

Cluster analysis of Croatian hotel Web sites quality measured with Web metrics

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Abstract: -

This paper examines the web site quality issues of the Croatian hotels. The opportunities from offering high quality web site services are examined as well as potential problems. Inevitable mechanism for controlling the quality of a web site is the use of specific analytic techniques and metrics. Wide range of web site metrics are discussed and finally a set of 44 attributes chosen for the evaluation of Croatian hotel's web site quality. The objective of the survey conducted on the 30 hotels was to identify different groups of hotel web sites in relation to their quality measured with specific web metrics. Key research question was: can hotel web sites be placed into meaningful groups by consideration of variation in web metrics and number of hotel stars? To confirm the reliability of chosen metrics a Cronbach's alpha test was conducted. Apart from descriptive statistics tools, to answer the posed research question, clustering analysis was conducted and the characteristics of the three clusters were considered. Experiences and best practices of the hotel web sites clusters are taken as the prime source of recommendation for improving web sites quality level.

Key-Words: - Web metrics, Hotel Web sites, Evaluation Criteria, Cluster analysis, Measurement, Quality

1. Introduction

Internet and Internet-based technologies offer benefits that make them a valuable asset for all industries. They allow individuals to disseminate large volumes of information quickly and efficiently, share information with a global audience and they may be updated easily. Furthermore, they also provide benefits for those who demand information allowing greater access to a greater volume of product/service information. These benefits are particularly valuable to the travel/tourism industry because of industry specific characteristics [15].

The aim of this study is to obtain a better understanding of Croatian hotel web sites quality. It is of particular interest to characterize variation within the Croatian hotel web sites with respect to their quality measured with web metrics. Improved knowledge of quality of Croatian hotel web sites should help us in providing recommendations for the hotel industry management.

The major question is: Is the web site effective and how to measure its effectiveness? Managers should therefore clearly recognize a tremendous value of web metrics.

2. Efficiency metrics in Web site design – related work and research design

Many authors have published works that include web metrics definitions and a number of studies have suggested the design attributes of 'successful' web sites.

Law and Hsu [9] in their research included these dimensions: (1) facilities information; (2) reservation information; (3) contact information; (4) Web site management, and (5) surrounding area information.

Based on their findings visitors of hotel web pages are generally looking for the basics: (1) reservation transaction information should be easily accessed and clearly displayed and information regarding room rates, availability, and policy should be built into the web site; (2) e-travelers should also be able to make reservations online, with the peace of mind that the transaction is secure; (3) guests should also be able to view and revise reservations online with ease; (4) in terms of the tangible hotel facilities, web sites should take advantage of visual and audio capabilities of modern computing technology showing picture of the hotel facilities, location, guest rooms and other features when making reservations; (5) web site designers should pay due attention to the download time, meaning that providing an information-rich web site without over-packing the pages to slow

down the access; (6) basic contact and access information, such as telephone number, address, e-mail, local transportation, the closest airport, and transportation options from airport to hotel, should be made available on the web site and such information should be presented clearly and be available in printer-friendly format so that visitors can prepare a hard copy to bring along to feel psychologically secured; (7) as hotels receive more international visitors, multilingual sites will become a necessity; and (8) web sites need to be updated on regular basis to provide the newest information [9].

Panian and Jakovic made a custom web metrics model in their evaluation of hotel web sites in Croatia. They tailored the original model developed at Trinity College Dublin to suit the need for their research. Model was finally comprised of 8 different fields according to which the evaluation was done [13].

Calero et al. classify the most important metrics proposed for web information systems and provide global vision of web metrics. They have studied a range of recently published works that include web metrics definitions and presented the comprehensive classification with 385 metrics using a three-dimensional web quality model [3].

For the present study, the question we pose is: can hotel web sites be placed into meaningful groups by consideration of variation in web metrics and number of hotel stars? We would like to find out if members of the dataset can be classified in limited number of types, with rather similar web sites characteristics, together with quality of the hotel measured by the number of hotel stars.

3. Web site quality attributes

Internet users usually find web sites as a 'window' or 'interface' by which they can use specific hospitality/tourism services. A typical e-service operation has 'front-end' Web-based systems and 'back-end' information systems [8]. E-service customers expect the same level of customer service quality that they would receive from the 'brick-and-mortar' part of the 'hotel business'. Superb web site quality is the only mechanism that brings repeat users to web sites [12]. A good or rather inevitable mechanism for controlling the quality of a web site is the use of specific analytic techniques and metrics. In recent years, a wide ranging set of metrics have been proposed for quantifying web quality attributes [1], [2], [5], [6], [16].

In addition to these customer-focused models, the quality of the web sites can be evaluated from the software development side. Mendoza proposed an ISO/IEC 9126-based portal environment evaluation model [10]. Considering all these models and

frameworks three common concepts appears to have the impact on web site efficiency: usability, functionality and reliability. Therefore, web site efficiency is a relative category by which we can measure its usability, functionality, and reliability. It commonly represents a set of attributes of that bear on the relationship between the level of its performance and the resources used [3].

Web site functionality defines the set and the range of services offered, focusing particularly on the alignment of the web site set-up project and business strategy. Far too often businesses compromise on the initial planning and design of their web sites, because they want to get the site set up and running. For example, if the web site's initial design is scalable, a company would probably save a lot of extra effort and money. This means that, prior to anything else, when a company decides to offer their services on the web, it must consider which services may best result benefits for company and its customers as well. The scope of the offered services, its 'depth' and the alignment with the business usually represent the referent point for evaluating its efficiency and functionality (for example, by defining Key Performance Indicators for specific processes).

Usability is a quality attribute that assesses how easy user interfaces are to use [11]. The word usability also refers to methods for improving ease-of-use during the design process and represents the ease of browsing and performance of tasks needed to completion of the transaction. Nielsen defines usability by five quality components [11]: learnability or the ease of using web site services for the first time, efficiency or how quickly users can perform tasks when they got used to web site's design, memorability of web site features, errors and satisfaction.

Web sites reliability refers to the set of attributes that may contribute to the user trust. This usually represents a set of security attributes (software, services, technology, etc.) which helps user gain trust in web site performance. Typical security 'layers' may be: integrity, confidentiality, availability, privacy, non-repudiation, authenticity, etc.

4. Research design and methodology

The successful performance of a hotel web site, in this research, was determined by a set of criteria for the hotel web site evaluation. These criteria were applied to the Croatian hotel web sites. Data were collected in the period from 15 April 2007 (the beginning of the research) to 02 May 2007. As the basis for conducting this research, we use the list of categorized hotels in The Republic of Croatia published on the web site of Ministry of the Sea, Tourism, Transportation and Development (2007). Among 638 hotels in Croatia the distribution according to the number of stars is

following: 1 star - 4,86%, 2 star – 28,68%, 3 star – 51,25%, 4 star – 12,70% and 5 star – 2,51%. Sample of 30 hotels is selected that represent the distribution according to the number of stars as in the total population of all Croatian hotels.

A limitation of this research may be found in its focus strictly on Croatian hotel web sites. The research results may not be indicative for other countries and cultures. The objective of the survey was to identify different groups of hotel web sites in relation to the quality of their web sites measured with web metrics.

The checklist used for our study is tailored to suit requirements for evaluating hotel web sites as follows:

1. First impressions: URL (simple and related); download time – size of home page; look and feel – readability; contact details; use of attractors.
2. Navigation: ease of use; site map; return to home page from any page; internal search engine; broken links; navigational links visible.
3. Content: useful information about hotel and services offered; use of valuable graphics; use of valuable animation; use of valuable sound; up-to-dateness; FAQs.
4. Attractors: special offers; free games; breaking news; newsletter; other.
5. Findability: intuitive URL; designed for search engine performance (intuitive keywords, use of meta-tags); advertising (on-line advertising, off-line advertising (brochures), on-line recommend a friend, on-line put in favorites); partner and affiliate sites (links).
6. Making contact: e-mail and other details visible; response time to inquiries (automatic e-mail response, personal e-mail response); use of online forms; phone contact number provided.
7. Making reservation: visible pricelist; cards acceptance; on-line reservation form; computerized reservation system (CRS).
8. Other useful information: additional services offered; how to find hotel (description or map); guestbook; hotel history; information about destination.

Total number of 44 criterion was used to determine quality of hotel web sites around three previously mentioned dimensions of hotel web sites quality (usability, functionality and reliability). These criterions will be presented later in the paper. Scores were recorded concerning about sixty different hotel Web sites, every in each column. One respondent that often uses hotel web site reservations systems evaluated each of 44 criterion with Likert scale from 1 to 5, with the meaning of 1 – poor, and 5 – very good. In addition, number of stars for each hotel is recorded.

Measuring average score for each criterion gives us an approximate indication of the hotel web site quality relative to the other sites.

Scale	Number of criterions	Cronbach alpha
First impressions	5	0,7511
Navigation	6	0,7399
Content	6	0,7137
Attractors	5	0,7541
Findability	8	0,5823
Making contact	5	0,6831
Making reservation	4	0,5682
Other useful information	5	0,5015

Table 1 - Cronbach's alpha on groups of criterions

Reliability analysis was conducted and Cronbach's alpha and calculated using statistical software package SPSS 10.0 ranging form 0,5015 to 0,7511. We concluded that those groups of criterion that have alpha higher than 0,7 are suitable for conducting cluster analysis. There are four score that are reliable: first impression, navigation, content, and attracting visitors.

These four scores together with information of number of hotel stars comprise 5 attribute values, i.e. a eleven-dimensional measure of the respondent's type. The 30 responses in total can be conceptualized as a cloud of 30 points in 5-dimensional attribute-space.

For the present study, we calculated average score for each groups of questions, which measure an attribute for a web site quality. The statements for each group of questions, their mean value and standard deviations are listed in Tables 1 to 4. However, care should be taken over the interpretation of these means and standard deviation figures, because Likert scale data are not truly numeric. Still, listed means and standard deviations are useful measures for descriptive purpose.

5 Web sites metrics scores

Most of the examinees agree that the use of attractors (3,67) have the greatest impact on their first impression. Download time – size of the home page (3,8) is also relevant for gaining the good first impression. Contact details (3,87) are slightly less important than the first two criteria, followed by look and feel readability (3,93). And the URL (4,57) has been selected as the less important of these criteria for first impression.

	Mean	Std.Dev.
URL	4,57	0,86
Download time - size of home page	3,80	0,66
Look and feel - readability	3,93	0,83
Contact details	3,87	1,14
Use of attractors	3,67	0,61
Average score for first impression	3,97	0,48

Table 2 - Mean values for criterion on first impression (1 – poor, and 5 – very good)

The most important criteria for navigation is internal search engine (1,7). All other criteria except site map (2,23) are far behind. The next important criterion is return to home page from any page (4,17). Ease of use and navigational links visible (4,3) have the equal effect on site navigation in the examinees opinion. And broken links (4,77) have been designated as the least important of all indicated criteria.

	Mean	Std.Dev.
Ease of use	4,30	0,79
Site map	2,23	1,61
Return to Home Page from any page	4,17	1,34
Internal search engine	1,70	1,42
Broken links	4,77	0,63
Navigational links visible	4,30	0,75
Average score for navigation	3,58	0,66

Table 3 - Mean values for criterion on navigation (1 – poor, and 5 – very good)

Mean values of responses have showed that FAQ's is definitely the most important content on a site with no deviation from the answers. The use of valuable sound (1,03) is also very important content on the web site. Use of valuable animation (2,86) is the next multimedia content that people like to see on a web page. It is followed by the up-to-datedness' (3,16) and another multimedia content the use of valuable graphics (3,3). The last and the least important criteria for the content are useful information about hotel and services (4,1). This table shows us the tendency of new age towards the visual and acoustic presentation of web pages.

	Mean	Std.Dev.
Useful information about hotel and services	4,10	0,76
Use of valuable graphics	3,30	0,79
Use of valuable animation	2,87	1,20
Use of valuable sound	1,03	0,18
Up-to-dateness	3,17	0,83
FAQ's	1,00	0,00
Average score for content	2,58	0,39

Table 4 - Mean values for criterion on content (1 – poor, and 5 – very good)

All of these criteria are very important on attracting visitors, but all examinees agree that free games (1,00)

contribute the most. Breaking news (1,03) are second in line, this shows that visitors like to be along with important news throughout the world. Some way behind are special offers (1,53) and Other (1,60). Newsletter (1,67) is important but in line with other criteria from this research it is attracting visitors the least, and has been pointed as the least important criteria.

	Mean	Std.Dev.
Special offers	1,53	0,97
Free games	1,00	0,00
Breaking news	1,03	0,18
Newsletter	1,67	1,37
Other	1,60	1,04
Average scores for attracting visitors	1,37	0,56

Table 5 - Mean values for criterion on attracting visitors (1 – poor, and 5 – very good)

6 Cluster analysis

The objective of conducting a cluster analysis was to discover if members of the dataset be classified as belonging to one of a small number of types, with broadly similar responses among all hotel web sites who constitute a given type? This can be especially important for hotel managers who want to discover what constitutes a good quality and effective web site.

Cluster analysis is the suitable statistical tool that can be used for accomplishing goal of this paper (first used by Tryon, 1939) [5]. Cluster analysis is conducted with the aim to assign data points (sequences) into reasonably homogenous groups (clusters). The main issue with cluster analysis is how many clusters are to be used. If number of clusters is too big, dissimilarity within each cluster will be low, but clusters could be too specific. Therefore, result of such analysis could not be easily interpreted and generalized. If number of clusters is too low, dissimilarity within each cluster will be high, and such clusters could not produce new and useful information. Therefore, one has to be aware that there is no correct number of clusters. However, we still have to make a decision on how many clusters we shall use.

Using the standard form of the statistical package Statistica, ver 7.0, we carried out K-means clustering, the method where number of clusters has to be determined in advance. According to the Scree test [4], we determined that three clusters are the most appropriate to use.

Figure 1. shows mean values for each variable according to different clusters. It is obvious from the picture that clusters differ according to many variables values.

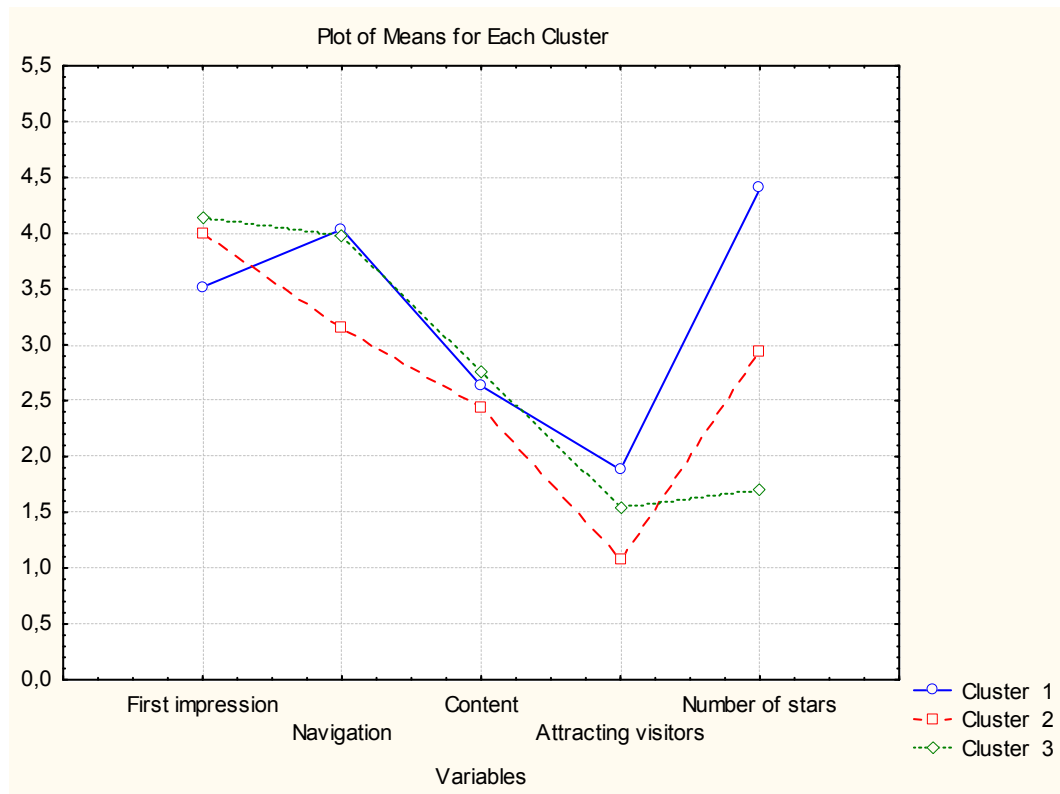


Figure 1. Mean values for each cluster

The statistical characteristics of the three clusters with respect to the five attributes under consideration are listed in the following table. None of the clusters performed best at entire criterion. The main characteristics are described below.

Cluster 1

This is the cluster with high-categorized hotels (4 and 5 stars). Members of this cluster are considerably more aware of the navigation. It's surprising that the value of first impression is the smallest, low-categorized hotels have better results. Quality of the content is rather similar to other two clusters. Those hotels are best at attracting visitors among other two clusters. However, it is important to stress that all of the three clusters are performing badly at attracting visitors' metrics.

Cluster 2

Among this group there are majority of the medium-categorized hotels (2 and 3 stars). They perform badly at all of the variables (first impression, navigation, content, attracting visitors, number of stars). They are especially bad at attracting visitors with the lowest mean metrics value. It seems that hotel management does not perceive web sites as important marketing and selling channel.

Cluster 3

This cluster contains low-categorized hotels and it's very surprising that mean values for this cluster, concerning all variables (first impression, navigation, content and attracting visitors) are better then to the

members from the second cluster. Best results are in variable first impression, better than high-categorized hotels. In addition, they are as good as high-categorized hotels at navigation and content metrics.

7. Recommendations

Analysis of efficiency and quality of Croatian hotel web sites has been carried out using web site metrics. Based on used web site metrics, clusters of hotel web sites have been formed, aiming to find web site characteristics which the best hotel web sites have in common. The main conclusion from this study is that classifying hotel web sites according to only one criterion misses out important attributes of the web site quality. We have identified groups of hotels that were better at attracting visitors, but worse at first impression. None of the clusters outperforms other clusters based on the entire criterion: first impression, navigation, content, and attracting visitors. None of the clusters could be used as a reference point for hotel web site content recommendations. Therefore, we used hotels from the first cluster for recommendations on navigation, content, and attracting visitors. On the other hand, we used hotels from the second and third cluster for recommendations on first impression.

Recommendations for successful hotel web site based on our findings, as a referent source of information to the

visitor, but also as a marketing and sales canal, are stated here:

- Informative content is primary and compulsory for a hotel web site. Information has to be well structured and text market directed so as to incite the web site visitor to visit the hotel.
- Additional content on destination and events are desirable.
- Contact information always has to be placed in sight as well as enable the visitors their print-out. Regarding phone number, Croatian area code number is necessary for foreigners. If hotel is engaged in organization of different activities, as conference organization, group visits etc., specialized phone numbers and contacts are desirable.
- Hotel destination and orientation information are of importance. Also, the description of how to reach hotel if traveling from a larger local inhabited place, if traveling by car, train, plane etc. should be included on the web site.
- It is useful to describe all the activities and events near hotel for they could incite the hotel visitors to come for a visit or stay longer.
- All additional activities offered by the hotel should be described separately. Graphics, photos, multimedia should be carefully used so as to incite the visitor if the web site firstly to visit the hotel and all then engage in those hotel activities as a perk.
- If hotel is near the sea coast, it is useful to give information about nearby beaches, provide photos and give visiting recommendation.
- Web site has to be translated at least on one worldwide foreign language. Thoughtful is to translate it on several different foreign languages, but for sure on language of the aiming visitor group of people.
- Opening a web page and multimedia on it must not be time consuming. It has to be optimized so as the visitor is not repelled by the time consumption.
- Photos put on the web site have to be professionally taken. Special concern has to be taken regarding legal rights reserved for the author of the photo as well as the privacy of the persons on the photo.
- Free informational bulletin or newsletter can be put on the web site as powerful and direct promotional tool.
- Web site should include offers for some specific services – combining activities that hotel provides with the activities that other local hotels provide, hotel creates its own tourist products and induces its utilization.

- All possible advantages that hotel has, should be emphasized on the hotel web site, including the ones usually taken for granted e.g. if the hotel has a shaded parking space, it should be emphasized on the web site for all those possible visitors who want maximum protection for their vehicles
- Hotel web site should provide a system for reservation enabling the possible visitor to book in advance his/her accommodation as well as the usage of the additional facilities hotel provides. On-line reservation (booking) system gives a better insight into the current hotel capacity as well as it contributes to the good hotel reputation. System has to ensure their clients personal information privacy. In case web site does not provide such reservation (booking) system, there should be a reservation (booking) form which, after sending it properly fulfilled to a given mail address, sends an automatic polite response and information about the soon-as-possible reply.
- Many Internet browsers have an automatic blockage system (pop-up blocker) against showing the web pages in a new window. Web site has to be constructed homogenously in order to prevent pop-ups'.
- Spelling and grammar should be with due care. Text should not include foreign words, foreign abbreviations and professional phrases. All text put on the web site has to be language-edited beforehand by a professional language-editor.
- Domain (web address of the web site) has to be owned by the hotel not by the company which designed the site or by the staff of the hotel. It must never be let domain to expire – there were cases when domain for particular web sites expired and those domains were bought by individuals who then demanded even bigger compensations from the original owner for further usage of the domain. This research showed that some hotels changed their domains and old ones are out of function. Domain has to be simple, concise and easy to remember.
- Internet forums, guest books, evaluation by the visitors, grading of the hotel, comments of the visitors to the hotel web site help the hotel management in gathering the feedback from the hotel clients or clients-to-be. This information helps the management in constructing the SWOT analysis for the hotel. Web site should provide as many ways as possible for constant interaction with the visitors to the web site.

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