moreover, finding a way to get to the locality and the request of a brochure involved several difficulties related to the navigational structure of the website.

4. Conclusions

This work introduced an incremental approach for the evaluation of the usability of the website. The application of the three steps of the proposed approach was illustrated on the website www.suedtirol.info. This application confirmed that the incremental method allows to collect information in systematic way starting from an inspective evaluation, with two various levels of detail, continuing with a comparative analysis of the competitive websites, and finalizing the analysis with a third phase that involves the experiment with the customers. The planning of this last step is based on data obtained from the preceding steps that allow to effectively define the tasks, select subjects to be involved and optimize the outcome on the investment.

Acknowledgments

References

[1] Architectural and Transportation Barriers Compliance Board. Telecommunications act accessibility guidelines. *Federal Register*, February 3, 1998.

[2] Architectural and Transportation Barriers Compliance Board. Electronic and information technology accessibility standards. *Federal Register*, December 21, 2000.

[3] R. G. Bias and D. J. Mayhew. *Cost-justifying usability: An update for the Internet age*. Morgan Kaufmann Publishers, 2 edition, 2005.

[4] D. Bolchini, L. Cantoni, and L. Triacca. Website usability and quality of web communication. In *Proc. 5th Association for Business Communication (ABC) European Convention*, 2003.

[5] P. B. Crosby. *Quality is free*. McGraw-Hill, 1979.

[6] W. E. Deming. *Out of the Crisis*. MIT Press, 1986.

[7] European Parliament. *Resolution on the Commission communication eEurope 2002: Accessibility of Public Websites and their Content*. 2002.

[8] European Union. *Council of the European Union: Accessibility of Public Websites – Accessibility for People with Disabilities: Council Resolution*. 2002.

[9] M. Imai. *Kaizen: The Key To Japan's Competitive Success*. McGraw-Hill/Irwin, 1 edition, 1986.

[10] ISO/IEC TR 9126-4. *Software engineering - Product quality - Part 4: Quality in use metrics*. 2004.

[11] Italian Parliament. Stanca Act, Law no. 4, January 9, 2004: Provisions to support the access to information technologies for the disabled. *Gazzetta Ufficiale*, 13(17 January 2004), 2004.

[12] L. Mich, M. Franch, and G. Cilione. The 2QCV3Q Quality Model for the Analysiy of Web site Requirements. *Journal of Web Engineering*, 2(2):105–127.