

**EARLY TRANSFORMATIONS OF
COMMERCIAL WEB SITES: EVIDENCE
FROM PUBLIC ANNOUNCEMENTS**

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ABSTRACT

Many organizations are constantly redesigning their web presence. Despite the frequency of these transformations, there appears to be little evidence to explain why organizations undertake such initiatives and what kinds of changes are incorporated into each updated version of a web presence. To understand why commercial organizations transform their web presence, we conduct a content analysis and a cluster analysis of press releases describing redesign initiatives in the late 1990s. Findings suggest that the majority of companies redesigned their web presence to expand information and change navigation protocols. Surprisingly, the addition of interactive features such as online ordering and community communication channels is present in only 20% of the redesign cases studied. According to the groups provided by the cluster analysis, most of the changes reported in these press releases are centered on improving the usability of the web presence. Based on this evidence we conclude that initial transformations to commercial web sites were more driven by the need to effectively communicate new information than by the addition of e-commerce features.

Index Terms: web sites, usability, redesign, content analysis, cluster analysis, e-commerce.

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1. Introduction

In the early days of the Internet as a commercial medium, a new breed of "pure-Internet" companies, such as Amazon.com and eBay, were created to take advantage of the capabilities of the new medium. At the same time, many brick-and-mortar organizations rushed to establish a web presence. For both types of companies, a web site is an indispensable tool not only to communicate information to their constituencies, but also to carry out business transactions online. Although an organization's web presence is generally considered "work in progress," there is little research evidence to explain why organizations constantly update their web presence and what kinds of changes are incorporated into each new version. Anecdotal evidence suggests that changing a web presence may have a significant impact on the firm. For example, in September 2000, shares of NBCi (NBC Internet) increased more than 20% after the company unveiled its redesigned site (USA Today, 9/26/00). In another news account, Salon.com, an online magazine, was forced to pull back a site redesign that generated numerous complaints from its users (New York Times, 6/5/00). Despite these and other examples, we are unaware of any systematic study of web presence transformation in commercial organizations. Little is known about what drives these changes, what kind of new features are incorporated and whether the nature of the additions is different depending upon the type of organization.

A commercial web presence is in essence a web-based information system that is constantly evolving to reflect new strategic objectives and/or to take advantage of new technological possibilities. To understand these web presence transformations, we adopt a qualitative approach, based on the analysis of a collection of press releases announcing the unveiling of a redesigned web presence in the period 1995-1999. We analyze the content of these textual documents to learn about the features added to web sites and the evolution of these features over time.

The remainder of this paper is organized as follows. Section 2 reviews the relevant literature in functionality, usability and web site design, as well as the emerging empirical literature in e-commerce metrics. Section 3 outlines the research questions underlying the study and Section 4 describes the research methodology. Section 5 presents the results and section 6 discusses the findings, their implication and limitations. This discussion is followed by the conclusions.

2. Literature Review

Just after the Internet opened for business, in 1994-1995 the main objective for many organizations was to establish a presence on the web and to use the site to communicate information to their constituencies. In these early days, little was known about how to design web sites to maximize profits (Hoffman et al. 1996). Since then, a number of studies have explored the link between web site design and commercial success. Design features may affect consumers' reactions to the site (Jarvenpaa and Todd, 1997), web site traffic (Lohse and Spiller, 1998; Goodwin and Marquis, 2000), purchase behavior

(Liang and Lai, 2002), customer loyalty (Koufaris et al. 2001) and sales (Lohse and Spiller, 1998).

These studies take web site design characteristics as given and relate them to specific performance indicators such as sales, site traffic or user perceptions. However, they do not address the motivations behind web site transformations or the differential impacts of a redesigned site on particular performance indicators. Empirical research has paid relatively little attention to the waves of changes undergone by commercial web sites and the reasons why companies decide to alter their web presence.

Palmer and Griffith (1998) theorize that web site design is the result of both technical aspects and marketing decisions. Technical characteristics refer to the selection of new formats (e.g. audio or video) to present information, and decisions regarding navigation protocols (e.g. hyperlinks, frames, etc.). Marketing considerations include information content, promotions, online sales and the availability of service/support. We interpret this framework to suggest that web design is determined by technological choices and strategic/marketing considerations regarding the purpose of the firm's web site (Figure 1). Therefore, any change in the technological environment, due to the rapid advances in Internet-related technologies, or any shift in the web-marketing strategy of the firm would result in the redesign of the web presence to take advantage of the new possibilities.

A web presence can be thought of as an information system deployed on the web. As with any other information system, the Technology Acceptance Model (Davis, 1989) can be used to explain the determinants of its adoption and use. The theoretical underpinnings of TAM relate information systems adoption and usage to users' perceptions of usefulness and ease of use. *Usefulness* refers to the degree in which the system will help

the user in the performance of his/her tasks, while *ease-of-use* points to the extent to which using the system will be free of effort. To be perceived as useful, an information system should provide the necessary functions, so that users can accomplish their tasks. Therefore, the functionality of the system is critical to determine whether a system will be adopted and used. At the same time, to be perceived as easy to use, the system must provide good usability or be usable.

Usability refers to the degree of compatibility of the system with the users' cognitive characteristics for communication, understanding, memory and problem solving (Goodwin, 1987). Usable systems are those in which the user and the system can "communicate" clearly without misunderstandings through the interface (Benbunan-Fich, 2001; Van Waes 2000).

In sum, there are two objective attributes of system design -functionality and usability- that impact whether users adopt (and how users perceive) information systems. Functionality characteristics determine users' perceptions of usefulness, while usability attributes result in perceptions of ease of use. These perceptions determine whether a system will be adopted and used. These notions can be extended to web-based systems to explain the rationale behind many web site transformations as attempts from the part of the firm to add functionality and/or improve the usability of the site and increase the likelihood of adoption of the site.

2.1 Usability, Functionality and Web site design

The usability and web design literature (Nielsen, 2000; Shneiderman 1998) suggest that providing high-quality information and the ability to easily find information are two

major design goals of a web presence. However, in order to achieve its potential as a business tool, commercial web sites should also provide e-commerce functionality based on the Internet's unique characteristics in terms of connectivity, interactivity and network integration, which allow firms to interact with customers in unique and novel ways. Examples of this new interactive reach include online order forms, and direct communication channels between the company and its customers and among customers themselves.

Some authors classify usability characteristics in terms of information content and access or navigation (Nielsen, 2000; Scharl and Bauer, 1999). The premise is that a usable web site provides the necessary information in an easy to access way. Recent studies in e-commerce metrics provide more detailed constructs and measures in the areas of content and navigation (Straub et al. 2002a; Straub et al. 2002b).

Content refers to the "broadness, thoroughness, accuracy, and updatedness" of the information (Ghose and Dou, 1998). Palmer (2002) articulates content in terms of the quantity and variety of information presented through the site, while Agarwal and Venkatesh (2002) include the relevance, depth and breadth and timeliness of the information in their definition of the concept. An important dimension of content in commercial web sites is the availability of **product or service descriptions** (Zhu and Kraemer, 2002). The types of offerings that organizations present to the market drive e-commerce strategies and hence influence web site design decisions (Palmer and Griffith, 1998). Several studies conceptualize content not only as the substance but also as the form in which the information is presented. For example, Palmer's (2002) content construct includes the use of text, **graphics or multimedia**, and Agarwal and Venkatesh (2002) use

the term "media use" to indicate the use of multimedia to present content. Thus, for the purposes of this research, we separate content in two dimensions: substance (information content) and form (multimedia and graphics).

The second usability parameter is *navigation*. It refers to tools such as buttons, links and menu bars that allow the user to move around the site and find information. McKinney et al. (2002) define navigation as the "ease to go back and forth" and the "use of a few clicks" to access a specific area of the site. Some factors that positively influence navigation are the sequencing of web pages, a well-organized layout and consistent use of navigational protocols (Palmer, 2002). We use the term **layout** to designate these characteristics.

A significant improvement in the area of navigation, is the availability of **search engines** to enable users to quickly and easily find what they need (Koufaris, 2002). Because the organization of content in a web site is non-linear, a search function would help users to locate more efficiently the information they are looking for (Hoffman et al. 1996). In the context of commercial web sites with online ordering, search capabilities assist the users in finding a specific product quickly (Zhu and Kraemer, 2002). For sites whose products can not be purchased online, search facilities may indicate the nearest dealer or retailer (dealer locator).

One element that may negatively affect navigation is the response time of the system, also referred to as **download delays** (Palmer, 2002). McKinney et al. (2002) define this concept as the speed of access and the availability of the web site at all times. For a web presence, the download delay is influenced by factors such as connection speed and Internet traffic (Benbunan-Fich, 2001), as well as particular characteristics of the web

servers and IT infrastructure. In general, Internet traffic and hardware constraints on data retrieval and calculation are beyond the designers' control. There are however, some features inherent to the design of a web presence such as page size and amount of graphics that can be modified to improve the time that it takes for a page to download in a typical user screen.

In addition to content and navigation features, commercial web sites take advantage of the Internet's potential for interactivity and provide e-commerce functionality. Interactivity is a multidimensional concept that can manifest itself in different ways (Ghose and Dou, 1998). Hoffman and Novak (1996) make the distinction between two levels: *Person-Interactivity* that occurs between humans through a medium and *Machine-Interactivity*, which occurs between humans and machines.

Person-Interactivity refers to bi-directional human conversations where the parties establish a computer-mediated dialogue (Schultz, 1999). Web sites support this type of interactivity by providing synchronous (e.g. chat rooms, instant messages) and asynchronous (such as emails or bulletin boards) communication channels through the site. Depending upon the communicating parties, these channels could be for customers to contact the company (e.g. "Contact US" or "Email US" buttons) or for customers to communicate with other customers.

In the case of customer-company channels, the web site provides users with the option of contacting the company (typically via email) with particular issues, comments or complaints. Depending on the nature of the product or service offered and the degree of customer focus, some web sites offer real time **customer support facilities**, where users

can contact company representatives via web-enabled voice communication or instant messaging based communication (Zhu and Kraemer, 2002).

Inter-customer channels consist of providing computer-mediated communication facilities for users to communicate directly with one another, overcoming time and distance barriers. In this case, the web site typically offers the user the opportunity to participate in an online group or **community** (Agarwal and Venkatesh, 2002). Through these online user groups, customers can share their experiences with others and ask questions that may be answered by others (Ghose and Dhou, 1998).

Machine-Interactivity refers to elements that support the interaction between the user and the site (Scharl and Bauer, 1999). Consumers using the Internet to gather information or to purchase goods or services are influenced by the interactivity of the site (Jarvenpaa and Todd, 1997). Highly interactive web sites offer their customers the opportunity to **purchase products online**. This feature can be defined as transaction-interactivity, and encompasses not only the ability to buy online, but also the availability of order tracking and return mechanisms (Zhu and Kraemer, 2002).

Another element of interactivity to support purchase transactions is the existence of online **promotions** through the web site. Particular promotional campaigns such as sweepstakes, contests, coupons and prizes that can be successfully implemented online, may be added to the web site. These marketing elements can help companies collect specific information about their web site visitors, and may be critical to drive more traffic to the web site (Ghose and Dhou, 1998).

From a technical standpoint, *machine-interactivity* may also manifest itself as features aimed at facilitating the general interaction between the user and the site. In this

context, the ability to customize the site according to individual user preferences or **personalization**, is an example of an interactive element that can be used for this purpose (Palmer, 2002; Zhu and Kraemer, 2002)¹. The assumption is that web sites that can be tailored to the "unique and idiosyncratic needs of a specific user" (Agarwal and Venkatesh, 2002) are easier to use. Another approach to facilitate the interaction between the user and the site is by increasing the responsiveness of the system (Palmer, 2002) and offering detailed feedback and help facilities. These **feedback** features are key user interface measures (Shapiro and Varian, 1999) also aimed at facilitating the interaction between the user and the site, as well as providing frequently requested information in a way that is easy to access (Jarvenpaa and Todd, 1997).

The previous review of the literature allows the identification of the three conceptual categories --content, navigation and interactivity -- and the indicators associated with each one. **Table 1** summarizes these categories, along with their measures and the studies that provide specific metrics in each case. These three conceptual categories (content, navigation and interactivity) lay the foundation to examine web presence transformations in commercial organizations.

<< Insert Table 1 about here >>>

2.2. Evolution of commercial web sites

The very first commercial web sites were more like electronic billboards of information than interactive tools for doing business (Guenther, 2000). However, as

¹ In the literature, some authors use the term personalization and customization interchangeably, to indicate the ability to customize the content of the site according to individual user preferences. In this paper, we use the term "personalization" to make a distinction between *product* customization and *web site content* customization.

Internet technology has evolved and matured, and organizations have moved ahead in their learning curve of how to use the Internet for business, their web sites have become more sophisticated. It follows logically from Palmer and Griffith's (1998) model that any shift in the technology front and/or in the organization's purpose with the web site will result in a *redesign* of the web presence. Even if the technology stays the same for a period of time, the organization may decide to expand the information content offered, or to facilitate the access to information, or to transform its site into a more interactive business medium. All of these changes may prompt a web site *redesign*.

Clearly, any change in the technological environment or in the organization's ability to incorporate new and more advanced features to its web site would result in a different set of design choices, and a more interactive web presence. These notions have been documented by some recent studies. In an empirical study about the adoption of e-commerce by small and medium enterprises (SMEs) in the United Kingdom, Daniel et al. (2002) found evidence to support the assumption that firms follow at least four sequential stages or clusters of adoption. Firms in the first cluster develop their initial e-commerce services, those in the second cluster use e-mail to communicate with customers, suppliers and employees. The third level of adoption corresponds to information-based web sites and development of online ordering facilities. The most advanced adopters in the fourth cluster have online ordering facilities and are developing online payment capabilities.

The conception of e-commerce as an evolutionary innovation has also received support in the practitioner literature. A survey of web site designers reported by ComputerWorld in the U.S. in 1998 indicates that the first wave of web redesign in 1996 was aimed at improving usability, while the second wave in 1997 was more oriented

towards enabling customers' transactions. The third stage in 1998 consisted of the integration of the site with back end systems to support personalization (delivering customized information based on user preferences) and better inventory management. The final wave in 1999 was more focused on real-time interactive capabilities to provide communication forums with customer service representatives and other customers (Machlis, 1998).

Using different research techniques and populations, these studies confirm that the process whereby organizations incorporate particular web site characteristics emerges in successive iterations.

3. Research Questions

This study is designed to examine why organizations redesigned their sites in the late 1990s. Because the literature in this area is not yet well developed, it can not lead to the formulation of specific hypotheses. In particular, we intend to study the kind of changes that organizations announce when they redesign their sites based on the set of parameters extracted from the literature. We also seek to explore if the incorporation of new features corresponds to a particular time frame. For example, we examine if the addition of search engines occurred in a specific period of time. If this were the case, we would be able to trace the general evolution of commercial web sites in terms of the features added. We also intend to study whether different kinds of organizations undertake different kinds of web presence redesigns. Finally, we examine whether particular sets of features are launched simultaneously in a redesigned site, with the intention of establishing a typology of redesign efforts.

More specifically, our research questions are: (1) What kinds of new features are launched with a redesigned web site? (2) Are the features different over time? (3) Are there organizational predictors of web site changes? (4) Which features are launched at the same time? All of these issues will shed some light on the reasons that motivate organizations to redesign their web presence and improve our understanding of the uses of commercial web sites.

4. Methodology

To address these research questions, we use a qualitative approach based on the analysis of secondary documents. We use a sample of press releases describing web site redesign initiatives during the 1995-1999 period. Our unit of data collection - the press release - presents several advantages over more conventional methods such as interviews and questionnaires. First, it does not suffer from sample size problems, as is often the case with interviews and questionnaires that cannot be completed or are not returned. Second, press releases represent descriptive data of actual practices, while surveys and interviews rely on collective and subjective perceptions of such practices. Third, the use of secondary data collected over a period of several years permits an analysis over time, instead of the typical cross-sectional examination achieved through more traditional methods (Todd et al. 1995).

An additional advantage of press releases that have been generated at the same time as the events being investigated is that they overcome problems of recall, particularly when historical information is sought. Although researchers are unable to exercise any control

over the generation of this kind of secondary data, its low cost is yet another advantage over more expensive and less reliable primary data collection methods (Cowton, 1998; Harris, 2001).

We use content analysis techniques to code the press releases. This mode of analysis is a form of semiotics, which consists of assigning words to conceptual categories (Myers, 1997). Then, we use cluster analysis to investigate whether we can articulate a typology of redesign efforts. Each of these steps is described in more detail below.

4.1 Step One: Content Analysis

As a research technique, content analysis allows examining the objective, systematic and quantitative description of the manifest content of communication (Berelson, 1955). The premise of our study is that by analyzing the content of redesign announcements, we can better understand the motivations underlying these efforts and the nature of the updates launched with each redesigned version of a commercial web site in the late 1990s.

Content analysis has been applied in a number of studies in the Information and Communications Technology (ICT) field in order to address a variety of research questions. Examples include the evolution of information systems job skills (Todd et al. 1995), employment outsourcing (Slaughter and Ang, 1996), job-seeking ads of Webmasters (Wade and Parent, 2001), collaboration in technical communication (Thompson, 2001) and asynchronous group decision-making (Benbunan-Fich et al. 2003) among other topics. Other studies have also used this methodology to analyze the content of web sites. Ghose and Dou (1998) coded web sites in terms of their level of interactivity.

Bucy et al. (1999) studied the formal features of Web sites and showed a significant relationship between site traffic and page structure. Scharl and Bauer (1999) developed an automated software program to analyze the content of a site and count the number of images and external links.

Content analysis is a method of inquiry into the meaning of messages (Krippendorff, 1980), where researchers use systematic recording procedures to code and produce a quantitative description of the content of the communication. These counts are then statistically analyzed. To make valid inferences, all decisions on variables, their measurement and coding rules must be made in advance (Neuendorf, 2002). Having a predetermined analysis structure allows the systematic collection of data uniformly across all the observations without being distracted by non-relevant information. The counting or coding allows organizing, indexing and retrieving data, which offers the opportunity for researchers to learn about the issue under investigation (Berg, 1998).

Neuendorf (2002) notes that in some content analysis situations, the unit of observation (or unit of data collection) is different from the unit of analysis. In our case, the unit of data collection is the press release and the units of analysis or message components are the words or phrases that describe new features of the redesigned web site. The categories of analysis identified from the literature resulted in thirteen categorical variables, presented in **Table 2**. The use of a literature-based framework allows relating the inferences to the existing body of research.

<<< Insert Table 2 about here >>>

Based on the coding, we make two types of inferences. First, we study the frequency of the features added to redesigned web sites during the period; and second, we

analyze whether these features are more frequent in any given year. Then, we use an algorithm to classify the observations in clusters according to the features added.

4.2 Step Two: Cluster Analysis

Cluster analysis is a multivariate analysis technique that seeks to organize objects or observations in relatively homogeneous groups, or "clusters." These clusters are internally homogenous (members are similar to one another) but externally heterogeneous (members are *not* like members of other clusters). Each cluster thus describes, in terms of the data collected, the class to which its members belong; and this description may be abstracted to create a taxonomy.

As a data reduction procedure, cluster analysis combines information about the entire sample and identifies major groups whose profiles can be studied. However, cluster analysis presents some caveats. First, it is primarily an exploratory technique because it has no statistical basis upon which to draw inferences to the entire population. Second, the cluster solution is not unique. It depends on the algorithm used to create the cluster and the number of variables considered. Notwithstanding these limitations, the methodology has been successfully applied in other disciplines. For example, in biology it has been used to form groups of living organisms, in marketing to perform segmentation analysis, and in organizational studies, to identify groups of firms based on their performance or strategies (Hair, 1998).

5. Results

Our data consists of press releases describing redesign initiatives in commercial web sites. We obtained the sample through full-text database searches of Lexis/Nexis, from January 1995 to December 1999. Redesign articles are defined as those containing the following keywords: redesign AND (web site OR website) and issued as PR Newswires or Business Wires. The initial search over the five-year period yields a total of 630 articles, which includes the redesign of products, magazines, and production facilities. These non-relevant announcements are eliminated. Duplicate articles (those referring to the same redesign), and press releases announcing *intentions* or *plans* of redesign and/or the hiring of consultants for an upcoming redesign project are also excluded. Only articles announcing the completion of a web site redesign effort were kept².

After the screening procedure, a total of 212³ articles remained in the sample (2 in 1995, 21 in 1996, 39 in 1997, 51 in 1998 and 100 in 1999). Since first generation web sites are launched in 1994-1995, when the Internet "opened for business," the number of redesign announcements in 1995 is extremely small. Shortly thereafter, we find evidence through press releases of increasing web site redesign efforts. These initiatives steadily grow over the years and in 1999 the number of press releases doubles the levels of 1998.

Table 3 describes the sample in terms of number of articles and type of organization making the announcement.

<<< Insert Table 3 about here >>>

² About a dozen companies announced two different redesigns during this period. These announcements were treated and coded as separate observations.

³ The original sample size was 213 but one observation from 1997 was dropped from the sample because it did not mention any details about the nature of the redesign and it could not be content analyzed.

Press releases in the sample were coded according to the variables presented in Table 2. Each of these items represents a categorical (0-1) descriptor of the content of the announcement. Coding instructions were to record a "1" if the article mentioned that a particular variable was added to the web site, or "0" otherwise. The coding was mostly based on "manifest" content (explicit mention of the variables in the text of the press release) but the coders were allowed to use *latent* coding in those cases in which the article mentioned a particular design parameter without using the specific keywords. Coders were instructed to record only those design enhancements released in the current version of the site. Upcoming changes were not to be coded, since there was no way of knowing whether these future features were ever implemented. To standardize the coding process, a codebook and code form were developed.

One of the authors and a graduate assistant worked as coders. Due to the exploratory nature of this study with no strong a priori expectations about the results, the service of one of the authors as a coder did not seem to present a threat to the study's validity. Prior to the actual coding, the researchers became familiar with the instructions and coding forms, and they coded a sample of articles to check their understanding of the procedure. After training and pilot testing, they worked independently to content-analyze each article. The coding of the articles in the sample took approximately 20 hours for each coder. To avoid coder fatigue that could result in inconsistencies, researchers divided the work in sessions of 2-3 hours.

Inter-coder reliability

For each variable, the level of inter-coder reliability was computed as the percent of agreement.⁴ The first column of **Table 4** shows the level of reliability obtained for each variable. Following Neuendorf (2002) we are reporting reliability coefficients separately. Reporting an average of the reliability coefficients across different items may cover very low levels of reliability for specific variables. Although acceptable levels of intercoder reliability are subject to debate, a widely accepted rule of thumb is that correlation coefficients exceeding .75 to .80 indicate high reliability, and .70 is considered reliable. Based on these thresholds, only product and service offers showed an acceptable level of 70%, while all the of the remaining variables exhibited very high levels of reliability, ranging from 83% to 98%.

To proceed with the analysis, the differences in coding were individually discussed and solved. The discrepancies between the coders can be broadly classified in two categories: errors of omission (e.g. overlooking particular keywords), and errors of interpretation (e.g. coding upcoming enhancements and future plans as current additions). This consensus process took approximately 10 hours. The resulting consensus coding was used for the data analysis.

5.1 Content Analysis Results

The analysis of the frequency of occurrence per variable shows that most of the articles in the sample report new content (78%), layout (65%) and navigation (64%) features. New product and service offerings (35%), search engines (30%) and multimedia

⁴ Percentage of agreement = (Total number of observations - number of disagreements) / Total number of observations.

(25%) are in a distant second tier. About 21% of the articles mention the addition of online ordering and about 20% report the creation of inter-user communication facilities (or community feature). Counts and frequencies per variable are presented in **Table 4**.

<<< Insert Table 4 about here >>>

To investigate whether different types of organizations launch different types of features when redesigning their web sites, we classify them in two categories: Internet firms and traditional firms. We statistically test the differences between the proportion of companies making the additions represented in each variable. We use a two-sample binomial test with normal approximation and calculate the z value. **Table 5** shows these results.

<<< Insert Table 5 about here >>>

The most significant differences in proportions are found in layout and content ($p < .01$). Internet companies announced more new layout features than traditional companies, while these traditional companies incorporated more new content than their Internet counterparts. Marginally significant results ($p < .05$) are found for User Feedback, Multimedia and Communication. Non-net companies incorporated relatively more new features in User Feedback and Multimedia, while Internet firms added proportionally more inter-user communication options than their non-net counterparts.

In order to study the frequency of these features over time, we conduct a chi-square analysis of the years and each variable. Results are shown in **Table 6**. Significant Likelihood Ratio Chi-Squares are found for navigation, multimedia, online ordering and search engines. The proportion of firms adding navigation features to their sites increased until 1998, when it reached its peak, and then decreased substantially in 1999. The

proportion of companies including multimedia options in their sites steadily decreased over the period, as these features became standard in web sites. A contrary trend is observed for online ordering, which consistently increased over the years. Finally, the addition of search engines was a popular trend in 1996, but lost its popularity, as more companies automatically included them in their sites.

<<< Insert Table 6 about here >>>

Thus, a year-by-year analysis shows that the addition of search engines was popular in 1996, and multimedia and graphics were a frequent new feature in 1997. Navigation reached its peak in 1998 and then decreased in 1999, while online ordering was very infrequent at the beginning of the period, but increased and reached its maximum in 1999.

5.2 Cluster Analysis Results

In order to examine whether some of these additions occurred simultaneously, we conducted a cluster analysis. This technique allows organizing the data in groups (called clusters) of homogeneous observations (similar redesign changes) while also distinguishing each group from others according to these attributes. The use of the complete set of redesign variables and the Ward's minimum variance method produced a 13-cluster solution. A listing of the clusters is presented in **Table 7**. Each cluster was named with the variables that most of the firms in that group changed. More detailed information about each cluster is provided in Appendix 1.

<<< Insert Table 7 about here >>>

Based on the groupings provided by the cluster analysis, it appears that when companies added search engines, or multimedia or communication facilities, they also

changed the overall content and navigation protocols in their web sites (clusters 1, 2, and 10 respectively). However, the addition of online ordering was usually launched on its own (cluster 11) or sometimes with content expansions (cluster 12). Moreover, clusters 9 through 12 refer to interactivity additions while the remaining clusters mostly describe different types of usability changes.

To examine further the composition of each cluster, we conducted a chi-square analysis of firm type by cluster. Because net and non-net firms are found in different proportions across clusters, when compared to the expected proportions given for the total sample (60% non-net vs. 40% net firms), the chi-square test is significant at $p < .05$. See cross-tabulation at the bottom of the table in Appendix 1. For example, cluster 3 (content and navigation) is made up in its entirety of non-net firms, and cluster 4 (layout and offerings) contains a majority of net firms. A majority of Internet firms is also found in clusters 10 (content, navigation and communication) and cluster 11 (online ordering).

6. Discussion of Results

In this section, it is worthwhile to recapitulate the findings as we are discussing them. The coding and frequency analysis of 212 redesign press releases produces three types of results. First, the most frequent new features added to web sites during the period are new content (78%), layout (65%) and navigation (64%). About a third of the articles mention new product and service offerings (35%) and the addition of search engines (30%), while multimedia, online ordering and community features are mentioned by about 25%, 21% and 20% of the articles, respectively. Taken together and in the context of the

three categories (content, navigation and interactivity), these frequencies suggest that the majority of companies redesign their sites to expand content and change navigation protocols. The addition of interactive features such as online ordering and community communication channels is present in only 20% of the redesign cases studied.

The second finding is related to the type of companies and the new features added to their web sites. A statistical test of the difference between the proportion of Internet and traditional companies reveals that Internet companies added more new layout features ($p < .01$) and more inter-user communication facilities ($p < .05$) than non-net companies. Meanwhile, the traditional (non-net) firms added proportionally more new content ($p < .01$), new User Feedback features and richer presentation formats through Multimedia and Graphics than Internet firms in the sample.

The analysis by type of firm indicates that traditional companies are expanding the substance (content) and changing the form (multimedia) of the information presented through their web sites, and exploring new ways of receiving information from their users (User Feedback). In contrast, Internet companies are more focused on changing the appearance of their sites (layout) and launching community facilities for inter-user communication. Our findings confirm the notion that Internet-firms because of their very nature offered a more sophisticated web presence than conventional organizations.

Third, there is a discernable pattern of frequently added features in the years studied. The addition of search engines was a popular feature in 1996, when over 50% of the articles mention this new mechanism, presumably to help users locate an increasing amount of information presented through the site. Multimedia and graphics were a frequent new feature in 1997, when companies seemed to experiment with novel ways of presenting

their information. New navigation protocols were the most frequent addition in 1998, perhaps due to the emergence of navigation standards (e.g. via index tabs in the homepage instead of frames). Finally, the incorporation of online ordering facilities increased steadily throughout the period, and reached its maximum in 1999.

These yearly results seem to indicate that the first years of the period 1996-1998 were devoted to facilitating the search, presentation and access to the information contained in the web site, while the last year shows evidence of more sophisticated transactional capabilities through the addition of online ordering facilities. Interestingly, these self-reported accounts lag behind the practitioners' survey reported by ComputerWorld (Machlis, 1998). Table 8 compares the results of the survey vis-à-vis our findings.

The cluster analysis of the data reveals which types of web site changes occur simultaneously. For example, when companies add search engines, or multimedia presentations or communication facilities, they also revamp content and navigation. But online ordering is usually launched by itself. In all, four clusters (9-12) refer to interactivity expansions (promotions, communication and online ordering) while the rest of the clusters profile different combinations of content, layout and navigation enhancements.

Remarkably, most of the changes reported in these press releases and grouped by the clustering procedure, refer to usability characteristics. Very few articles report the addition of new functionality to enable online transactions. Two alternative explanations justify this finding. First, it is possible that most of the sites studied already featured e-commerce functionality and that the reason for the redesign was merely to improve usability. The second possibility is that the majority of these companies were not ready (or

not willing) to incorporate this kind of functionality into their sites yet, and at this stage, they were just fine-tuning the information content and the usability of their sites. Indeed, most of the press releases examined in this project were focused on highlighting the user-friendliness of the sites rather than advertising technical "bells and whistles," which leads us to believe that a web presence was mostly used as a communication tool to inform different constituencies such as investors and actual and potential consumers.

6.1 Limitations

In interpreting the results, several limitations should be acknowledged. First, the use of press releases as the source to identify the companies that change their sites during the period under study may introduce some selection bias. Only companies that announce their redesign activities through PR Newswires or Business Wires are selected, when in fact many more companies may have changed their sites but did not issue a press release to that effect or used a different medium to communicate the redesign of their web site. Second, some press releases may not present an exhaustive account of new features added to the sites and focus instead on highlighting the most important ones.

Another possible limitation comes from the selection of the coding variables, which may have restricted the inferences we can make about web presence transformations. In particular, one may question the origin and completeness of the coding variables. The framework was built from the three conceptual categories found in the literature (content, navigation and interactivity) and specific metrics developed by other authors for each one. To check for the completeness of the coding variables, we selected a random sample of 20 articles and counted the items that could not be classified in any of the categories. There

were only a handful of items mostly of technical nature (e.g. server upgrade) that were left unclassified. Thus, the coding variables used for this analysis can be considered complete. Clearly, each variable can be further subdivided into separate components. For example, promotion includes survey, contests, and promotions, and thus can originate three different categories. We decided against this kind of micro-level specification of variables to avoid a multitude of categories where the number of hits was scant.

Another limitation is related to the use of the cluster analysis. The data reduction solutions produced by this method are dependent upon the number of classification variables and the choice of the clustering algorithm. We used Ward's minimum variance method because it produces clusters with approximately the same number of observations, where the intra-cluster variance is reduced. Other contemporary studies in this area (e.g. Daniel et al. 2002) have used the same clustering algorithm. Other methods, however, may produce different clusters.

Finally, the period under study must also be considered as a possible limitation. In the late 1990s, many organizations were launching their first web sites and experimenting with them. Thus, the selection of the time frame offers a unique opportunity to study initial transformations to commercial web sites, which do not necessarily represent the kind of changes that those sites underwent in subsequent years.

6.2 Implications and contributions

Despite these limitations, our results present interesting implications to understand the dynamic nature of web site transformations. When examined in the context of the drivers of site design proposed by Palmer and Griffith (1998), namely: technical choices

and strategic considerations, our findings point to another key determinant not explicitly addressed by the framework, the need to accommodate the user. Most of the web presence transformations examined describe user-oriented changes, in terms of aesthetic considerations (i.e. new layout to make the site more appealing and attractive for the users) and/or the expansion of information or format (content) to adapt to the changing needs of the users. It seems then that many site *redesigns* are driven by the need to adjust the web presence to the users and the desire to transform the site into a more effective communication tool.

Based on this insight, we propose that the determinants of web site *redesigns* are: technological capabilities, marketing/e-commerce strategy and audience/user needs. Thus, a shift in any of these three fronts would result in a web site *redesign* (See Figure 2). In light of this model, the refinement of a web presence can be explained in terms of technological change (driven by the emergence of an Internet-related innovation), a modification in the organization's e-commerce strategy or an adaptation to the user's needs or preferences. Clearly, these three areas are not mutually exclusive, and hence the overlapping sections of the model. For example, a particular feature such as a search engine may have a technological component (search algorithm), a marketing aspect (its placement on the site) and a user component (how users interact with the search engine). Each one of these considerations may be addressed, thus prompting the redesign of a particular feature.

Taking into account user characteristics and preferences leads to web presence transformations whose main objective is to improve usability by making the site a more effective communication vehicle. These kinds of transformations are likely to affect the

perceptions of ease-of-use and encourage more users to adopt the site. Increasing the adoption rate of a site has important implications for systems whose use is voluntary.

In fact, most of the press releases describe changes in the content and presentation and access of the information and relatively few articles report the addition of interactive features such as online ordering and community forums. In this period, companies were making strategic decisions about the information to be communicated through the web site and as content was expanding, there was a need to improve navigation and layout. Likewise, as more users were interacting with the newly released sites, companies were discovering the need to adjust the content offered through the site to the characteristics and needs of the users. The evidence provided in these press releases indicates that the reason behind many commercial web sites transformations in the late 1990s was to improve the effectiveness of the site as a communication vehicle, rather than providing sophisticated interactive features.

Further research based on these findings should examine the evolution of commercial web sites using alternative data sources and methodologies. Triangulation of results will offer a more complete picture of the motivations behind these web presence transformations. Another possible extension for this work is to examine subsequent transformations experienced by web sites and reported in press releases. Since the number of articles describing such changes increases exponentially since 2000, we are currently testing the use of content analysis software to automatically produce the coding and comparing its reliability to human coders.

7. Conclusions

This research is one of the pioneer efforts to systematically examine web presence transformations across a variety of companies in the late 1990s. The study is based on press releases describing web site redesign during the period and the use of content analysis techniques. The framework guiding the content analysis was derived from the recent literature in web-based systems design and e-commerce metrics.

Based on the results of this study, we conclude that the majority of the web site redesigns in the period are motivated by the need to expand content and change navigation protocols, in an effort to transform the site into a more efficient communication tool. Surprisingly, the addition of interactive features such as online ordering and community communication channels is present in only 20% of the cases studied. In fact, the cluster analysis reveals that the majority of the transformations are centered on improving the usability of the web site. Therefore, web presence transformations in the late 1990s are more driven by the need to improve the communication potential of the sites than by functionality additions to support e-commerce.

Our findings are in stark contrast to popular beliefs about the importance of interactive features in early commercial web sites. It seems that throughout the late 1990s firms were still using their web presence first and foremost as communication vehicles. It would be interesting to examine whether this attention to the communication needs of different audiences diminishes in subsequent years, as companies incorporate more interactivity into their sites.

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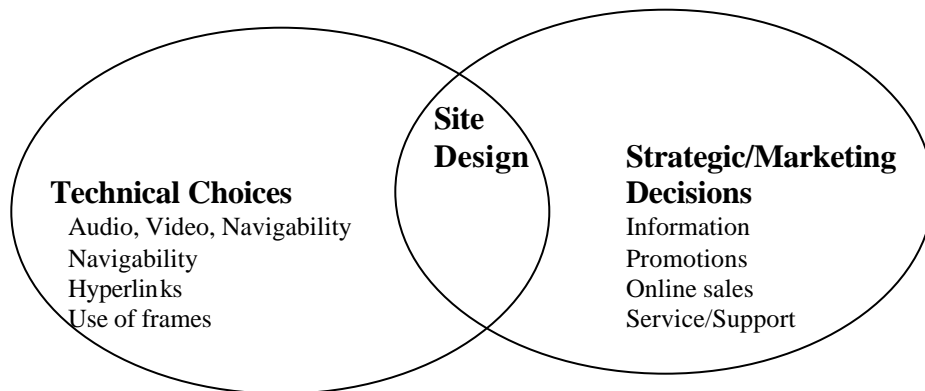
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Figure 1. Emerging Web marketing model



Source: Adapted from Palmer and Griffith (1998)

Figure 2. Web presence redesign model

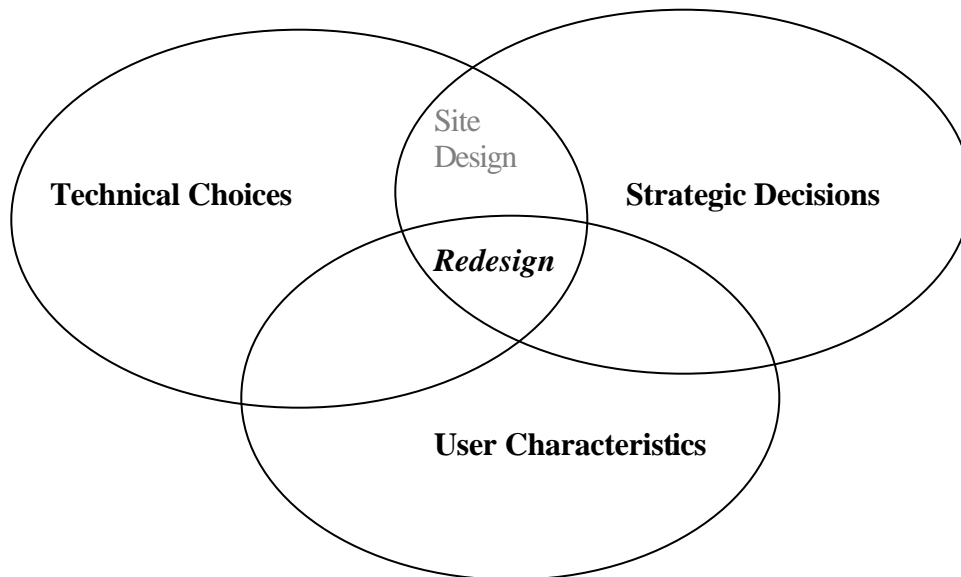


Table 1. Categories of Analysis

Category	Construct	Measures	Studies
Content	Information Content	Quantity/Variety Depth/Breadth, Relevance, Timeliness	Palmer (2002) Agarwal & Venkatesh (2002)
Content	Product/Service Information	Product Information Online	Zhu & Kraemer (2002)
Content (Form)	Multimedia and Graphics	Media Use	Agarwal & Venkatesh (2002)
Navigation	Navigation	Ease to go back and forth, few clicks	McKinney et al. (2002)
Navigation	Layout	Organization, Sequence, Arrangement and Layout	Palmer (2002)
Navigation	Search Mechanism	Search engine Search capability	Koufaris (2002) Zhu & Kraemer (2002)
Navigation	Download Delay Access	Access Speed, Display Rate Responsive, Quick loads	Palmer (2002) McKinney et al. (2002)
Interactivity	Personalization	Customization Interactivity Personalization Content Personalization	Palmer (2002) Agarwal & Venkatesh (2002) Zhu & Kraemer (2002)
Interactivity	Online Ordering	Transaction	Zhu & Kraemer (2002)
Interactivity	Responsiveness (Help)	Feedback to users Customer Support	Palmer (2002) Zhu & Kraemer (2002)
Interactivity	Inter-User Connectivity	Community	Agarwal & Venkatesh (2002)
Interactivity	User Feedback	Contact US Feedback button	Zhu & Kraemer (2002)
Interactivity	Marketing and Promotion	e-coupons, online contests, surveys, prizes	Ghose & Dhou (1998)

Table 2: Variables, Definitions and Keywords

No.	Variable	Definition
V1	Layout	General appearance ("look and feel") of the site including arrangement and organization of objects on the screen.
V2	Information (content)	Breadth or depth of information presented through the site (including company information but excluding specific products or services).
V3	Help	User resources such as help or other customer support facilities.
V4	Load Time	Changes in the speed in which the pages can be delivered to the users.
V5	User Feedback	Ability to receive feedback from the users.
V6	Navigation	Access to different areas/objects of a web page or mobility between pages. Menus, buttons, links, etc.
V7	Multimedia and graphics	Incorporation of graphics, video, or audio files on the site.
V8	Personalization	Allow users to customize the appearance or features of the site.
V9	Communication Capabilities	Availability of direct communication channels to allow interaction among users of the site. Also called "community feature."
V10	Product or service offers	Presentation and/or description of products or services available.
V11	Purchase / Online transactions	General purchasing capabilities, including ordering forms and checkout process, security features, and recommendation function. For service firms, it refers to online transactions (reservation, banking).
V12	Searching Capabilities	Search Engines to find specific products, services or information in the site. Includes dealer/provider locator.
V13	Marketing and promotion	Ability to play games, or participate in contests through the site.

Table 3. Description of the sample

	1995	1996	1997	1998	1999	Total
Number of announcements	2	21	38	51	100	212
Number of features added						
Average		4.76	4.42	3.71	3.90	4.03
(Standard deviation)		(1.61)	(1.39)	(1.57)	(1.66)	(1.61)
Breakdown by type of firm						
Net	0	5	9	20	52	86
Non-net	2	16	29	31	48	126

Table 4. Inter-coder reliability and frequencies per variable

Var.		Percent of Agreement (Inter-coder reliability)	Final Count (after consensus)	Frequency
1	Layout	87%	137	65%
2	Content	83%	165	78%
3	Help	92%	26	12%
4	Load Time	98%	22	11%
5	User Feedback	89%	26	12%
6	Navigation	86%	135	64%
7	Multimedia	90%	52	25%
8	Personalization	90%	35	17%
9	Communication	93%	42	20%
10	Offerings	70%	74	35%
11	Online Ordering	91%	45	21%
12	Search Engines	91%	62	30%
13	Marketing/Promotions	92%	34	16%

Table 5. Test of Differences between proportions (Net vs. Non-net firms)

Var.		Non-Net (n=126)	Net (n=86)	Z value
1	Layout	57%	76%	-2.757**
2	Content	85%	67%	3.008**
3	Help	14%	9%	1.086
4	Load Time	10%	12%	-0.493
5	User Feedback	16%	7%	1.94*
6	Navigation	61%	67%	-0.941
7	Multimedia	29%	19%	1.656*
8	Personalization	15%	19%	-0.68
9	Communication	16%	26%	-1.74*
10	Offerings	31%	41%	-1.461
11	Online Ordering	21%	22%	-0.254
12	Search Engines	30%	28%	0.353
13	Marketing/Promotions	14%	19%	-0.84

Significance levels: * p<.05; ** p<.01

Table 6. Chi-Square Analysis of variables per year

Var.		1996	1997	1998	1999	L.R. Chi-Square (df = 3)
1	Layout	67%	61%	63%	61%	0.89
2	Content	95%	82%	78%	72%	0.07
3	Help	19%	16%	10%	11%	0.65
4	Load Time	14%	18%	8%	8%	0.31
5	User Feedback	19%	16%	6%	12%	0.32
6	Navigation	67%	66%	78%	56%	0.05*
7	Multimedia	38%	39%	27%	14%	0.005**
8	Personalization	19%	21%	8%	19%	0.22
9	Communication	24%	16%	18%	21%	0.84
10	Offerings	43%	39%	27%	36%	0.52
11	Online Ordering	5%	13%	16%	31%	0.006**
12	Search Engines	57%	37%	22%	25%	0.015*
13	Marketing/Promotions	10%	18%	10%	18%	0.43

Significance levels: * p<.05; ** p<.01

Table 7. Cluster Profiles

Cluster No.	Name	No. of Observations
1	Content, Navigation and Search Engines	41
2	Content, Navigation and Multimedia	13
3	Content and Navigation	9
4	Layout and Offerings	21
5	Content	7
6	Layout and Navigation	18
7	Layout and Content	8
8	Layout, Navigation and Offerings	17
9	Content and Promotions	14
10	Content, Navigation and Communication	13
11	Online Ordering	16
12	Content and Online Ordering	14
13	Product Offerings	21

Table 8: Comparison of Survey Results with our Findings

Year	Results of Machlis' Survey	Our Findings
1996	Usability	Search Engines
1997	Transactions	Multimedia
1998	Integration/Personalization	Navigation
1999	Real Time forums	Transactions

Appendix 1: Detailed Cluster Analysis

	Cl #1	Cl #2	Cl #3	Cl #4	Cl #5	Cl #6	Cl #7	Cl #8	Cl #9	Cl #10	Cl #11	Cl #12	Cl #13	Totals
N	41	13	9	21	7	18	8	17	14	13	16	14	21	212
Variables														
1. Lay	32 (78%)	9 (69%)	0	20 (95%)	0	18 (100%)	8 (100%)	17 (100%)	8 (57%)	7 (54%)	12 (75%)	3 (21%)	3 (14%)	137
2. Cont	35 (85%)	13 (100%)	9 (100%)	7 (33%)	7 (100%)	13 (72%)	8 (100%)	13 (76%)	13 (93%)	12 (92%)	6 (38%)	14 (100%)	15 (71%)	165
3. Help	8 (20%)	0	0	3 (14%)	0	0	1 (13%)	9 (53%)	1 (7%)	1 (8%)	0	0	3 (14%)	26
4. Load	12 (29%)	0	0	2 (10%)	0	0	0	1 (6%)	3 (21%)	1 (8%)	1 (6%)	1 (7%)	1 (5%)	22
5. User	8 (20%)	0	0	3 (14%)	4 (57%)	0	0	5 (29%)	2 (14%)	0	0	1 (7%)	3 (14%)	26
6. Nav	35 (85%)	13 (100%)	9 (100%)	11 (52%)	0	18 (100%)	0	14 (82%)	0	13 (100%)	10 (63%)	0	12 (57%)	135
7. Mult	11 (27%)	13 (100%)	0	2 (10%)	0	0	0	4 (24%)	9 (64%)	0	0	5 (36%)	8 (38%)	52
8. Pers	3 (7%)	3 (23%)	0	14 (67%)	0	1 (5%)	1 (13%)	3 (18%)	1 (7%)	0	0	8 (57%)	1 (5%)	35
9. Com	4 (10%)	1 (8%)	0	9 (43%)	0	0	0	3 (18%)	8 (57%)	13 (100%)	0	2 (14%)	2 (10%)	42
10. Off	5 (12%)	0	0	17 (81%)	0	0	0	16 (94%)	1 (7%)	4 (31%)	4 (25%)	6 (43%)	21 (100%)	74
11. OO	2 (5%)	3 (23%)	0	5 (24%)	0	0	0	4 (24%)	0	3 (23%)	15 (94%)	11 (79%)	2 (10%)	45
12. Sear	36 (88%)	0	0	11 (52%)	0	0	0	0	3 (21%)	0	1 (6%)	6 (43%)	5 (24%)	62
13. Mkt	1 (2%)	1 (8%)	0	8 (38%)	1 (14%)	3 (17%)	0	0	11 (79%)	3 (23%)	0	1 (7%)	5 (24%)	34
Firms(1)														
Non-Net	25	9	9	7	5	10	5	11	10	4	7	9	15	126
Net	16	4	0	14	2	8	3	6	4	9	9	5	6	86
Years(2)														
1995	0	0	0	0	1	0	0	0	1	0	0	0	0	2
1996	8	0	1	2	0	0	1	1	1	1	0	2	4	21
1997	8	5	1	4	2	1	0	4	4	1	2	1	5	38
1998	8	6	3	2	2	9	2	2	2	4	2	3	6	51
1999	17	2	4	13	2	8	5	10	6	7	12	8	6	100

(1) A chi-square analysis of cluster and type of firms is significant at p=0.02

(2) Chi-square analysis of cluster and year can not be performed because more than 75% of the cells have expected counts lower than 5.