Accessing the Quality of Online Classified Websites:
An Empirical Study of the 100 largest US Newspapers

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ABSTRACT: The use of websites and web applications to advertise, inform and to execute business transactions has become a standard practice in our modern economy. Customers expect every form of organization that they interact with to develop a web presence. Newspaper organizations cannot afford to overlook this phenomenon for two reasons. First, these organizations compete in the marketplace by being the first to publish information. Since the Internet is especially fitting for speedy publication of information, news organizations of all types must to use this media. Second, which might be a more compelling reason, is that consumers are using the Internet as an information resource. It is therefore important for Newspaper publishers to integrate this media into their business.

This study focuses on how Newspaper organizations are using or not using the Internet to publish rental ads. The study of this niche is interesting because it is a profitable area of the firms. This study evaluated the web sites of the 100 largest US daily newspapers to document the level of quality of these sites. The quality criteria of intrinsic data quality (DQ), contextual DQ, accessibility DQ and representation DQ were used to evaluate these sites. The results show that while the larger organizations have better sites than smaller ones, that quality improvement of these sites is needed across the board.

INTRODUCTION

This study of the 100 largest US Newspapers occurred partly because of the need to use online classifieds to assess rental properties in Boston area. It became apparent that some web sites were just too poorly designed to be useful. Due to our data quality experience, the decision to study classified ads was rather natural. It was natural to apply data quality expertise to classified ads. This study appears to be the only one focused exclusively on the quality of on-line classified rental properties. This study is important both from the customer's, the provider's and the web-programmer's viewpoint. It is hoped that this study would create an impetuous for the discussion of programming improvements for electronic classified ads. The Newspaper Association of America (NAA) estimates that the market for classifieds ads is $16.8 billion. Almost all of this revenue is from print classifieds. Typically classified ads make up between 35-40% of the total revenues of a daily newspaper.[1] The NAA also estimates that there are more than 1,000 employment, 900 real estate and 500 automotive web sites offering classifieds-type information.[2] From a competitive standpoint every provider of electronic classifieds on the web is competing with other providers of print-based classifieds. It is reasonable to expect that the quality of online classifieds ads could give a producer competitive advantage over other competitors. High levels of quality would also benefit users of such services since they would find their information in efficient and cost-effective ways. The results of this empirical study would describe the quality levels of online rental classifieds is a first step towards their future improvements.

APPROACHES FOR ENSURING AND INVESTIGATING SOFTWARE QUALITY

The focus on software quality is becoming more and more important in all organizations that depend on software products. In the past, only the larger software firms had the resources and the interest in investing in quality improvement processes. Economic factors sometimes hinder quality assurance efforts and lead some software firms to release their products before standard quality inspection processes have been completed. This often results in costly updates, returns and bad public image. To rectify the weakness of quality inspection, many software firms have embraced quality assurance and implementation processes that rely more on the approach of building quality into all software design, development and prototyping. These tools include system development life cycle (SDLC), prototyping, and computer-based methods (Kendall and Kendall,[3] Merlyn and Parkinson,[4] Zahedi[5]). The Capability Maturity Model (CMM), developed by the Software Engineering Institute of Carnegie Mellon University, is another tool that firms use to integrate quality into each process of software development (Parzinger and Nath[6]).

While the approach of building quality into the development process has a lot of advantages, one must still measure or evaluate the quality of a software product before one could ascertain the value of a product. The task that we face in this study was to decide on the dimensions to use for the software evaluation process. There are different criteria that are in literature in regard to the topic of data, data quality, information quality and information systems quality. Levitin and Redman[7][8] identified several properties of data without linking the properties to software systems. Miller[9] describes the ten dimensions of information quality from the perspective of organizations dealing in information products. The criteria he gives therefore focuses on the more general features of information. Some researchers in literature investigated the quality of information systems from the service quality perspective (Pitt, Watson and Kavan [10][11]). Many of the authors that conduct service quality based views in their studies use the SERVQUAL dimensions (Parasuraman, Zeithaml, and Berry [12]). DeLone and McLean's [13]works on the quality of information systems are probably the most visible in the areas of evaluating the quality of information systems. These authors recommend two dimensions of system and information quality and several criteria for the evaluation of the quality of such systems.

A final field of research that is beginning to grow in literature is the attempt to evaluate the quality of websites. Examples of work in this area include tools such as WEBQUAL, with its two dimensions of attractiveness and informativeness (Barnes and Vidgen [14]) and the work of Katerattanakul, P. and Siau, K. [15]. These focus on the quality of general web pages rather than on specific web application. The present research will therefore contribute to research work that seek to describe the quality of web application, in particular web applications that Newspapers use for their rental services. Though WEBQUAL was developed for a web application for bookstores, the present work would be developed based on the quality dimensions that were developed by Wang and Strong (1996) [16], rather than on WEBQUAL dimensions. There are two reasons for this choice, first the former dimensions were developed using rigorous investigation of IS managers. It also includes a finer differentiation of web application quality dimensions than the two dimensions that WEBQUAL instrument offers.

RESEARCH APPROACH

This exploratory research is seen as the first segment of a two-part study. Initially, this research targeted rental classifieds. The choice of the rental ads was made so that we could exploit our experiences with such web applications even though several other categories of classifieds exist, such as automotive, real estate sales, employment classifieds. It is assumed that

availability of multiple "standard" criteria for rental ads would make it easier to examine first. A laboratory research approach was selected because it would allow us to test and rate all classified ads (the research objects) in the same way. Additionally, a laboratory study approach could be completed faster that a mail-survey and would therefore yield time and cost-savings.

The determination of the size of the demographics of the research sample was also an important research decision. Based on the data of the NAA, in 1999 there were 736 morning newspapers and 760 evening newspapers in the US (a total of 1,483 after compensation is made for those producing both morning and evening papers).[17] In April 2000, it was estimated that about 1,200 US daily newspapers had established online services.[18] However, many of these daily news had no online classifieds in the true sense of the word. NAA found that only about 70% of its members have online classified advertising.[19] In this study, the focus would be on morning newspapers since they have the higher level or scope of classifieds. Based on the estimation that there are 1,200 websites, we estimate that about 50% of these would be for morning newspapers. We estimate that our potential research population is about 600 classifieds ads sites. After the available data was analyzed, it was decided to focus on the largest 100 US newspapers instead of a statistical random sample. Two facts weighed against the use of a random sample. First, about 75% of all daily newspapers in the US have a daily circulation of less than 50,000. This implies that a representative random sample would have a high proportion of newspaper organizations with small circulation. However, evidence in literature suggests that these newspapers are less likely to have online classifieds due to limited resources and skills.[20] Since this study is designed to document the practices of existing web sites, and newspapers with larger circulation could be expected to have such web sites, the decision was made to focus on the 100 largest daily newspapers in the US.

These 100 largest newspapers studied cover 38 out of the 50 US states. The largest newspaper in the study had daily circulation in 1999 of 1,671,530 and the smallest newspaper had a circulation of 101,948 (1999). Table 1 shows a breakdown of the visited web sites. Only 96 of the web sites visited had valid or research relevant data. Two web sites were reserved only for members. One site had no classified ads while another had no data at all. The research population was therefore reduced to 96 classifieds websites. Table 2 shows the structure of the parent population from which the research sample was drawn. It shows that 92% of the US market has a circulation of 100,000 or less. . Our research sample focuses on the high end (top 7.07%) of the US market.

Table 1: Break-down of the web sites visited

Restricted web sites	2 (2%)
Web sites without classifieds	1 (1%)
Incomplete web sites	1 (1%)
Final research sample	96 (96%)

There are at least two approaches for a laboratory test of a web site. First, one could compare each web site to an ideal standard. This approach was not used since we do not have an ideal standard. Second, one could subject all the tested web sites to a form of relative benchmarks. The reference standards used in this study do not represent an ideal, rather they constitute functions that leading providers offer and have been accepted by an evaluator as part

of a comparative tool. This latter approach is used in this study. The content of the instrument (comparative tool) is described in the next section.

Table 2: Description of parent population: Structure of the US daily newspapers market (1999)[21]

Circulation	Under 50,000	50,001-100,000	100,001-250,000	Over 250,001
Number of newspapers in category	1,244 (83.88 %)	134 (9.03%)	65 (4.38%)	40 (2.69%)

DEFINING QUALITY DIMENSIONS AND DESIGNING THE SURVEY INSTRUMENT

The issue of defining data quality has been prominent in literature in the past decade. As could be expected each information media has its own peculiarities in regard to how quality is defined. In this section of the report, relevant data quality literature, which develops a quality framework, is summarized in this section. Definitions from previous work were adapted for this study. First, data quality is defined as the set of characteristics that describes the degree to which information meets or exceeds the expectations of users.[22] A data quality dimension is defined as a group of quality characteristics whose components manifest associative properties. The association may be due to the similar manner in which users respond to the characteristics in a group[23] or based on the relationship of the characteristics to a third global factor. In defining a data quality framework for this study, reference is made to previous work by Wang and Strong (1996). These authors identified four quality dimensions in their research: intrinsic data quality (DQ), contextual DQ, accessibility DQ and representation DQ. These dimensions focus on four key issues and questions. The interpretation of these issues and questions for this work is stated as follows:

Intrinsic DQ: What degree of care was taken in the creation and preparation of information?
If a high degree of care was taken in the preparation of information it could be expected to have accuracy, objectivity, reputation and believability.

Representation DQ: What degree of care was taken in the presentation and organization of information for users?
If a high degree of care was taken in the presentation and organization of data, it would be structured, concise, consistent, easy to read, interpret and understand.

Accessibility DQ: What degree of freedom do users have to use data, define and/or refine the manner in which information is inputted, processed or presented to them? Information with a high level of accessibility DQ would permit users to easily access modify and refine data. Users would also be able to select the most appropriate input, processing and representation approaches for their needs.

Contextual DQ: To what degree does the information provided meet the needs of the users? Information with a high level of contextual DQ would add value, be relevant, complete, timely and appropriate for decision-making.

While the same data quality dimensions presented above was adapted for our research, the criteria used under each dimension were specifically developed for classified ads web sites. The development of the instrument has two parts. First, a model of the process of creating online classifieds was prepared. Table 3 shows each of the stages of the process as well as the possible data quality issues.

Table 3: Description of the process used by web-based classified advertising firms

Procedural Steps	Relevant Data Quality Issues
Step 1. Agents and owners having properties to rent visit an online site and enter the content of their classified ad in an electronic form that is submitted to a newspaper (alternately, the data could be mailed in an envelope).	This is the step that significantly defines the *intrinsic* data quality of classified ads that are put online. Errors in spelling, formatting, abbreviations and in the scope of data collected deter the intrinsic DQ of the information that is provided.
Step 2. The submission is processed and the ad is published if there is no credit-verification problem.	This step is part of the preparation phase. A newspaper organization could inspect and correct errors made in step 1 here.
Step 3. Individuals seeking rental properties visit the classifieds section of an online newspaper to preview the available ads.	This phase reveals the accessibility of a web site. If the classified section is malfunctioning most of the time or not well positioned on a web site, or is located on an inaccessible server, the accessibility quality may suffer. A special case of "low" *accessibility* DQ occurred in this study in the case of certain newspapers that have their online classifieds under password-protection.
Step 4. Visitors enter information about the property that they want to preview (if the web-site permits such flexibility otherwise the process continues with step 7).	This step exposes the degree of contextual quality of an online classifieds section. High *contextual* DQ would mean that there are several different kinds of search fields and criteria that could be used to *define the ads* that the user is seeking. It would also imply that the user has some flexibility in determining the *method* used to search and the *scope of areas* to look for the defined matching ads.
Step 5. The results of the search is presented to the user and tools are made available to ease the browsing process	This step influences the level of *representation* DQ that an online classified section offers. The provision of ads with high level of precision in their contents, e.g. no mixing of 2 bedrooms with 3 bedrooms, ads with high uniformity and graphing tools and pictures all enhance the representation DQ.

Step 6. The visitor is offered tools that would permit him/her to manipulate, refine or modify the kind of information, the format and/or the scope of matching results that the application presents.	This step reveals the *accessibility* DQ of the search results. Static and inflexible data results have low accessibility DQ, while those that can be sorted, refined and easily manipulated by users, have high accessibility DQ.
Step 7. User views the presented matching results (pre-selected or user-defined) and decides on the next step of action.	This step shows another side of the accessibility DQ. The provision of tools for printing, saving and e-mailing results or contacting the individual that paid for an ad, would enhance value and the accessibility DQ of results to users.

This study focuses on the data quality issues occurring in Steps 3-6. Steps 1 and 2 were omitted since a different approach that concentrates on the identification of user errors and the study of the data entry process would be required. Step 7 was also excluded for the obvious reason that we expect that most Internet users would have the means and the know-how to email, save and print the results of their search. The survey instrument for this study was therefore designed to cover the dimensions of contextual, representation and accessibility DQ.

Table 4 summarizes the variables that were included in the data collection instrument. The variables are self-explanatory for the most part. Under contextual DQ, the instrument was used to gather information about the manner in which users define rental ads, the means by which users define their preferred location and the methods by which the computer searches for the matching ads and the scope of searches.

The accessibility DQ dimension of the instrument measures the degree of convenience with which results could be manipulated, refined as well as the ease with which one could interact with the search results.

Table 4: Description of the research instrument items/variables

Data Quality Dimension	Variables included in instrument
Contextual DQ	Search methods available: 　　- Distances 　　- Places 　　- Zip Codes 　　- Newspapers 　　- Other Search variables (defining property ad): 　　- Bedrooms　　　　　- Date available 　　- Baths　　　　　　- Realtor fees 　　- Property type　　　- Type of lease 　　- Size　　　　　　- Keywords 　　- Number of rooms　- Date of ad listing 　　- Rent per month 　　- Criteria priorities can be set

	Search variables (defining property location):
	    - Mixed and fixed counties and neighborhoods
	    - Multiple counties can be selected per search
	    - One county or all counties at once can be selected per search
	    - Multiple cities can be selected percounty and search
	    - Multiple cities in multiple neighborhoods/counties can be selected per search

Accessibility DQ	Accessibility of data results:
	    - Availability of sorting
	    - Number of variables that can be used for sorting results
	    - Highlighting and collection of ads for selective processing
	    - Searching through results
	    - Hypertext based skip-browsing (nonlinear) possibilities.
	    - Visibility of the total sum of matches
	    - Visibility of the total number of pages of printable results

Representation DQ	Representation quality of results:
	    - Uniformity of listings
	    - Precision of listings
	    - Presentation of amenities on a separate page or section
	    - Map-based features for describing transportation issues
	    - Floor plans
	    - Availability of neighborhood information

The variables included in the representation DQ section of the survey measure the scope of data, and of the variety of the functions that the classifieds offer the user. These quality criteria and research instrument were developed based on a thorough pre-study of a few online classifieds. As a result of the pre-study, the data collection instrument was modified to include a few additional variables. The items included during the test process under the section of search methods (Q1) are: Newspapers and Other items. For Q2 the following items were added: keywords and priorities. Under Q3: the as possibility of the searching through search results was added. The updated version of the survey instrument is included in the appendix of this paper.

DESCRIBING THE TEST PROCESS

The research was carried out early 2001. The following testing procedure was used for all sites:

1. Visit the web site of the newspaper and look for any information on the neighborhoods
2. Visit the classifieds section and look for the rental properties category
3. Determine if the newspaper owns the rental classifieds section or if it is a partnership web site run by a professional classifieds agency, e.g. Appartments.com
4. Create a search that would yield a multi-page result
5. Inspect results for accessibility and representation DQ
6. Finish the recording of results and move to the next web site

These basic steps were used for each site and the results were recorded on the survey instrument and later, the data was transferred into spreadsheets for further analysis.

RESULTS OF THE STUDY

The following section provides a summary of the results of the survey. For each of the investigated functions, we would give the overall summary of the results and then control for the effects of circulation of the newspapers on the results.

1.   *The use of partnerships (with professional firms) to provide online classifieds*

A partnership was assumed to exist only when an organization solely offers a third party web application on its site. The results showed that 54% of the web sites use the services of third parties to provide online classifieds for their users and 46% of the web sites studied owned their classified web sites. Few newspapers provided (hypertext) links to other classifieds web sites as an additional feature. This practice was not interpreted as partnership. . Table 5 provides a detailed analysis of the results with regard to daily circulation. A definite trend is obvious. The larger a newspaper is, the greater the likelihood that they would partner with a third party in creating their rental classifieds web site. The converse is also true for newspapers with smaller circulation.

Table 5: Tendency to work with third parties or partners

Circulation	Percentages
500,000 and higher	62.5%
Greater than 400,000 and less than 500,000	71.4%
Greater than 300,000 and less than 400,000	50%
Greater than 200,000 and less than 300,000	41.7%
Greater than 100,000 and less than 200,000	41.9%

2.   *The availability of search functions on classifieds web sites*

Not all classifieds web sites allow the use of search functions. The most primitive sites use the web solely as an electronic billboard. These sites are referred to as "listing classifieds web sites" because they do not allow users interact with search results in a meaningful manner. In many cases, the user does not even have the tools to conduct a search at all. Other sites allow users to select a category or type of rental property they need, and results are then listed with no sorting possibilities. Listings are presented to users much in the same way as the hard-copy version of a newspaper listing. Overall, 66% of the sites permitted some form of search tools to the user, while 34% permitted little or no search capabilities. It seems that the sites operated by newspapers with a larger circulation tend to offer search functions than those being operated by newspapers with a smaller circulation (see Figure 6). In the next segment, we would present the kinds of search functions offered by the newspapers studied.

Table 6: Sites offering adequate search methods based on newspaper circulation

Circulation	Percentages
500,000 and higher	100%
Greater than 400,000 and less than 500,000	100%
Greater than 300,000 and less than 400,000	78.6%
Greater than 200,000 and less than 300,000	45.8%
Greater than 100,000 and less than 200,000	46.5%

3. *The scope of search methods provided for the definition of geographical locations*
    The scope of search methods that are possible for online searches was investigated. In other words, how does a user define the geographical location of a desired rental property. The five categories investigated are: the use of distances, the use of names of places, the use of zip codes, the use of newspaper names and the "other" category. The overall results are as follows.
    This study also included a detailed investigation of how the "names of places" fields are used to define geographical locations. Many websites use different levels of aggregation, such as counties, neighborhoods and city names, for defining geographical places. We define neighborhoods as an aggregation of cities which, by virtue of their proximity to each other, are recognizable as a sub-segment of a geographical region, such as North, North-East, South and so on. Counties are geographical areas that are each made up of multiple neighborhoods. This aspect of defining geographical places is described later on in this paper.

Table 7: Scope of search methods offered for defining locations (multiple responses possible)

Method	Percentages
Distances (combined with places)	4%
Use of the name of places	70%
Zip codes	5%
Newspaper names	9%
Other (e.g. street names)	2%

The results suggest that the name of places which could be cities, neighborhoods, counties or mixture. Searching based on name of place is the most popular method used by online classifieds. The use of this kind of method is effective, especially when a map of the area is provided for the user. All the other items such as newspaper names, zip-codes, distances and all other items listed are less common on web sites. The results provide some evidence that very few sites combine the use of name of places with other methods such as distances.

One advantage of using distances in combination with name of places is obvious. Users who view their commute as part of their decision criteria can make a more informed decision than would be possible with the use of name of places alone. The use of newspaper names and zip codes would primarily benefit users who are knowledgeable about the region in question. The analysis of the results with respect to size did not reveal any interesting differences between small and large organizations. The next section presents information about the methods that are provided for defining rental objects.

4. *The scope of fields provided for the description of rental ads or objects*
    An important feature of every online classified section is the extent to which a user can define the rental ads to be listed. The results of this research reveal that most sites concentrate on a few variables (see Table 8). The "property type" variable (85%) occurs most often on all web sites. The uses of fields for "number of bedrooms" (63%), "rent per month" (60%) follow in second and third places respectively. Only 54% of the web sites permit users to search based on the number of bathrooms. 45% of the sites offer the use

of "keyword fields" and 43% permit the "date of ad posting" as a defining criterion. All the other possible fields included in the instrument were seldom used.

Table 8: Scope of search variables offered (multiple responses possible)

Search fields	Percentages
Property type	85%
Number of bedrooms	63%
Rent per month	60%
Number of bathrooms	54%
Keywords fields	45%
Date of posting of an ad	43%
Set priority	9%
Size of property (sq. ft.)	1%
Date available	1%
Number of rooms	0%
Realtor fees	0%
Type of lease	0%

Further analysis of the results revealed that the "keyword fields" and the "date of ad posting" often occur together. Furthermore, we discovered that the newspapers with the smaller circulation used these two features more frequently. 60% of the newspapers with a circulation of less that 200,000 used keyword search fields and 46.5% of them used the "date of ad posting" as a listing criterion. Altogether, we conclude that the scope of search fields provided in 40% of the sites investigated is of lower contextual quality.

5. *The scope of tools provided for the limiting of search neighborhood of rental property*
    Table 9 describes the degree of flexibility that is possible in defining/limiting the scope of geographical search. The ideal scenario here would be a classified site that permits a user to select a state first and then allows them to select specific neighborhood(s) they want from a list of all possible areas. (If this is the first time neighborhood is used, it needs to be specifically defined in the section that describes geographical searching.) Finally, the system would permit a user to select the particular cities in each neighborhood that should be included in the search (i.e., from a list of all cities in the neighborhood chosen). Overall, most online classifieds do not offer their users the highest possible flexibility that is the possibility of selecting multiple cities in multiple neighborhoods per search. Table 9 shows the scope of tools provided for limiting the definition of neighborhoods. For this section, multiple responses per web site were possible. About one half of the sites do not offer their users the opportunity to search by cities or counties. Those that do, often create their own "self-defined" regions, which may even mix cities and counties together or combine two or more neighborhoods/counties into a category. Fifty four percent of the sites permit users to select multiple neighborhoods counties per search. Only nine percent of the web sites offer the highest flexibility of multiple cities and multiple counties per search. Though the quality seems to be low across the board, larger firms (with a daily circulation of more than 300,000) offer better flexibility than do the smaller ones in searching by geographical area.

Table 9: Scope of search fields used for describing neighborhoods (multiple responses possible)

Search fields	Percentages
Mixed and fixed counties and neighborhoods	52%
Multiple counties can be selected per search	54%
Only one county/neighborhood or all neighborhoods can be used	7%
Multiple cities per county can be used	0%
Multiple cities in multiple counties can be used	9%

6.   *The degree of accessibility of search results*

When online classified ads produces search results, the output does vary with respect to the degree of accessibility of the results to users. Accessibility, in this context, describes the scope of the tools that are provided to enable a user to interact more meaningfully with search results that are generated after a rental property search. Tools such as sorting functions, page skip-browsing and selective processing tools were investigated. Tables 10 and 11 summarize the accessibility of the websites visited. The results in Table 10 show that about 38.5% of all sites do not sort results that are presented to users. According to the Table only 13% sort with 3 or more variables. Sixty three percent of the sites have sorting functions out of which forty eight percent of the websites tested only allow automatic sorting of the results using one variable. The fields that can be used for sorting range from very useful ones, such as rent and number of bedrooms, to less helpful ones such as alphabetical sorting of results. Alphabetical sorting offers a low level of accessibility but it is better than cases in which results were not sorted at all. In summary, about 61.5% of the sites investigated offered little accessibility in regard to sorting functions. Twelve and a half percent of the sites belong to the best class, which provides customizable sorting processes with three or more variables. When we factored in the circulation size, there were very little discernable differences between the smaller and the larger Newspapers.

Table 10: Sites offering sorting functions for results

Degree of sorting provided	Percentages
No sorting is done	38.5%
Sorting with 1 variable possible	48%
Sorting with 2 variables possible	1%
Sorting with 3 or more variables possible	12.5%

There are additional features that make it easier for users to interact with search results. Functionality such as the visibility of the number of matches or hits and of the number of the results pages was documented. Furthermore, we looked for the following: the feature that permits a user to skip through pages, the feature of allows users to select and compile ads and the feature that allows users to search through their search results. The availability of these enhanced accessibility features is summarized in the next section.

The most common feature of the sites is the estimation and presentation of the number of hits (92%). Seventy three percent of the sites allow the selection and collection of listings or records for further processing. Fifty seven percent of the sites show the number of

printable pages of search results. The majority of the sites do not present their results in a manner that permits hypertext-based jumping from page to page. Only 9% of the sites permit users to search through search results. On the whole there is room for the improvement of the accessibility DQ of the classified sites investigated.

7. *The level of representation data quality of web sites*

Table 12 summarizes the items that were evaluated in regard to quality of representing search results. These criteria include the uniformity of all listings and also the precision or degree of specificity of each listing. A listing with a high degree of precision includes only one rental property and exact rental costs, for example $ 2000 is precise while $2000-$3500 is not precise. This criterion is important if one plans to have a useful sorting process based on rental cost. Representation quality also includes information tools that permit users to view a map of the location of the rental property. Additionally, representation quality includes the convenience of viewing the floor plan and layouts, neighborhood information and detailed list of the available amenities of the rental property.

Table 12: Scope of representation quality features on web sites (multiple listings possible)

Criteria	Percentages
Inclusion of neighborhood information	80%
Inclusion of floor plans	30%
Mapping function	30%
Separate section/feature for viewing amenities	30%
Precise listings	4%
Uniformity of content of listings	2%

As shown in Table 10, most web sites include general information about the different communities covered by their web sites. Such information includes crime rates, school performance and demographics. This seems to be the only area that is covered by most (80%) sites. All the other components of representation quality were neglected by at least two-thirds of the research sample. On 70% of the web sites, a user would not be able to generate an electronic map of the location of the rental property. Furthermore, users are not able to see floor plans nor are they provided with a distinct feature that permits them to view the amenities provided in the rental property in 70% of the sites. Based on the very low degree of features and options provided, it seems safe to say that the representation quality area could be improved.

SUMMARY

This laboratory-based study investigated the quality of rental advertising section of the online classifieds of the 100 largest US daily Newspapers. Ninety-six of the one hundred classifieds web sites visited were evaluated. The study investigated the contextual, accessibility and representation quality of the sites. The results of the study are summarized below.

Newspapers with a larger circulation seem to be more likely to form partnerships for the development of the online classifieds applications. Web sites that are owned by smaller newspaper organizations seem to be more likely to offer less search functionality to their users. In other words, most of the sites investigated do not offer the combination of quantitative and

qualitative measures for the definition of search areas. These web classifieds permitted users to select a state, and then multiple neighborhoods from the state and lastly multiple cities from each of the selected neighborhoods. About half of the population investigated did not permit the use of defined neighborhoods for geography-based searches. There are significant opportunities for data quality improvement in this area.

The study also gathered data with respect to the number and kind of fields that are used to describe a rental property in a classified ad. Property type number of bedrooms and rent per month are the most frequent fields provided. The fields most sites provided for the searching of rental ads could be described as sufficient. All items described till this point define the contextual quality of classifieds sites. On a scale of 1 (excellent) to 5 (bad), we rated the contextual quality of most of the sites tested as 3.0 (average).

The level of accessibility of search results to users was also investigated. Only 12.5% of the sites offered very good sorting function for search results. Many of the sites permitted sorting using 1 variable while about 38.5% permitted no sorting at all. Navigating through the search results was neither user friendly or easy. A high degree of accessibility is demonstrated by almost all of the sites providing the number of hits per search and most of them permitted the feature of highlighting and separating interesting ads for further use. In this area of accessibility quality, we would rate most of the sites as average (3.0).

The study also tested the representation quality offered by the sites. In this area two thirds or more sites lack the expected features. Most ads did not include any section for describing amenities, for generating maps of streets, and for floor plans. On the positive side, most of the sites had some form of neighborhood information for users. The representation quality seems to be in need of urgent improvement. We rate the level of representation quality of most sites as below average/expectation (4.0).

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