BRIDGING THE QUALITY GAPS FOR A MULTISTEP PROCESS TO WEBSITE USABILITY

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Dicembre 2010 □ N. 21
ABSTRACT

Usability plays a key role for the success of a website and in turn of the e-business model it supports. There are a variety of approaches and techniques a web agency can choose from to develop websites that assure usability intended as the quality of user experience. However, identifying which techniques are more suitable for a given project, addressing cost-benefit concerns, is often left to the experience of the web engineer. In this paper we propose a systematic approach for realizing more usable websites, based on a process defined to overcome quality gaps appearing in website lifecycle. The result is a multi-step process suggesting the techniques most adequate to bridge a given gap. In order to illustrate the process, we describe the results of its application to the website of a tourist destination.

KEYWORDS
Website, Usability, Quality dimensions, 7Loci meta-model, Usability techniques, Gaps.

1. INTRODUCTION

Usability plays a critical role for the success of a website [Nielsen 2003]. For many sectors websites are mandatory to support companies and organizations strategies and activities (see, for example, [Afuah and Tucci 2003], [Feng 2007], [Rappa 2009], [Timmers 1998]) 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 [Garigliano et al. 2008]. In such a context, maintaining usability at an adequate level is a challenging task.

Usability and computer interfaces have been investigated since the 1940's [Bush 1945], but Internet and Web inception highly increased the demand of methods to address usability and quality concerns and there are a variety of contributions coming both from academia and consultants; among the most cited [Norman 1988], [Nielsen and Landauer 1993], [Nielsen and Loranger 2006]. Besides technological and cognitive factors, economic return of investment in usability has been investigated [Bias and Mayhew 1994], [Bias and Mayhew 2005], [Griffith 2002], [Nielsen 2008]. Wixon [2003] criticize existing contributions, asking for studies providing cost-benefit analysis to support practitioners in real projects. Usability techniques and tools have also been largely studied and classified [Doubleday et al. 1997], [Dix 2003], [Pearrow 2006], [Tomlin 2009]. Some authors underline the need to apply different techniques integrating their results [Jeffries and Desurvire 1992], given that none of them alone can take into account of all the usability issues. It is also worth mentioning that companies investing in usability - on average, about 11% of overall web design and build budget - often do not adopt any specific process [e-consultancy 2007]. Finally, Norman recommends that usability concerns should not be regarded as "beta testing" for software development [Norman 2006].
Thus, although many models and techniques 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, there exist a number of approaches which range from general-purpose quality models (e.g., [Cantoni et al. 2003], [Matera et al. 2002], [Olsina et al. 2005]), to very specific, usually domain and task-dependent frameworks, (e.g., [Barnes and Vidgen 2001], [Kim and Stoel 2004], [Minerva 2003]). Besides, we find authors that consider usability as the central point for development of a website, promoting a user centred design [Krug 2000], [Garrett 2002].

Focusing on the existing usability process, the International Organization for Standardization (ISO) has proposed a multi-steps process [ISO 13407 1999], [ISO/IEC 14598-5 1998]; a complex usability engineering life cycle is defined in [Mayhew 1999]. In the web engineering area, website quality auditing is recommended has an integral part of the re-engineering strategy [Deshpande et al. 2002].

Nevertheless, existing approaches and processes are based on principles and steps often too general to be readily end effectively adopted in a specific project. The usability process proposed in this paper aims to find an adequate prescription level to allow its application with limited customization, but also to be sufficiently flexible to manage specific usability strategies. Another requirement for the process is that it must be stated in such a way as to be understood and adopted with commitment by both the management of the company owning the website 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 term. Whereas, developers need specific suggestions on how the site should be revised.

To tackle these requirements and taking into account that usability is a relevant dimension of the more general concept of quality, we propose a new structured process to design and evaluate the usability of websites according to a quality gaps bridging approach. Since quality depends on a number of factors and points of view, it comes in different types [Grönroos 1990], [Juran and Gryna 1980], [Juran 1995]. Differences in understanding of quality on the company’s side (the goods or services provider) and the users’ side represent a number of gaps that have to be managed to support the success of the company [Parasuraman et al. 1985]. We then apply the concept of quality gap to define a roadmap, that is a process for website usability which steps correspond to different quality gaps that may occurs in the website lifecycle. For each step we suggest a usability technique to reduce the quality gaps in an efficient way, applying techniques of increasing complexity and costs.

To illustrate the feasibility and the effectiveness of the approach we report the main results of its application to a real project for a complex tourist website, which plays a strategic role for a region of the north of Italy. Usability assessment for tourist destination websites is a challenging task, because such sites pose all the problems related to websites development at an enhanced level.

An early version of the process has been presented in a conference paper [Mich et al. 2008]; this paper extends this earlier work by offering a complete methodological framework and providing a comprehensive analysis of the application of the process.

The rest of the paper is structured as follows: the original quality-gaps roadmap for a usability process is introduced in Section 2; Section 3 presents its application to the tourism website of the Italian province Alto Adige □ South Tyrol, which is part of the Italian autonomous region Trentino Alto Adige-Suedtirol; conclusions are summarized in Section 4.

2. A QUALITY-GAPS BRIDGING PROCESS TO ADDRESS WEBSITES USABILITY

Websites’ 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 of an appropriate terminology to the possibility to correctly visualize the Web pages in the most popular browsers, etc. Thus, there are many factors that are not always orthogonal and can be related to different scientific 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 could also increase download times (e.g., for an image-based page, in terms of memory usage and consequently network bandwidth). In theoretical perspective, usability constitutes one of the quality dimensions of a website and, in order to draw attention to the viewpoint of the user-navigator is frequently referred as the quality in use [ISO/IEC 9126-4 2004] or more recently as user experience [Stewart 2008]. Moreover, given that a website cannot be regarded as a mere good, we can refer also to service quality as defined in economics.
Taking into account these general considerations, the main assumptions of the proposed approach are the following:

- **Usability** is one of the dimensions of website quality and therefore it must be evaluated in the context of other aspects. In particular, we adopted the 7Loci meta-model (firstly named 2QCV3Q) [Mich et al. 2003c], [Mich and Franch 2005], that identifies the above mentioned dimensions interpreting the loci of classical rhetoric [Cicero 58bc]: quis (Identity), quid (Content), cur (Services), ubi (Identification), quando (Management), quomodo (Usability), to which medieval treatises added a seventh dimension quibus auxiliis (Feasibility) to deal with issues related to with what means and devices (since the 1940s, the first six loci have been widely used in journalism, taking the form of the five wh-/h questions: who, what, why, when, where, how). Beside characteristics included in many of the quality models, for example the ISO model for the quality of software [ISO/IEC 9126-1 2001], 7Loci deals with identity and project management issues that are critical for the success of a website.

- **Given that a website is a product with characteristics of both goods and services,** we suggest referring to the service quality model defined in the seminal paper by Parasuraman et al. [1985]. The core assumption of the model states that the service quality as perceived by consumers is a function of the gap between the expected and perceived service that in turn depends on the design, marketing and delivery of the service. We adapted this model to address the mixed nature of goods (mainly in terms of the hardware and software components) and services of a website.

Focusing on the quality gaps, we introduce an incremental process to website usability that aims at suggesting which usability tools and techniques can be adopted at each step of the evaluation. Our process considers both the users' and the owner's points of view. For the first viewpoint, the following types of quality are important:

- **Requested quality** is the quality that the users expect from website to satisfy their stated needs and can be explicitly defined by the requirements that the website must satisfy for its various segments [Mich et al. 2003b], or audience [Cantoni et al. 2003], [van der Geest 2001].
- **Expected quality** that is also called *not declared quality* because the users take it for granted; it can often be described in terms of functionalities already present in competitors' websites.
- **Quality in use** represents the quality of the website as perceived by the user in a specific use context, to perform tasks that allow fulfilling his or her goals.
- **Perceived quality** is the quality that the users believe they have received as compared to their expectations. It differs from delivered quality because it also depends on the communication of the quality given by the website owner.
- **Unexpected quality**, also called latent, is when the site satisfies needs that are new or unknown to the users; these needs cannot be identified with a requirements analysis as they represent something unexpected.

For the owner point of view, the website quality can be studied in terms of designed quality and delivered quality:

- **Designed quality** is the quality the website owner has planned to offer to the user; from the analysis of requested and expected quality, users' needs are interpreted in terms of specifications for the website.
- **Delivered or issued quality** is the result of the transposition of the design into a website.

Gaps could arise when there are differences or discrepancies regarding the owner's (e.g., the managers of a company, or the members of a consortium for a tourism organisation, etc.) and users' (e.g., customers of an e-commerce company, members of a consortium, etc.) perceptions of website quality. In this situation, the objective of the company should be to fill in these gaps as much as possible, according to a reactive quality management. But sometimes it is necessary to increase the quality going beyond the users' expectation and satisfy latent requirements that customers may not be aware of, thus increasing the business value adopting a proactive quality management. The goal of a usability project can then be interpreted as bridging the qualities gaps, so that, for example, the delivered quality is brought as close as
possible to the expected and the requested quality. To this end, it is necessary to intervene on the gaps, or differences, that can occur between the above mentioned qualities and that represent critical points for the website overall quality. This observation suggests using the quality gaps as a roadmap obtaining an evaluation process for usability of websites based on five main steps. Fig. 1 illustrates the suggested process. At each step of the evaluation (these steps correspond to the gaps from the top to the bottom of the figure), a specific quality gap is addressed by one or more usability technique. In fact, the analysis of the quality and usability of a website involves various expertises, including domain knowledge, and increasing costs for evaluation techniques depending on a quality gap to be addressed and on the required level of analysis [Bias and Mayhew 2005]. It is therefore appropriate to adopt a method that allows identifying techniques for each level avoiding the use of too sophisticated instruments where they are unnecessary, in order to reduce the costs and to maximize output (efficiency and effectiveness). Accordingly, we propose a five-step process where each step is characterized by different objectives, increasing complexity and costs.

- **Step 1/Gap1.** This step has to assess whether the requested quality is fulfilled, in other words, we must check if there is a gap between the requested quality and the designed or delivered quality of the website. To this end, depending on the stage of development of the website we can (a) verify the compliance to the initial requirements of the prototypes or wireframes of the web pages for the designed quality, or (b) verify the compliance to the requirements of the on-line version of the website for delivered quality. As for the usability technique, we suggest an inspective evaluation. The evaluation is to be carried out by experts in the website quality and the domain the website belongs to. For example, marketing (and e-marketing) and tourism (and e-tourism) for a tourism portal. Experts can refer to: (a) recognized best practices, checklists and standards, that in our approach can be integrated and derived from the 7Loci meta-model [Mich et al. 2003a]; see also [Olsina 2005]; (b) quality schema specialised for specific domains if available (see [Mich and Franch 2005]) or categories of websites (see for example, [Barnes and Vidgen 2002], [Triacca et al. 2004], [Mich et al. 2005]). The aim is to accomplish a systematic evaluation of all the dimensions characterizing a website, determining its overall quality, and thus contextualizing the evaluation of usability vs. the other quality dimensions. Results of this assessment can be used to plan or refocus changes on any of the features of the website, prioritizing the most critical ones.

- **Step 2/Gap2.** In this step we have to check if the website satisfies the needs that are taken for granted by the users, corresponding to the implicit or expected quality requirements. For this purpose, the website is compared to competitors websites in order to position the results of the previous inspective evaluation in the competitive context. The main assumption is that to maintain your (online) competitive advantage, information, services and any other features that users are accustomed to find in competitors websites should be available on the website of interest as well. Inspection techniques can be adopted in this step too. If necessary, quality models can be applied assigning scores to macro-attributes allowing to quickly compare performances of the investigated websites. The results of this phase can be crucial for management decisions with respect to the investments necessary for website evolution. Moreover, results of the comparison to competitors and those obtained in the first step of the quality gaps roadmap allow to address one of the fundamental quality principles or Four Absolutes of Quality Management[], that is, quality means conformance to requirements, not goodness[] [Crosby 1979].

- **Step 3/Gap 3.** Quality in use is normally evaluated with tests and experiments with users. In many cases it is necessary to plan a test with a panel of users or customers, identified on the basis of the site targets, in order to study the usability in the setting of a controlled experiment. The goal is to elicit eventual difficulties with using the website to fulfil predefined tasks. Such tasks are selected among those related to the website crucial functionalities and are, therefore, strategic for the success of the company business model. This step can be integrated with an accessibility evaluation according to the Web Content Accessibility Guidelines (WCAG2.0) of the Web Accessibility Initiative of the World Wide Web Consortium (W3C) (http://www.w3.org/WAI), or to the American 508 Law (http://www.section508.gov) or to the Stanca law for Public Administration recommended for all other websites in Italy (http://www.pubbliaccesso.gov.it/normative/law_20040109_n4.htm).

- **Step 4/Gap 4.** The quality perceived by the users depends on the communication, for example advertising, of the delivered website. This aspect can then be investigated by means of questionnaires, interviews, or indexes related to loyal customers and conversion rate. The perceived quality can be investigated in the context of the experiments with the users, as happened with the project described in section 3.
Fig. 1 Quality gaps in the usability process

- **Step 5/Gap 5.** This step deals with a major concern regarding the role of the website for the organization business models. In fact, covering the quality gaps described in Fig. 1, that is satisfying needs, requirements, goals or expectations related to expected, requested, perceived and quality in use, does not always guarantee a competitive advantage. In other words, a quality website would not necessarily be successful. For this reason, the website has to offer some services or contents that correspond to unexpected requirements of the users. To identify these services, creativity techniques (e.g., \cite{Gause and Weinberg 1989}, \cite{Meiden}, \cite{Mich et al. 2005}), or forecasting methods as the Delphi method \cite{Linstone and Turoff 2002} can be applied, involving experts of different domains. Obviously, when new ideas are generated, they must be adopted in the website in such a way as to maintain its usability.

These five steps are intended to optimize the effort necessary to improve the usability of a website by binding them to overcoming different quality gaps. In this setting, a particular step can be applied as many times as a quality gap turns out. In particular, the first step allows contextualising the usability evaluation of the website with respect to the other dimensions determining its overall quality. For example, a website that doesn't allow the tourist to understand the nature of the site (e.g., a portal of the agency of regional tourist promotion vs. a commercial website for the same destination), may force the user to leave it even if there are no navigation or usability problems in the strict sense. Also the analysis of the target groups to which the website is addressed is critical for the realization of a usable website, because usability investments can be minimized by differentiating content and services for different audience. For instance, for promoting a tourist destination on a new market it is necessary to decide to which extent a translation of the site must be realized. In some cases it is sufficient to translate only main sections or e-commerce interfaces, e.g., of the form to reserve a hotel room, to the other language. In other cases, the website must be localized adapting its content to the culture and the specific requirements of the segments that characterizes this new market. However, the third step is the most critical, because usability experiments and tests are in general more expensive than any inspective techniques \cite{Bias and Mayhew 2005}.

Activities and results of each step have to be documented in order to optimise the information content of the communication with the stakeholders. In some projects the management can play the role of mediator between several sides: the usability evaluators and the website development team, and also the owners and sponsors of the website.
An important question is when a usability project should start. Even though it is not possible to give a general answer, we can list factors that shall trigger such a project; starting from those more strategic for the organization: (a) changes in the web business model (e.g., from a promotional to an e-commerce website); (b) missed web-based business goals; (c) decreasing online competitive advantage; (d) the need in revising the website for marketing reasons (e.g., for tourist destination websites, it is advised to foresee an important revision of the site with a 2-3 years frequency); (e) an opportunity to adopt a new technology or instruments to improve the website performance; (f) the need to evaluate a new transaction or communication functionalities (e.g., when a virtual space for a web community is introduced); and finally, (g) suggestions from users and website developers.

From a methodological point of view, another relevant issue is how usability project can be fitted with the website development lifecycle. Firstly, it is important to underline that in general terms the process supports addressing usability issues as an ongoing activity according to the continuous improvements or kaizen vision [Imai 1986] and also to the Plan-Do-Check-Act quality cycle [Deming 1986]. Secondly, for developing a new website, the answer depends on the lifecycle model adopted. A hybrid approach that suggests an agile user-centered web engineering process [Memmel 2006] would agree with the gaps-filling steps proposed in this paper. Classical lifecycle models can benefit from a usability evaluation at different stages of the development, given that the evaluation can be carried out on artefacts of different complexity, from wireframes of the pages and prototypes, to online websites. Also, any website re-engineering project would benefit from a usability evaluation [Deshpande et al. 2002].

To illustrate in detail the quality gaps roadmap used as a usability evaluation process, the next section reports its application to a real project realized for the website www.suedtirol.info of Alto Adige □ Suedtirol. This site represents the tourist destination portal of an Italian autonomous province that has primary competence in tourism.

3. USABILITY OF THE TOURIST WEBSITE OF ALTO ADIGE □ SOUTH TYROL

3.1. Premise

Usability assessment of tourist destination websites is a challenging task, because such sites pose all the problems related to websites development at an enhanced magnitude:

- multiple owners and sponsors, sometimes having conflicting interests;
- undefined, or difficult to define in advance, users profiles; multiple segments due to different target markets;
- strategic promotional and commercial goals;
- integration with large back-end information systems, such as for instance reservation systems [Werthner and Klein 1999];
- high number of competitors, both for the same tourist offer and for different destinations;
- presence of so-called "clones" of the official website of the destination which are actually owned by other, often only commercial, organizations;
- presence of a large number of sections or so called micro-sites, for example, dedicated to specific sports or activities, such as mountain biking, or wine tourism, or dedicated to cultural events, and other areas of interests;
- international audience, that require the realization of versions in different languages and cultural adaptations (website localization);
- large decisional committee, usually representing a large number of stakeholders, sometimes including politicians;
- the need of large investment both for the development and the update of the website (costs for technical, operative and organizational issues);
- conflictual contexts, in which the offer of the destination has to be defined and commercialized, and tourist operators, travel agencies, tour operators, politicians, interact according to coordination models more or less effective [Franch et al. 2006].
From a business point of view, 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 tourists. 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 or to reserve related services (http://www.emarketer.com). 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. In USA, 66% of US leisure travellers use the internet to plan some aspect of their travel (versus 35% in 2000), while 56% report making reservations online (http://www.newmediatrendwatch.com). In Europe, online travel sales reached 65.2 billion euro in 2009 - or 25.7% of the market (up from 39.7 billion euro, or 16% in 2006) [Marcussen 2009]. In Italy, the second tourist market for Alto-Adige South Tyrol (36.8% of the arrivals in 2009; the first is Germany, with 46.2%; http://www.provinz.bz.it/astat), the number of online reservations increases slower, and online penetration is expected to reach 20% by 2011 (http://www.phocuswright.com). Updated data on the use of the Internet by tourists can be found on the website of the European Travel Commission, www.etcnewmedia.com/review; and for Italy it is provided by the ISNART □ National Institute of the Tourist Research (http://www.isnart.it/bancadati).

3.2. The tourist Web site of Alto Adige □ South Tyrol

The website www.suedtirol.info belongs to the tourist society of the autonomous province Alto Adige □ South Tyrol, which is characterised by bilingual culture (Italian and German). This province is a part of the Italian region Trentino, where the alpine tourism plays a very important role (see the statistics in http://www.provincia.bz.it/astat). Moreover, the regional level has been recognized as the most appropriate strategically for defining the tourist policy from the viewpoint of an alpine destination, as Alto Adige - Suedtirol is [Franch et al. 2004]. However, the quality of the websites of the Agencies of tourist promotion does not always correspond to the expectations of tourists and operators. In particular, studies of the Regional Tourist Board website highlighted limitations in many sites of the observed destinations [Mich and Franch 2003].

Tourist societies of Italian regions have varied tasks and functions, different societal nature, with different role and contribution of public authorities [Franch et al. 2002]. The site www.suedtirol.info is managed by the company Sinfonet S.c.r.l. whose mission is the development, communication and intermediation of the tourist destination Alto Adige-South Tyrol. In general terms, a tourist destination is defined as a place of travel that tourists wish to visit due to its natural or artificial attractions [Cooper et al. 2008]; a destination is characterized by the following factors [Mich et al. 2005]:

1) A well defined geographic area with recognizable identity and boundaries;
2) The presence of numerous operators with different outlooks and objectives, which requires creation of a shared strategy for the presentation of the offer;
3) A potential demand for the offered tourist product, whose nature and characteristics must be identified;
4) The awareness of the need in a balance between the tourist use of the places and their preservation in ecological-environmental and social sense.

Internet and, in particular, a website can play an important role for a destination as regards all the four points listed above.

Apart from the traditional problems of information systems, the design and development of websites present additional challenges. These problems and the opportunities introduced by web-based applications for the organizations have been investigated since 2001 by Web engineering [Deshpande and Hansen 2001] and recently by a new discipline, the Web science [Hendler et al. 2008]. Web engineering considers the interactive, hypermedia and data-intensive nature of the web-based information systems and classifies web applications in several categories, ranging from document-centric websites to the ubiquitous and semantic Web applications [Kappel et al. 2006]. According to this classification, www.suedtirol.info is a portal-oriented web application. The most distinguishing of portals is the possibility to contain different sections, information and functionality to satisfy the needs of different targets: for a tourist destination they can provide a single access point to different user segments and stakeholders in the destination. However, it is necessary to take into account the risks caused by the fact that portals are websites of large size, which are highly related to the website’s usability and maintenance. In websites consisting of many pages and with many navigation features, the problem of disorientation
and information overload can undermine the strategic objective of the website. Finally, in the light of the goals declared by Sinfonet, the role a tourist portal can play as an online intermediary is also essential. In fact, it must be emphasized that the tourism of Alto Adige-South Tyrol, as it happens in the other regions of the Italian Alps, is not-intermediated so that the role of tour operators is marginal [Franch et al. 2004]. For this reason, as it is stated in the Sinfonet strategic document, the most critical website requirements arise from the need in providing reservation services for several hospitality categories, which cover approximately 98% of the total places of stay in Alto Adige-South Tyrol (in 2006, there were 4,356 hotels and 5,908 extra-hotel lodging structures, http://www.provincia.bz.it). Moreover, the site is an instrument of branding and image for the destination.

In more detail, the site www.suedtirol.info intends to be a destination management system that:

1) reflects an institutional orientation that accounts for the commercial needs of the hospitality structures;
2) classifies user types into segments in order to guide them to appropriate subjects, offering accommodation options according to the navigational path taken (e.g., for bikers, visualizing lodging structures with facilities for bike maintenance).

The first aspect assumes a coordination logic that is the websites has to support the integration of the tourist operators strategies needed for the creation of a destination in order to cope with organization models appropriate for its promotion and commercialization [Franch et al. 2004]. To this point, it must be noticed that most of the hospitality structures in Alto Adige-South Tyrol are characterized by small size, family management and a small number of employees. Normally, such organization structures do not assume differentiated roles [Franch et al. 2006]. This fact constitutes an important aspect for the realization of the balance described in the forth point of the definition of the tourist destination. However, it presents an additional challenge for involvement and coordination of varied operators, apart from the hospitality structures themselves, to propose an integrated tourist offer.

The second aspect was addressed by Sinfonet by introducing three thematic areas, corresponding to different tourist segments: "familiarmente" (familiarly), "piacevolmente" (pleasantly), and "attivamente" (actively), where accommodation offers and events are personalized for the corresponding user experience (Fig. 2).

![Fig. 2 Home page of the website www.suedtirol.info (December 2005)](image-url)
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:

1) **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;

2) **New visitor**: a user that is unfamiliar with Alto Adige; needs additional guidance and orientation; reaches the website by means of advertisements on the Internet or on traditional communication channels;

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

As regards the identified segments, the data provided by Sinfonet coincides with the statistical results obtained by the eTourism group of the University of Trento for the Dolomites: family visitors prevail in summer while youth in winter, with the dominance of German tourists that in 2006 comprise 58% from the total number of tourists versus 38% of Italian ones.

The first version of the www.suedtirol.info website went online in 2002 and was characterized by an innovative graphic design, that went away from the traditional three column layouts of portals, and by some original marketing choices, among them the most evident, the presence of thematic areas related to different tourist segments. In the following we will describe the main steps of the evaluation process in some details in order to give a clear idea of the variety of the problems and issues that must be tackled and also to illustrate passages that are not easy to be found in the existing literature.

### 3.3. Application of the bridging the quality gaps process

#### Steps #1: Inspective evaluation of the quality of the website www.suedtirol.info

This evaluation step was fulfilled on the website available online in 2005 using a standard 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. There are two reasons for this: first, it was not requested by Sinfonet; second, it 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 □ good. Scores have been assigned taking into account information on www.suedtirol.info, Sinfonet, and on the missions and functions of tourist boards. The obtained table was applied by three experts in the tourism sector and website quality. The results are summarized in Table I. It also provides some preliminary observations (verbatim translation from Italian) on the single items that they have been elaborated in more detail in the further evaluation. Nevertheless, it is important to remember that any quality evaluation is subjective. In order to minimize this effect, in cases where disagreement in rates given by the three experts were observed, the experts were asked to check their assumptions and revise their opinion until the convergence was achieved (boldface is used to mark the scores that initially were more distant). Furthermore, the final goal of any evaluation is to obtain information useful for improving the most critical aspects given the initial needs, both implicit and explicit. That means, the scores themselves are less important than their interpretation aimed at filling the expected vs. delivered quality gaps.

**Table I. Main inspective evaluation results according to the standard schema (March, 2005)**

<table>
<thead>
<tr>
<th>Dimension</th>
<th>Score</th>
<th>Some critical observations of the experts</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Identity</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Brand</strong>: does the website have a strong identity?</td>
<td>2</td>
<td>Inconsistency in the use and interpretation of the logo</td>
</tr>
<tr>
<td><strong>Image</strong>: Does the website transmit a sound image of the company?</td>
<td>1</td>
<td>The nature of the company behind the site is not clear</td>
</tr>
<tr>
<td><strong>Design</strong>: Is the website’s graphics attractive to the users?</td>
<td>2</td>
<td>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</td>
</tr>
<tr>
<td>Personalization: Does the website adapt to different user categories?</td>
<td>1</td>
<td>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)</td>
</tr>
<tr>
<td>---</td>
<td>---</td>
<td>---</td>
</tr>
<tr>
<td>Content</td>
<td>3</td>
<td>Degrees of coverage are different for different fields; incomplete information in some sections. Missed URL of the hotels. The section ‘Abbiamo scelto per te’ (‘Chosen for you’) contains already highlighted and non-homogeneous items (e.g., meteo)</td>
</tr>
<tr>
<td>Value of information and links: Are the information and links useful?</td>
<td>3</td>
<td>General content is often missing. Difficult to recognize external links, lack of content description for those links</td>
</tr>
<tr>
<td>Quality of information: Is the information accurate?</td>
<td>2</td>
<td>In the choice of place, names of other subjects appear, such as ‘Tourist association’, etc.</td>
</tr>
<tr>
<td>Authors and sources contained: Does the website cite the sources of information?</td>
<td>2</td>
<td>Absent</td>
</tr>
<tr>
<td>Services</td>
<td>3</td>
<td>The central panel has a list of items describing too similar (e.g., enogastronomic) events; the information about download times for downloadable objects and the length of the tour is missing</td>
</tr>
<tr>
<td>Company functionality: Does the functionality correspond to the company objectives?</td>
<td>3</td>
<td>Summaries for retrieved results are missing; non-optimal choice of search criteria, in particular: Area versus Locality; ask for Area if not specified. Inconsistency between ‘Accommodation Search’ and ‘Search &amp; book’</td>
</tr>
<tr>
<td>User functionality: Does the functionality correspond to the goals of the users?</td>
<td>3</td>
<td>Problems to contact the Web master</td>
</tr>
<tr>
<td>Correctness: Are there any errors in the site’s functionality?</td>
<td>2</td>
<td>The mode of data exchange is not specified, i.e. if the connection is secure, as well as how this data is going to be used.</td>
</tr>
<tr>
<td>Security, ethics and privacy: Are the transactions secure and is access controlled?</td>
<td>-</td>
<td>-</td>
</tr>
<tr>
<td>Identification</td>
<td>2</td>
<td>The domain is less intuitive than .it or .com; the name is difficult to remember for people unfamiliar with German language</td>
</tr>
<tr>
<td>URL: Is the URL of the site intuitive and easy to remember?</td>
<td>1</td>
<td>Problematic results for some keywords, such as for instance, ‘alto adige’ versus ‘suedtirol’; ‘hotel’ versus ‘hotel’</td>
</tr>
<tr>
<td>Retrieval: Does the website appear in first retrieved items of search engines?</td>
<td>2</td>
<td>Problems to contact the Web master</td>
</tr>
<tr>
<td>Contact information: Is it possible to contact the company or the Webmaster?</td>
<td>0</td>
<td>It could be relevant for the intranet section to involve operators</td>
</tr>
<tr>
<td>Community building: Is it possible to interact with other users of the website?</td>
<td>0</td>
<td>-</td>
</tr>
<tr>
<td>Management</td>
<td>3</td>
<td>Absent; maybe not relevant</td>
</tr>
<tr>
<td>Update and revision: Is information up to date?</td>
<td>0</td>
<td>Some problems with Java script have been experienced</td>
</tr>
<tr>
<td>Date: Is there a date of the last update?</td>
<td>3</td>
<td>Recent system, based on current/standard technologies adopted for the Web</td>
</tr>
<tr>
<td>Check-up: Does the website have good administration?</td>
<td>2</td>
<td>Recent system, based on current/standard technologies adopted for the Web</td>
</tr>
<tr>
<td>Tools: Are the technologies used in the website up to date?</td>
<td>2</td>
<td>Recent system, based on current/standard technologies adopted for the Web</td>
</tr>
<tr>
<td>Usability</td>
<td>2</td>
<td>Ugly-looking pages visualized in monitors of dimensions larger than 800x600</td>
</tr>
<tr>
<td>Hardware and software requirements: Does the website require common hard- and software?</td>
<td>-</td>
<td>Insufficient contrast between characters and background</td>
</tr>
<tr>
<td>Accessibility: Is the access of disabled people allowed?</td>
<td>2</td>
<td>The site is not straightforwardly understandable. Some links to the various</td>
</tr>
<tr>
<td>Navigability: Is it easy to</td>
<td>2</td>
<td>The site is not straightforwardly understandable. Some links to the various</td>
</tr>
</tbody>
</table>
navigate in the website?
parts of the site are unclear. It is necessary to add more tools and revise the structure of menus; redundant space due to the privilege of the design to the usability (scrolling panes are required). "Go back" button is only present in the newsletter section. Too sparse map. Search engine with undefined scope.

| Download times: Are the download times acceptable? | 3 | Must be improved for the analogical connection; important also for teleworking |
| Languages: Is it possible to use many languages? | 2 | Different level of elaboration must be handled |
| Terminology: Is the language and symbols used easy for understanding? | 2 | The menu items and symbols are not always intuitive; presence of acronyms (as for example, MP in the description the package "actively") and specialized terms ("tour operator"). A glossary is missing. Some translated terms are not as efficient as the original ones (e.g., the Italian translations for "familiarly", "pleasantly" and "actively"). |

The following diagram (Fig. 3) represents the result of the evaluation of www.suedtirol.info in Table 1. In particular, one can see how the most critical aspects are related to the dimensions Identity and Identification of the model 7Loci.

![Fig. 3 Quality of the website www.suedtirol.info (standard schema)](image)

From the methodological viewpoint, if these results are supposed to be used to choose the priorities of investment 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 have to be 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 by the management [Crosby 1979] 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 practice suggested in requirements engineering and in web usability too [Nielsen and Loranger 2006]. 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 not essential (optional).

The detailed analysis investigated the problems noted by the experts using the standard schema. As a result, the critical points of the website have been identified and classified in three groups according to the priorities of contribution suggested in the previous sub-paragraph. More specifically, we identified the following types of problems:

- three aspects that have a significant impact on the total quality of the site (compulsory),
- other nine points which would be useful to integrate, even if they are less urgent (recommended),
- aspects that could be improved, but are not essential (optional).

The first three problematic points are:

1) a weak website identity;
2) the three areas of the site that were not understood as directed to three different tourist segments;
3) a non intuitive navigational logic of the website.
All these aspects have been experienced by the experts involved. In more detail the following conclusions were derived:

1. Firstly, 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 had started evaluating another website trying to find the address of the site independently. This episode indicates a very important general problem. Internet is considered to be a virtual reality where the quality of the contents and the services is also estimated by the navigator on the basis of the authority of the site. It is therefore essential to indicate properly what is behind it.

2. The lack of understanding of the thematic sections or area familiarly, pleasantly and actively as innovative modalities to organize the content of the site for three various segments can have important effects on the usability. Possible reasons of this incomprehension lie in the original solution itself (now adopted by a large number of tourist destination websites); and in different linguistic effectiveness of the terms expressed in different languages. For instance, in Italian the word familiarmente does not mean being with the family as it was intended by the site, but with familiarity, with confidence.

3. All the experts have indicated the difficulty of comprehending the logic of the site. This aspect is probably related to the previous one: if the functionality of the three sections, which the organization of contents is based on, is not catch, overall the navigation of the site becomes more difficult. The graphical design of the site, although estimated as original and elegant by all the experts, seems to have some negative influence on the user-friendliness of navigation. Perhaps it is too sophisticated or, as it will be confirmed by the successive analysis, the rules of inner and external coherence were not complied enough to limit the cognitive effort required for navigation. The bottom line is that the realization of the websites must take into account that any difference carry additional information from the user viewpoint [Bateson 1980], thus increasing the cognitive effort to browse the site. Therefore changes in graphics, language, terms, etc. must be used to highlight effective differences and useful information.

The list of problematic issues from recommended category includes:

1. The use of the logo and of its logotype inside the website: the logo - the graphical element that characterize the Alto Adige-South Tyrol brand - is an integrate part of the site identity. Best practices suggest representing it in the same position and in a similar way in all the pages of the site, given that the site may be accessed not only through the home page. The mountain profile that is part of the Alto Adige South Tyrol brand was instead positioned in the bottom part of the internal pages and often remained not visualized unless after scrolling.

2. Not intuitive web address: a problem indicated by the most advanced users (with computer science skills above the average) who prefer to reconstruct the address on the basis of conventions that allow to avoid the use of search engines; this aspect is also negative for off-line communication of the URL.

3. Blank spaces used not optimally: such spaces increase the need in scrolling and limit the total quality of the home page for monitor of dimensions larger than 800x600 (see Fig. 1). They also increase the effort required for focusing on the useful information.

4. Too sparse map of the site: this goes in contradiction with the principle of carefully design scrolling movements for visualizing the information (see for example, [Nielsen and Loranger 2006]). In this particular case, information that helps to browse the site become difficult to read, thus it is necessary to make the map visible on a page.

5. Inconsistence in the contents describing the localities in the destination: this fact was partially caused by the presence of sub-destinations, e.g., the Dolomites, which do not correspond to single localities, but marked as such.

6. Discontinuity in the representation of the contents: some items have a template that appears and asks the user to specialize the search, while other items of the same level provide information directly.

7. Unmotivated differences in the search functionality and accommodation reservation, as different modes are provided when the access was done via the menu or using the template of the home page.

8. Difficulty to recognize external links: to avoid that users leave from the site it is recommended not only to indicate external links appropriately, but also to provide them with short descriptions whenever it is useful.
9. Translations in the different languages elaborated at different level of detail, inconsistency in using labels and texts of different quality. The problem is more critical for high level labels such as "familiarly", that turned out to be more effective in German, and that represents the name of a large section of the site.

Other critical points belonging to optional category collected such observations as:

1. Unexploited possibilities of visualizing information reducing the human effort to fill in various data: as an example, if the tourist locality is not specified in the search of accommodation, the site must propose some names anyway, within acceptable response time (the choice of the criteria often implies political or strategic decisions: e.g., shall the hotels be sorted in alphabetical order, or by users ratings, or by availability, etc.).
2. Difficulty of reading the text due to insufficient contrast and dimensions of the characters used.
3. Lack of functionality for loyal or advanced users, such as a list visualizing the searches made. Such lists give to the user the idea of being an active participant of the site. The information on the file size of documents to download and a glossary are also missing.
4. Presence of linguistic forms, for instance, the use of imperative tense, whose effectiveness must be verified for different cultures and languages.
5. Homogeneity in a certain period among the events in the central panel of the home page, that does not allow to fully use the opportunity of giving to the user a complete picture of the tourist offer. It means that when provided information related to only certain type of activities, e.g., ski contests or gastronomical initiatives, the tourist doesn’t obtain a complete picture of the kind of things that can be found in the destination.

In order to accurately document the issues described above, cards with screenshots and their problematic points have been created. These images highlight the parts of interest in the site and, where necessary, add explicit annotation. Fig. 4 shows an example of such a card. Goals and results of the first step of the evaluation project are described in a report of 50 pages containing more than 20 cards.

Fig. 4 Example of a card used to show critical elements of the website
Steps #2: Comparison with competitors' websites

To position the results of the inspective evaluation in the competitive context addressing the expected vs. the delivered quality gap, the website www.suedtirol.info has been compared to the sites of the three 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 table was developed by eTourism research group for evaluation of websites of regional tourist organizations [Mich and Franch 2003]. The results of the comparative evaluation are summarized in Table II. 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. We highlight in bold type the lowest and in italic the highest values for each dimension. In overall, this result is not unexpected as all the sites had been largely revised in recent times.

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

<table>
<thead>
<tr>
<th>Dimension</th>
<th>South Tyrol</th>
<th>Trentino</th>
<th>Tyrol</th>
<th>Carinthia</th>
</tr>
</thead>
<tbody>
<tr>
<td>Content</td>
<td>0.78</td>
<td>0.81</td>
<td>0.81</td>
<td>0.63</td>
</tr>
<tr>
<td>Services</td>
<td>0.83</td>
<td>0.92</td>
<td>0.83</td>
<td>0.58</td>
</tr>
<tr>
<td>Identity</td>
<td>0.80</td>
<td>1.00</td>
<td>1.00</td>
<td>0.87</td>
</tr>
<tr>
<td>Identification</td>
<td>0.42</td>
<td>0.75</td>
<td>0.92</td>
<td>0.83</td>
</tr>
<tr>
<td>Management</td>
<td>0.88</td>
<td>0.88</td>
<td>0.88</td>
<td>0.63</td>
</tr>
<tr>
<td>Usability</td>
<td>0.89</td>
<td>0.89</td>
<td>0.83</td>
<td>0.78</td>
</tr>
</tbody>
</table>

Focusing on the site of South Tyrol (Fig. 5), this analysis combined with the evaluation based on the standard table confirms that the most critical dimension is Identification. The comparison for Identity seems less problematic than is resulted from the first evaluation (see Fig. 3). 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. In fact, a positive answer must be given to questions adopting a general principle, e.g., if even a little bit of information related to a given item exists, independently from the coverage. Moreover, individual questions inside of each single dimension are given the same importance. For this reason, the two results should be carefully compared [Mich et al. 2003a]. The diagrams in Fig. 5 confirm good quality levels of Trentino and Tyrol websites, and a lower quality of the Carinthia site.

To correctly interpret these results, one must also recall the limitations of the adopted method. Firstly, for sites of such large size websites it is not easy to find out all of the actually present elements (to answer □ no □ it is necessary an exhaustive visit of the entire site; while the positive confirmation requires visiting half of the pages of the site in average). However, this type of errors can in turn be the useful indicator of the visibility of the relevant information. Secondly, an accurate verification of the missing elements on the basis of the data related to single questions (see problematic issues identified in the first step) suggests that there is certain subjectivity also in a table of this type. In fact, the complexity of the websites does not allow to completely structuring the questions. To this end, explanatory notes have been provided where necessary allowing explaining the hypotheses or considerations assumed when answering single questions. To this end an evaluation tool was used to collect both the answers and the comments [Mich and Franch 2002].

A more complete interpretation of the results in Table II would require data that is unavailable from the client side. For instance, knowing the investments for the websites development and management would allow explaining different quality performances. Also, a staff of appropriate size and expertise can support a regular update of all the sections of the websites assuring constant achievements of quality goal in the perspective of continuous quality.

If necessary, a more detailed evaluation can be carried out to further differentiate the performances of the analyzed sites. For example, the actual Boolean table sets a certain number of languages required for the websites of this type and fulfils the spell check for the official language. Apart from the presence of several versions in varied languages, a more precise comparison could consider their linguistic quality □
and the level of contextualization (localization), in terms of ability to adapt to the various target markets.

As for the www.suedtirol.info site, on the basis of this comparative evaluation a number of suggestions were drawn. In particular, reaching new markets and the need of attracting new tourists 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.

Fig. 5 Quality of www.suedtirol.info, www.trentino.to, www.tirol.at, www.kaernten.at (December 2005; Boolean table)

Summing up, we can say that the comparative evaluation of the website has given a satisfactory general result for Usability (Table II). However, taking into account the analysis realized in the first phase of the evaluation which has pulled out many problematic issues, we concluded that the site needs to be improved before proceeding with the third phase of the evaluation process.

Fig. 6 shows some of the improvements made. Among these are new titles for the thematic areas, reduction of the pop-up menu items and indications of those items that further contain sub elements.

*Step #3 and #4: Evaluation with a Panel of Users and Questionnaire*

The third phase of the evaluation project of the website www.suedtirol.info has involved a test 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 tests allow to gather information on the user behaviour during navigation of the site in realistic contexts of use in order to identify difficulties or obstacles corresponding to gaps between quality in use and website quality - that make the users to abandon the site or prevent them from achieving their goals, and as a consequence reducing the success of the website. However, the tests with the users bring in some risks. The most important one is obtaining much information, but not being able to fully interpret or use it effectively to improve the site. Moreover, given that tests are expensive in terms of human resources as well as time consuming - their realization must be defined and planned with large attention [Bias and Mayhew 2005].

In the case of the tourist destination Alto Adige □ South Tyrol, we decided to realize a controlled experiment: a) after having applied the inspective techniques in the previous steps; b) on the basis of data recorded in the log files on the behaviour of the users on the 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. Ultimately, the main objective of the management of Sinfonet for the development of the new website www.suedtirol.info (this new site was developed instead of the previous one with URL www.hallo.com) was to increase the reservations online and the sale of the packages.

Fig. 6 Home page of the site www.suedtirol.info modified according to the results of the first two evaluation steps

From the methodological viewpoint, the design of an experiment with users involves several important choices: identification of subjects; definition of tasks; and finally, the setup of the work stations for navigation and recording of the sessions (see for example [Rubin 1994], [Dix et al. 2003]). These activities are described in detail in the following sub-sections, and then the main results of the experiment are derived.

Identification of subjects. To select the subjects to be involved in the experiment, we used information related to the target of the site provided by Sinfonet, in combination with the data collected from the eTourism group in the research work regarding the specificity of the demand in Alps and, in particular, the Dolomites [Franch et al. 2002]. As a result, two priority parameters have been identified: correspondence to one of the targets, □ family□ or □young people□ , and the degree of familiarity with Alto Adige - South Tyrol. The first parameter has been extracted directly from the tourist data. The second parameter was identified by Sinfonet for the launch of the site and allows to consider their target groups of tourists. Furthermore, it is an important factor for evaluating the result of the experiment itself, as people familiar with the province should have fewer problems, for instance, in choosing a locality to book a vacation or in finding the location of a hotel.

Potential subjects have been contacted via e-mail using four relevant mail lists that correspond respectively to: (1) the technical-administrative staff of the University of Trento (about 200 addresses); (2) students enrolled to the Master in Economics and management of the environment and of tourism (26 addresses); (3) students of the three-year bachelor degree in Economics and Company and Business Management of the Curricula for part-time students (about 160 addresses); and (4) master students in Tourism Management of the Trento School of Management (30 addresses). The e-mail messages have been sent between January 20 and 30; then, 39 subjects have demonstrated interest to participate. Among them a total of 22 subjects were selected as a result of a telephone interview in order to verify their profile (Table III) and to check their availability for the experiment’s appointment.

All the subjects that participated in this experiment were Italians and their native language was Italian. The class □Youth□ has been defined according to the way of spending vacations - with a partner or with friends - and the age varied between the 22 and 48 years. For the families it was required that the concerned subjects mostly pass the vacation with their children and usually is the person from the family,
A woman in most of the cases, that chooses the locality and reserves the hotel. The age of the subjects in the Family class varied between 31 and 52 years.

Table III Classification of subjects for the experiment

<table>
<thead>
<tr>
<th>Familiar with Alto Adige - South Tyrol</th>
<th>Youth</th>
<th>Family</th>
</tr>
</thead>
<tbody>
<tr>
<td>Unfamiliar with Alto Adige - South Tyrol</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

The familiarity with Alto Adige - South Tyrol has been verified by asking the subjects if they had ever been in vacation in the province and if they can indicate other localities apart the ones they have stayed. Considering the decisions made for the experiment, we have to remark the following points:

- In the classification of the subjects, objective parameters, such as age, were not discriminating: in fact, the maximum age of the category Youth was rather high, and it corresponded to the surveys on demographic behaviours of Italian young people.
- It was decided to not further explore the familiarity with the province, because a detailed familiarity with the geography or history of Alto Adige South Tyrol does not help much in the tourist navigation of the site with the tasks defined for the experiment.

On the methodological level, the number of subjects involved in each identified category respects the parameters suggested in the literature [Nielsen and Landauer 1993; Nielsen 2000], [Lewis 2006].

**Task Definition.** In the realization of experiments aimed at evaluating the usability of the websites, it is necessary to define a priori the tasks that the subjects must complete. The idea was to verify how the most important functionalities are utilized in different contexts and with predefined comparable objectives. In the present evaluation, the tasks have been defined based on the data provided by Sinfonet and the information about the problematic issues emerged from the first two phases of the evaluation process. In particular, the attention has been focused on the reservation of accommodations and tourist packages, the search of how to get to the locality of the booked accommodation and a request of a brochure.

The first task was defined slightly differently for the two targets. The subjects of the category Youth were asked to reserve a double room in a hotel in some locality maximum budget of 500 Euro, while the people of the category Family had to book a triple room with the possibility of adding fourth bed for an infant and the budget of 1500 Euro. In both cases the vacation was planned for the Easter period with duration of six days (5 nights). Tasks were described in the form of scenarios, according to common practices in Human Interface testing (see for example, [Dix et al. 2003]). The reservation was considered done after filling in the booking form. The conditions were specified so that to increase commitment of the subject to the task; this aspect is critical for the experiments simulating real activities. The budget has been fixed on the basis of the results emerged from the research taken by the eTourism group which intended to identify the characteristics of the tourist demand in the Dolomites [Franch et al. 2002].

The second task required to look for a vacation package with the same conditions as in the first task and terminated with submission of a request of information (without filling in the reservation form).

The third task involved search of travel directions, that is information on how to get from the user residence to the locality of stay.

Finally, the forth task consisted in finding a functionality suitable for asking illustrative material on the chosen locality for the vacation.

Some preliminary tests have been carried out in order to estimate the time needed for completing the proposed activities. The maximum time planned for every experiment was 60 minutes; it was then subdivided as follows: 5 minutes for a short introduction to the experiment; 5 minutes for completing a short questionnaire; 35 minutes maximum for navigation and other 5-10 minutes for a final interview.

The initial questionnaire consists of four parts with a total of 19 questions:

- The first part concerns identification of contact data of the subject (first and last names, age, sex, field of study and profession: this information was necessary to send a gadget chosen as incentive for the participants);
− the second section collects the data relevant to the navigation in Internet (regularity of use, goal of navigation, eventual use for vacation planning);
− the third part of the questionnaire contains questions aiming at identification of the tourist behaviours (vacations in Italy or abroad, season of vacations, way of spending holidays with friends, partner, etc., receptive structures);
− the last part contains questions clarifying familiarity with the site www.suedtirol.info (reasons for eventual visits of the site, other known websites of Alto Adige - South Tyrol) and the possibility to choose other two aspects that subjects related to Alto Adige - South Tyrol (among mountain, tradition, culture, gastronomy, sport or specify something else).

The goal of this questionnaire is to collect useful information for the interpretation of the experimental results. The final interview was based on four questions of general character to collect eventual observations on the experiment (Do you have any observations on the experiment?) and on the website (Do you have any observations on the site? What aspect did you like most? What aspect did you like least?). The second part of the interview touched on 13 more specific questions aiming at addressing gaps between perceived and web site quality (step 4), identifying useful observations for improving the site (e.g., Did you like the holiday package functionality?).

We realized some other tests in order to verify the possibility to include all the 4 parts of the experiment in one hour of total time in the following order: (1) introduction, (2) questionnaire, (3) tasks on the website, and (4) interview. Initially the times of the experiments have turned out to be longer than 60 minutes therefore we modified both the questions of the initial questionnaire and the definition of the tasks. The tests also demonstrated a substantial difference between the times required to complete the tasks on the website: some subjects that were already familiar with Alto Adige - South Tyrol chose the locality very quickly and completed the experiment in about 20 minutes. However, it was decided not to introduce further tasks calibrating them according to the maximum times obtained in the preliminary tests.

Settings of the work stations, collection and recording of the information. For users tests it is also necessary to determine the HW and SW settings, choosing an operating system, a browser and a resolution of the monitor among most widely used configurations (among those used in the period winter - spring 2005). Accordingly, PC used by the subjects was set up as follows: running operating system Windows XP Professional updated with the Service Pack 2; 6.0 Internet Explorer as a Web browser and resolution of the monitor equal to 1280x1024.

Another important choice is the possibility to realize many experiments at the same time with many subjects or individually. The results of the experiment and privacy concerns suggested that the second option had to be adopted.

The experiments have been realized in two laboratories of informatics, because such laboratory creates a more comfortable atmosphere for the participants, unlike specialised rooms.

The most important problem in collecting the data on such experiments is the need in tracking of the navigational paths taken by individual users for completing the assigned tasks. In fact it is not sufficient, especially in case of evaluating the usability, to only analyze the final result and thus verifying if the tasks were completed. Instead, it is necessary to analyze how the tasks have been fulfilled and, most importantly, to identify the critical points, hesitations, and eventual verbal comments. At the same time any influence on the subject’s behaviour should be eliminated.

Thus, we decided to record the experiments in one of the least invasive ways, i.e., using a webcam placed over the monitor of the PC of the subject. For the recording we used Camtasia Study 3.1.0 of the TechSmith Corporation (http://www.techsmith.com), a software application that allows acquiring video and audio files produced during the experiment. This software was then customized to the experiment’s requirements. We used the option that allows aligning the navigation window with the image of the subject in order to connect the navigation path to expressions of his or her face.

In the experiments we also wanted to avoid problems with RAM overload that may slow down the loading speed of the browser, due to the presence of two heavy active applications on a single PC at the same time. To this end, we have implemented a client-server system constituted by two PCs: the first one is provided to the subject and the second one is used to acquire the output. The performance of the experiments thus required two PCs connected in a network and installation of a software application for capturing the screen and acquiring image through the webcam. The PC used for the data acquisition was running Windows XP Professional, version 2002, Service Pack 2 with processor Pentium 4 2.60 CPU GHz 1.00 Gb RAM and video card NVIDIA GeForce4 MX 440 with AGP8X, Monitor 17 with
resolution 1280x1024. In order to verify that two stations operate correctly, the PC used by the subject and the one used for the image acquisition, we executed several tests.

Realization of the experiment. The experiments have been carried out in the first two weeks of February 2006, with the exception of the last experiment that was hold on March 22 2006. As it was not possible to carry out many experiments in the date planned by the first calendar, a remarkable organizational effort had been applied to enclose their total duration within two weeks to minimize the risk of fulfilling experiments on different versions of the site’s content (mainly for hotels availability data).

Moreover, in order to reduce the possible factors of influence on the experiments, they were led by the same person, further called as assistant. The role of the assistant was to facilitate the work of the participants, distribute the initial questionnaire and the cards with the defined tasks and to provide the web address of the site to complete these tasks. Other interference of the assistant was allowed only in case of the site’s freeze or technical problems.

The initial questionnaire was provided in the printed version to be directly filled in by the subject, while the final interviews were registered on paper by the assistant. Besides, eventual technical problems of general character in the course of the experiment were collected by the assistant in a separate form.

The first experiment confirmed some problems that were already identified in the first part (see the standard table: ‘Some problems with Java script have been experienced.’), whose origin had not been identified. The drawback reduced the time available for the final questionnaire; therefore another subject was selected from the same target group. Overall, we collected the data of 22 experiments.

Analysis of results. According to the definition of usability, it is desirable that a tourist uses the functionalities of a website to achieve specific goal effectively, efficiently and with satisfaction [ISO 9241-11 1998]. To this end, the results of the experiment were analyzed focusing both on the achievement of the 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.

As the goal of the experiments on usability is to collect as many as possible problems, so as to obtain useful information for improving the website, for each experiment we constructed a detailed template documenting and analysing the recordings made in the lab (see Fig. 7). The templates represent the first output of the experiment because they exemplify behaviours of real users and contain information potentially useful to improve the usability of the site and were used to identify the problems met by the tourists.

![Fig. 7 An extract of a template created to describe each experiment](image-url)
The figure contains a template used for tracking the navigation paths and choices made by the participant as recorded in the files produced during the experiments, along with the time spent.

Table IV presents a summary of the results of the realization of the four tasks - (1) reservation of a hotel room; (2) reservation of a package; (3) travel directions for the locality; (4) request of a brochure for the destination — classifying them as: correctly completed, completed without satisfying all necessary constraints and not completed. The first derived observation is that none of 22 participants has correctly completed all the tasks.

In more detail, in the first task — reservation of a hotel room — all the subjects of the Youth category, except one, completed the reservation request correctly (subject 16 has sent a demand directly to the hotel). Whereas, only two subjects of the Family category completed the tasks correctly. To this end, it must be emphasized that most probably the problem is related to the presence of an infant: some subjects carried out the search for 4 adults, thus reducing the possibility to find available accommodation. Moreover, the subject that has not fulfilled this task (15) started navigation with booking a package vacation that took all the time of the experiment.

<table>
<thead>
<tr>
<th>Subject</th>
<th>Room reservation</th>
<th>Package booking</th>
<th>Itinerary visualization</th>
<th>Request of catalogue</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>IC</td>
<td>IC</td>
<td>CC</td>
<td>CC</td>
</tr>
<tr>
<td>2</td>
<td>IC</td>
<td>IC</td>
<td>CC</td>
<td>nE</td>
</tr>
<tr>
<td>3</td>
<td>CC</td>
<td>IC</td>
<td>CC</td>
<td>IC</td>
</tr>
<tr>
<td>4</td>
<td>CC</td>
<td>IC</td>
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<tr>
<td>5</td>
<td>CC</td>
<td>IC</td>
<td>CC</td>
<td>IC</td>
</tr>
<tr>
<td>6</td>
<td>CC</td>
<td>nE</td>
<td>CC</td>
<td>CC</td>
</tr>
<tr>
<td>7</td>
<td>CC</td>
<td>IC</td>
<td>CC</td>
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<tr>
<td>8</td>
<td>CC</td>
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<td>9</td>
<td>CC</td>
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<td>CC</td>
<td>IC</td>
</tr>
<tr>
<td>10</td>
<td>CC</td>
<td>IC</td>
<td>nE</td>
<td>nE</td>
</tr>
<tr>
<td>11</td>
<td>CC</td>
<td>IC</td>
<td>CC</td>
<td>CC</td>
</tr>
<tr>
<td>12</td>
<td>CC</td>
<td>IC</td>
<td>nE</td>
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</tr>
<tr>
<td>13</td>
<td>IC</td>
<td>nE</td>
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<td>nE</td>
</tr>
<tr>
<td>14</td>
<td>CC</td>
<td>nE</td>
<td>nE</td>
<td>nE</td>
</tr>
<tr>
<td>15</td>
<td>nE</td>
<td>IC</td>
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<tr>
<td>16</td>
<td>IC</td>
<td>IC</td>
<td>nE</td>
<td>nE</td>
</tr>
<tr>
<td>17</td>
<td>CC</td>
<td>IC</td>
<td>CC</td>
<td>nE</td>
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<tr>
<td>18</td>
<td>IC</td>
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<td>IC</td>
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<tr>
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<td>IC</td>
<td>IC</td>
<td>CC</td>
<td>nE</td>
</tr>
<tr>
<td>21</td>
<td>IC</td>
<td>nE</td>
<td>CC</td>
<td>IC</td>
</tr>
<tr>
<td>22</td>
<td>IC</td>
<td>nE</td>
<td>CC</td>
<td>nE</td>
</tr>
</tbody>
</table>

Notes:
Gray background  Family target group
CC  Correctly completed
IC  Incorrectly completed
nE  not Existing or not filled
Italic typeset: subject unfamiliar with Alto Adige — South Tyrol

In the second task — book a vacation package — the result is more critical, as nobody of the subjects has completed the task correctly: 16 without fulfilled it violating the specified requirements for the number of nights, people or maximum cost; 6 have not completed the task although they spend on it a large part of the available time. More specifically, 7 subjects of the Family group completed the task without satisfying the parameters and 6 of the Youth group; 4 of the Family group and 2 for the Youth group have not completed the task at all. This result is further analyzed below.

In the third task — exploration of how to get to the destination — it was intentionally not specified if the locality for vacation was the one from first or the second task leaving the maximum freedom to the subject. The results are fairly homogenous regarding the characteristics of the subjects as 15 subjects out of 22 have completed the task. Among those 7 that have not completed are: 4 and 3 of the Family group and Youth group respectively; 3 and 4 of familiar and unfamiliar with the region.

Finally, in the fourth task — send a request for a catalogue of the predefined locality — only 4 subjects have completed the task and other 7 have made it incorrectly (asking for a catalogue that doesn’t
correspond to the predefined locality); 11 subjects have not completed the task and 8 of them belong to the Family category. The analysis of the templates suggests that this result does not depend on the difficulty of the task, as much as it depends on the difficulty met by the subject in booking the vacation package taking in some cases the entire time available.

A deeper analysis of the first two tasks, demonstrated differences in paths taken by the subjects. For the room reservation, we have 11 different paths. We also observed that some subjects chose link to the packages as the first step. It is worth noting that after several attempts 3 subjects changed completely the path; finally, one of the subjects that changed the path had succeeded to make a reservation through an external site. In some cases these path changes are related to the lack of results for the localities or predefined dates. Although in the case of families this difficulty was also caused by the number of people, in general, the problem of unavailability of any room with the defined characteristics often appears because the system interprets the indicated parameters as rigid constraints. In fact, in many cases the choice of a locality for a tourist that does not know a destination is random and thus it should be assumed that the subject would accept any locality in the predefined area. Similar considerations apply for the dates of the reservation. For this reason, many hotel reservation websites in case of negative answers suggest closest hotels or ask if the date is flexible. Otherwise, they also may generate several possible solutions even if not all the conditions are satisfied (partial match), suggesting discounted rates if possible. Also, focusing on the technology, there is a wide range of solutions that allow to avoid providing a negative answer without suggesting alternative solutions (see for example recommendation systems, [Ricci and Werthner 2006]).

As for the results for the Family group, where only 1 subject had correctly completed the reservation versus 10 in Youth, it would be useful to ask the user looking for a room for a package vacation to specify the family members. For instance, the site may ask the total number and the number of children under a certain age.

As it was shown, the second task of booking a package with same constraints as the first task caused the biggest problems. In particular, none of the subjects succeeded to complete it respecting all the parameters. More importantly, this problem seems not to be connected to the number of people for the reservation. Indeed, there is no big difference in the results for young people and families: the analysis of the templates showed that a great number of user searches were given no result. The subjects with a larger navigation experience tried to cope with the problem by releasing the constraints, leaving out the dates and indicating the number of subjects equal to 2, only indicating an area or a preferred type of package. In some cases even this trick did not help to obtain any output from the site. One of the reasons for such a result is caused by the peculiar number of nights for the task, i.e., 5. However, similar problems have been found also for the search with 7 nights, a more standard number for packages. In short, too many topics (e.g., wellness, culture, sports) seem to reduce the possibility to find a package. Analogous problem arise for the area (familiarly, pleasantly and actively): a big number of possible combinations among area and topics increases confusion of the web user. It would be very useful to further investigate how many topics are really important for people who look for a package and what is the priority that the tourist gives to varied items in the search of the package.

Among other problems that were experienced by the users there are issues related to dates: in some cases the site stops the search because the return date is earlier than the arrival date and an error window appears with no other information; and in some searches the site automatically expands the dates to periods longer than indicated. Some anomalies appear in the function of finding the way to get the locality. For example, in case of Corvara, a subject was able to complete the task only by explicitly indicating the postal code.

Finally, there is an observation of methodological character: before intervene on the website, each of the problems identified was connected with the characteristics of the subject from the initial questionnaire and observations collected in the final interview. This comparison allow for the cases of agreement (for example, an uncompleted task of finding the way to get to the place and an observation on the map functionality in the questionnaire) to confirm that the problem is not related to some external reason, but instead resides on the website.

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.

Step #5: Web business model

The goal of this step is to identify new and unknown users’ needs and requirements related to unexpected quality. In this step, companies should explore innovative choices to address business challenges, anticipating their competitors, and to maintain and increase competitive advantage.

Our usability evaluation project for www.suedtirol.info started on a version of the website that was designed to support an innovative business model of Alto Adige – Suedtirol as tourist destination. In particular, the website had to support e-commerce functionalities, whereas most of the Italian alpine destinations did not, and to promote the destination to new markets, more specifically, Eastern European countries. For that version, Sinfonet intended to apply the Delphi method for integrating such decisions with information useful to foresee the evolution of the tourism demand due to climate and economic factors. This work was not published to not disclose the company’s innovative solutions. However, its effective results can be seen on the actual version of the website that was largely revised and redesigned.

4. CONCLUSIONS

Usability is a demanding issue that requires specific projects for each website [Nielsen and Loranger 2006]. This paper introduced a five steps process for the evaluation of website usability based on a quality gaps roadmap. The application of the proposed process was illustrated on the large website of a tourist destination, www.suedtirol.info. This application confirmed that the gaps bridging approach allows to collect information in a systematic way starting from an in depth inspectional evaluation of all the quality dimensions of the site (requested quality), continuing with a comparative analysis of the competitors’ websites (expected quality), and finalizing the analysis with two steps that involve users instead of experts (quality in use and perceived quality). The planning of this last steps was based on data obtained from the preceding ones that allow to effectively define the tasks, select subjects to be involved and optimize the outcome on the investment. A last step based on a creativity technique was dedicated to the generation of ideas for more radical improvements necessary to address meta-level goals, that is to give the users something new or unknown in order to increase the competitive advantage of the destination (unexpected quality).

The gaps bridging approach has been applied to other real projects in different sectors and at different stages of their lifecycle, ranging from the design of a site for a new no-profit organization, to the reengineering of the informative architecture of a portal dedicated to the school, and to other e-commerce websites. In all these projects results were positive both for companies and developers.

As regards the www.suedtirol.info website, the proposed method allowed to its management to effectively and efficiently obtain critical information for elaborating and prioritizing the improvements of the site, thus maximizing the return on the investments. As a result of the modifications on the website, the analyses of the data on the traffic and navigation in the site collected regularly by Sinfonet, highlighted substantial diversification of navigation paths on the three main sections of the site and an increment of online transactions (estimated in 25% for packages). However, some of the indications produced in the evaluation, among these are accessibility problems and limitations of the technology adopted with respect to the flexibility of the interface, confirmed the need in redesigning the site, re-checking some of the technological choices, and the web navigation structure. Moreover, the results of the tests with the users have been used in summer 2007 in order to design a new interface for the hotel reservation and the sale of the packages vacation. The prototype of the new interfaces, before being inserted in the site, has been object of a process analogous to that one described in this paper – inspection of the wireframe, comparison with competitors websites, test with users, questionnaire - so as to take part preventively on any aspect that could reduce the usability of the new reservation modules, influencing negatively the performances of the site in terms of lacked attainment the company goals.

Results and insights gained through the various usability projects allow drawing some general conclusions on the feasibility and on the generality of the quality gaps bridging usability process.

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Focusing on the approach, we had a preliminary validation of the fact that the process is compatible with agile usability engineered frameworks adopted by almost all the website development agencies involved in our projects. In particular it further supports what we could call the “just in time” usability challenge in websites (continuous) development [Ambler 2008], [Foster 2005], [Memmel 2006]. In relation to the efficacy and efficiency of the process, lessons learned in these projects include:

- An inspective evaluation allows to identify in relatively brief times (on average, the time ratio requested for both the first two steps and the third one is of approximately 1:7) a large number of the website problems, problems which solution can quickly improve the site before carrying out more detailed and expensive analysis verifying the accomplishment of the strategic objectives of the site.
- The justification of the investments required to improve a website can be grounded also on the comparative data of the competitors’ website. In the www.suedtirol.info case, it would have been more difficult or even impossible for the company management to justify further investments on the website without these results and the detailed analysis of the problems found in the other dimensions of the 7 Loci model. In fact, the results for the reservation of single hotels and other lodgements were good in spite of the usability problems. Therefore the need to improve the websites was not obvious, even if the potentiality of the site was not fully exploited.
- The complexity and consequently the resources necessary for the third step require much attention in the realization of individual tests with the users, but the proposed method allows optimising the results. In particular, such tests aim to identify and resolve problems of the quality in use that affect the achievement of strategic company goals. In the case of the Sinfonet website, the reservation of the packages was worse than it was expected by the agency of promotion and only the tests with users of the Family target provided the data relating this problem to the rigidity of the online reservation system.
- An incremental way of evaluation of the website allows planning its revisions provided that the management established priorities making a connection between the output obtained in the different phases of the process and the company goals. Final decisions on which improvements are mandatory for the company’s a website success have to be made by management and not by web developers: the latter can instead give useful information on the cost related to specific solutions, and to identify possible alternatives to quality and usability critical points. For example, the management of the agency in charge of the www.suedtirol.info site decided to intervene immediately on all the critical aspects that do not required considerable technical or organizational efforts and to find temporary solutions to those that were highly critical for the quality and in turn for the success of the website.

In conclusion, we remind the reader that the large flexibility of the websites can be both beneficial and overwhelming for their users. Therefore, achievement of a good usability and quality level for a site is a continuous and open challenge. That is, constant attention and adequate resources are required and, most importantly, a creative effort is needed for discovering innovative solutions that would allow obtaining excellent quality results or at least results comparable to the benchmark, if there is any, for a given sector.

ACKNOWLEDGEMENT

We gratefully acknowledge the members and the collaborators of the eTourism research group of the University of Trento that supported the various usability projects and the subjects involved in the tests. We also thank the CEO of Sinfonet S.c.r.l. that allowed publishing the results of the study of their website.

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