

# INFORMATION SYSTEMS EDUCATION JOURNAL

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# INFORMATION SYSTEMS EDUCATION JOURNAL

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# Taking it to the Top: A Lesson in Search Engine Optimization

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## Abstract

Search engine optimization (SEO), the promoting of a Web site so it achieves optimal position with a search engine's rankings, is an important strategy for organizations and individuals in order to promote their brands online. Techniques for achieving SEO are relevant to students of marketing, computing, media arts, and other disciplines, and many college courses have begun to include SEO as part of their curricula. This paper describes an exercise for learning about SEO that mimics a popular online event known as an SEO contest. Contest participants implement a variety of SEO techniques in order to achieve the top position for an assigned word or phrase in a search engine's results. This paper also examines the learning benefits that such an exercise provides.

**Keywords:** Web 2.0, Search engine, Search Engine optimization, contest, learning

## 1. INTRODUCTION

The process of promoting a Web site so that it becomes easily discoverable by search engines is known as Search Engine Optimization (SEO). Because a higher placement within search results is more likely to drive traffic to a Web site, companies, bloggers, and individuals go to great lengths to have their names or products found within the first page of a search engine's results. The process of SEO is part art and part science. Two popular techniques for improving a site's ranking among search engines include modifying its HTML code to contain relevant keywords, and promoting the site on other Web sites via external links known as back links. As

the amount of content on the Web grows, it becomes increasingly important to include appropriate metadata that will enable search engines to find it.

This paper describes a competitive exercise in which students create a Web site to promote a fictitious product online, and vie for top positions within search results on three popular search engines. Their goal is to implement a variety of SEO techniques in order to determine those which are the most effective. Students at two universities participated in this exercise during the spring 2010 semester.

One group was enrolled in CS 299, an experimental, multi-disciplinary elective course entitled Web 2.0: Technology, Strategy, Community, offered at a business university in Massachusetts. CS 299 introduces students to Web 2.0 technologies, concepts, and applications, and their impact on business and society. The second group of students was enrolled in MIS 342, an e-commerce and e-marketing elective course offered at a small, private liberal-arts university in Pennsylvania. MIS 342 introduces students to the technological infrastructures, corporate strategies, and use of computer networks for Internet retailing. Because SEO is increasingly becoming a necessary skill in the work place, understanding search engine optimization methods and techniques will benefit students' future careers in advertising, Web development, multimedia, marketing, and business. (Spradling, Strauch & Warner, 2008; Middleton, 2009)

## 2. SEO IN THE CURRICULUM

While other Web 2.0 topics such as social networking, creating digital media, and online publishing and collaboration tools are making their way into Information Technology classrooms (Saulnier, 2007; Frydenberg & Press, 2010; Sendall, Ceccucci, & Peslak, 2008), and while Web systems and technologies are key knowledge areas in the Association of Computing Machinery (ACM)'s IT 2008 curriculum guidelines (Association for Computing Machinery, 2008), Search Engine Optimization is "the last key web systems topic that is missing from IT 2008". (Connolly, 2009).

The IS 2010 curriculum includes Web 2.0 topics in IS 2010.1 (Foundations of Information Systems) and the IS Innovation and New Technologies elective. The latter elective course suggests a unit on strategic importance of search, how search works, and how search is monetized. While "the topics [in this course] are a means to delivering an understanding of how IS shapes and enables organizations for competitive advantage by leading industries in IT-enabled innovations", SEO is specifically not mentioned. (Topi, Valacich, Wright, Kaiser, Nunamaker, Sipior, & deVreede, 2010, p. 411).

"Search engines in general (and Google in particular) act now as the main portal into most public Web sites. As such, it is increasingly important that students learn how search

engines work, how to design web sites for optimal search engine results, and how sponsored links systems such as Google's AdSense work." (Connolly, 2009, p. 76). He proposes a fourth year optional course that expands on client-server and database topics to include JavaScript application development, AJAX, using Web APIs, web deployment, hosting, and analytics, and search engine optimization.

As undergraduate IT curricula evolve from Computer Science toward Web Science (Berners-Lee, Hall, Hendler, Shadbolt, & Weitzner, 2006; Hendler, 2008; White, 2010) the need for understanding how search engines work will become an integral part of teaching about Web information and retrieval. "Our everyday use of the Web depends on fundamental developments in CS that took place long before the Web was invented. Today's search engines are based on, for example, developments in information retrieval with a legacy going back to the 1960s." (Hendler, 2008, p. 62)

SEO has found its place into some college computing and IT courses. (Sabin, Higgs, Riabov & Moreira, 2005; McCown, 2010). McCown (2010) describes an innovative undergraduate course on Search Engine Development, in which students who have software development experience write code to develop or enhance open source search engine application. They also learn how search engines and crawlers work to gather and organize online information to provide relevant results. Students find the topic relevant since a search engine is often one's entry point to the Web.

SEO is taking its place outside of the computing classroom as well. Students enrolled in E-commerce and e-business courses cover SEO at several universities. As the Web has evolved over the past decade, e-commerce courses have evolved from "'softer' skills such as project management, E-business concepts, and teamwork...to include more server-side programming and database skills" as well as more "technical and e-commerce concepts such as e-marketing, security, SSL, web services, search engine optimization, server configuration, user tracking, [and] advanced database concepts." (Sandvig, 2007, p. 215).

Marketing students learn SEO techniques so they can promote future businesses online. (Charlesworth, 2009; Xing & Zhangxi, 2006) Spradling et al. (2008) introduced an interdisciplinary Bachelor of Science Degree in Interactive Digital Media. Their new media concentration curriculum "includes instruction in writing, design, audio and video for the web, site organization, and search engine optimization." (p. 390). Hanson, Thackeray, Barnes, Neiger, and McIntyre (2008) claim an awareness of Web 2.0 concepts can be beneficial to health educators. "Ultimately, if health educators are going to use new Internet communication channels, they must learn how to increase traffic or visits to websites using Web 2.0 tools.... SEO and pay-per-click advertising ... have important implications for health educators wishing to reach target audiences more effectively through the internet." (p. 163).

Selcher (2005) discusses the need for SEO in order to perform research. Students of library and information science learn to use search engines and basic SEO principles: such as the popularity of the source of hyperlinks to a given web page. "Critical examinations of Google search results are imperative for understanding how information is organized and retrieved. By introducing ideas of relevance, proximity and ranking, students can transfer learned skills to other information resources." (Atwater-Singer, 2006, p. 3).

While the literature points to examples of courses that include SEO in their content, little has been written about teaching methods and ways to engage students in learning about SEO techniques. Sabin et al. (2005) describe an exercise in which students must refine search queries to find an effective combination of search terms that will result in a particular site rising to the top of the Google search results. This paper describes a competitive SEO exercise that models a real world environment in which companies vie for top positions in search engine results on three popular search engines.

Given the importance of SEO as a valuable future career skill, and the variety of technical skills and techniques that one might try in order to improve a site's ranking, these research questions emerged:

- What do students understand about SEO as part of an organization's online strategy?
- What SEO techniques will students try, and find most effective to promote a product or company online?
- How does participating in a competitive SEO exercise impact student learning about SEO?

### **3. SEARCH ENGINES, SEO TECHNIQUES, AND SEO CONTESTS**

As the World Wide Web has matured, the role of search engines has become more prominent. "Search engines have gained an increasingly powerful position by channeling the attention of millions of users." (Evans, 2007, p. 21.) At its simplest, a search engine is "comprised of three main components: a database of web pages (called an index), a method for finding web pages and indexing them, and a way to search the database." (Malaga, 2007, p. 69). While there are dozens of search engines, according to recent report released by marketing research firm Experian Hitwise (May, 2010), only three, Google (71.4%), Yahoo! (15%), and Bing (9.5%) account for approximately 95% of all searches. Search engines display results based on a page's relevance to the desired search terms. In addition to content on the page itself, Google's PageRank algorithm assumes that hyperlinks from one page to another serve as "a sort of endorsement of the 'authority' of the page being linked to." (Hendler, 64) There are over 200 different factors used by Google to determine a page's ranking. (Evans, 2007, p. 21)

Online businesses rely on search engines to generate traffic to their Web sites through the use of both organic and sponsored search results.

While sponsored results appear in search listings for key words purchased by an advertiser using an online advertising program such as Google AdWords, organic search results are based on a Web page's relevancy for a key word or phrase as determined by the search engine's ranking algorithms. The "enormous success [of search engines] ... has inevitably yielded techniques to ... improve search rank, leading, in turn, to the development of better search technologies." (Hendler, p. 64)

SEO requires an understanding of how search engines work in order to find information. Search engines rely on applications called spiders or bots that "crawl" the Web looking for new pages to index. Spiders often examine the structure of a Web page in order to determine relevance of its content. For example, some spiders give certain elements of a Web page, such as its title and its major heading, special emphasis (Morochove, 2008, p. 47). Manually submitting a Web page's URL to a search engine may cause its content to be indexed as well.

The location of an item in a search engine's results is critical for many organizations. According to Jansen and Spink (2006), 73 percent of search engine users never look beyond the first page of returned results. For this reason, companies aggressively compete to be ranked among the top listings. "Because of the importance of high search engine rankings and the profits involved, search engine optimizers look for tools, methods, and techniques that will help them achieve their goals." Malaga 2010, p.3. This is evidenced by the fact that organizations spent over \$1.4 billion on SEO in 2008 and this figure is expected to grow. (SEMPO, p. 4).

It is possible to modify the content of a Web page in order to improve its ranking or position within a search engine's results. "The ranking of Web pages based on their keywords can be improved with design, [and] as a result, these improvements in search engine position are correlated with increased hits." (Turns & Wagner, 2001, p. 9).

There are several commonly used techniques to influence or improve a page's position within search results. These include indexing (registering a site and its pages with a search engine and creating an XML site map), on-site optimization techniques (modifications made to the HTML code for the site itself) and off-site optimization (activities that take place on other sites to draw traffic to a particular site) (Curran, 2004; Jones, 2008; Malaga, 2010).

On-Site Optimization techniques include placing key words in the page title or meta-tags, including key words in HTML file names, and placing key words in headings and page content. Off-Site optimization techniques include encouraging and providing back links (links from other sites to yours), promoting a site using

social media tools such as Facebook or Twitter, and selecting a relevant domain name.

Marketing organizations often hold SEO Contests in order to gain data on the effectiveness of various SEO techniques. An SEO contest is an online event in which participants must create a Web site that is optimized such that their site achieves the highest position or ranking in search results for a specified phrase. The winners generally receive a cash prize. (Evans, 2007)

#### 4. METHODOLOGY

This section describes a project given to students in two sections of CS 299 and one section of MIS 342 to engage them in learning about SEO techniques. This project is modeled after standard SEO Contests (Evans, 2007). This project required students to create a Web site for a fictitious iPhone application. Students in the two sections of CS 299 promoted fictitious iPhone applications for Norwegian Tourism or Burmese recipes, while students in MIS 342 promoted an iPhone application for Tuvaluan recipes. These topics were chosen because they contained words and phrases that were commonly searched on Google individually, and in some combination, but a check on Google prior to the start of the project showed no search results for pages containing all of the relevant keywords.

After four weeks, the students whose pages ranked the highest in the results of the three most popular search engines, Google, Bing, and Yahoo! received a bonus.

Students were permitted to choose any Web platform or application with which they were familiar in order to create their Web sites. Each site had to have at least two pages: the home or landing page must contain sample content about the fictitious product, and a second page had to contain a description and log of the steps that students completed in to optimize the site for search engines to find. Students were asked to record the date and the position/ranking of their site within search results on Google, Bing, and Yahoo! every day for the duration of the project in order to try to determine those actions which produced higher positions in search results. Each Web site had to display a disclaimer informing the reader that this site was created for an

academic exercise, and that the product represented was not a real product.

There were some small differences in implementation of the assignment between the CS 299 and MIS 342 classes. Due to class sizes, CS 299 students worked in groups of three or four; MIS 342 students completed the project individually. CS 299 students had an incentive of 5% extra credit on the final exam to those who made the first page of search results. The two MIS 342 who made the top of the search results received gift cards to a regional convenience store.

All MIS 342 students had previously purchased their own domain names and hosted their Web sites on the college server, while CS 299 students were not required to purchase a domain name. Most MIS 342 students coded the HTML for their sites manually, while most CS 299 students used free Web applications such as WordPress, Yola, Blogger, or Google Sites to create their Web sites.

The instructors of CS 299 and MIS 342 provided a similar lecture and reading materials to their respective students regarding Search Engine Optimization prior to the start of this exercise, including the techniques mentioned above. Students in both courses were surveyed at the end of the four-week exercise regarding their attitudes toward the exercise, their understanding of SEO techniques and concepts prior to starting and after completing the exercise, and the SEO techniques they implemented that they found to be most effective.

Figure 1 in Appendix I shows Google's search results for the phrase "norwegian tourism iPhone application." Note that the highest ranking result is from a purchased domain name, [norwegianiphoneapp.net](http://norwegianiphoneapp.net), and another from [norwegiantourism.net](http://norwegiantourism.net), trails it slightly. One group created a page for its site on Facebook, and another student used [digg.com](http://digg.com) to vote or endorse his group's site. Both of these activities, which mentioned and contained back links to their respective sites, appeared closer to the top of the Google search results. Tweets from students who promoted their site on Twitter also appeared in the first page of Google's search results.

Two other Web sites, created and hosted with Yola and WordPress, as identified by the subdomains [norwegianiphone.yolasite.com](http://norwegianiphone.yolasite.com) and [norwegiantourismiphoneapp.wordpress.com](http://norwegiantourismiphoneapp.wordpress.com), respectively, also appear lower in the first page of the Google search rankings.

Figure 2 (a) in Appendix I shows the home page for the top-ranking site on Google, [norwegianiphoneapp.com](http://norwegianiphoneapp.com). It is a blog created with WordPress, which students updated regularly during the contest. The blog's sidebar also contains a Twitter Feed (Figure 2(c)) for the application.

Figure 2(b) in Appendix I shows some of the steps taken by the winning team. They purchased some domain names and immediately installed Google Analytics, a software tool for providing statistics on site usage, at the start of the project. While this did not necessarily impact their site's position in the search results, it gave the students experience with using such a tool, and a sense of the popularity of their site as they promoted it by asking friends to click on or place back links to their site.

Figures 2(c) and (d) in Appendix I show the site's ranking and an analysis of the ranking data gathered, and Figure 2(e) shows a Facebook fan page that the students created for their fictitious iPhone application. Figure 2(f) shows some of the statistics from Google Analytics.

## 5. ASSESSMENT OF SEO LEARNING

Sixteen MIS 342 students and 38 CS 299 students participated in this exercise during the spring 2010 semester. Prior to the start of the project 40 of the 54 students (74.1%), indicated that they either "strongly disagreed" or "disagreed" with the statement that they were familiar with SEO techniques prior to the project. This suggested that while they may have been familiar with the importance or objectives of SEO, most students have not taken the steps to actually optimize a site. As shown in Figure 1, 49 of the 54 students (90.7%), reported having a better understanding of SEO techniques after the completion of the project.

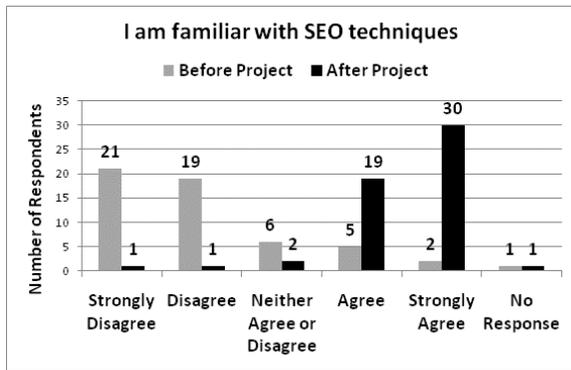


Figure 1. Familiarity with SEO at the start and end of the contest.

Students who completed this project had an increased understanding and familiarity with SEO techniques. The exercise provided "just in time" learning about SEO through hands-on experience. One student remarked:

I learned a lot about SEO because I didn't know anything about it before. I'm not an MIS major so a lot of this was new to me like optimizing websites. I now know how to do this and feel more positive about the subject matter. I would love to learn more about this topic because I want to diversify my understanding of the subject matter so I can apply it to my future job, if needed.

Figure 2 shows the most popular techniques that students used to promote their sites. The most popular that they used were keywords in meta tags, title tags, and content of a Web page.

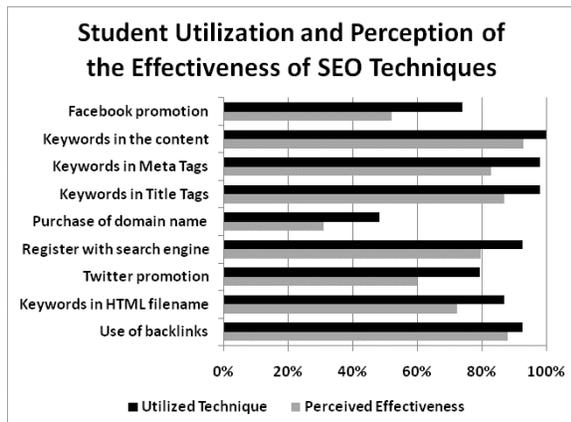


Figure 2. Techniques used and their perceived effectiveness.

These results align closely with an experimental research study conducted by Evans (2007) that concluded that high quality content (p. 27) and the number of backlinks into a web page (p. 30) are two of the primary factors in determining a web page's placement among search results. Further, all 5 of these techniques are among those highly recommended by leading search engine practitioners (Jones, 2008).

Students also realized that it takes dedication to achieve results.

I learned that it's not easy to optimize your website. It takes a lot of time along with patience for it to work. You need to constantly be up-to-date with it, so that your website shows up on search engines. One minute it may be there, while the other it may lose its [higher] ranking.

It is interesting to note that while fewer than half of the students purchased a relevant domain name (they were not required to do so for the project), 30% felt that purchasing a domain name is not an effective technique for SEO. Only a few CS 299 students purchased relevant domain names for their Web sites, while all MIS 342 students made use of the personal domain names that they had previously purchased as part of their course. Several CS 299 students commented on the fact that purchasing a relevant domain name gave some groups an unfair advantage. One student said:

I learned that if you actually spent money-- you won the competition. I think the assignment should've excluded ways in which you pay to get to the top. We all know that if you pay enough for something-- you can be on top. Using alternative resources and capabilities that we were supplied with should've been enough.

Another student said that "Winners ultimately invested their own money into the project making them win. By purchasing several domain names, prime opportunity was given to them." Said a third, "Those who purchased domain names seemed to have better results than those who used 'free' website domains," referring to names chosen as subdomains of popular Web creation tools, such as [norwegiantourism.wordpress.com](http://norwegiantourism.wordpress.com).

In addition to the techniques listed above, students hypothesized on other success strategies for SEO. One group discovered that "having a dynamic website with blog capabilities is was much easier to get recognized by the search engines than having a static website." Others commented on the perceived need to frequently update their sites in order to maintain their search rankings. Said one student: "I learned that in order to achieve a good result your page must be continuously updated. Also, even if you buy a domain name which includes the keywords of the search, you may not come first in the search results. SEO is not always a precise science."

As previously stated, this project was modeled after a popular SEO Contest. Figure 3 conveys that 31 of the 54 students (57.4%) "agreed" or "strongly agreed" that the competitive nature of the project was an incentive for them to work more regularly at completing this project.



Figure 3. Impact of competition on student effort.

Said one student:

I learned the most efficient and effective means of SEO. Not only did the competitive atmosphere contribute to this, but the overall goal to see your site first on Google. Going forward I recommend this project for future classes as it is an effective means to learning to key concepts of SEO.

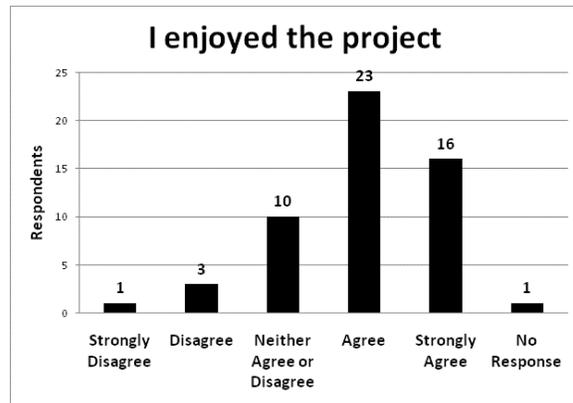


Figure 4. Measure of student enjoyment.

Figure 4 shows that overall, 39 of the 54 students (72.2%) "agreed" or "strongly agreed" that the SEO project was enjoyable. Several remarked, as did this student, that the exercise gave them experience in SEO that will be beneficial in their future careers:

I learned how to promote a Web site and how to drive traffic towards that website. I also learned several techniques on how to improve your standing in a Google search. The SEO project will be useful for the future especially since more and more businesses are using the internet to reach potential customers.

## 6. CONCLUSION

Search Engine Optimization is a relevant topic to introduce to students of computing, marketing, business, health educators, and other disciplines. Students see the value for companies, bloggers, and individuals to have the top position in search engine results in order to promote their products, services, or brands. The SEO contest described here provides students with a controlled environment to implement the SEO techniques they learn about in the classroom in order to determine their effectiveness. In the process they learn that effective SEO is part art, part science, and part luck, and that positive results cannot be accomplished in a short time. This exercise provides valuable skills that will be helpful in their future careers.

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**Editor's Note:**

*This paper was selected for inclusion in the journal as an ISECON 2010 Distinguished Paper. The acceptance rate is typically 7% for this category of paper based on blind reviews from six or more peers including three or more former best papers authors who did not submit a paper in 2010.*

## Appendix I – Additional Figures

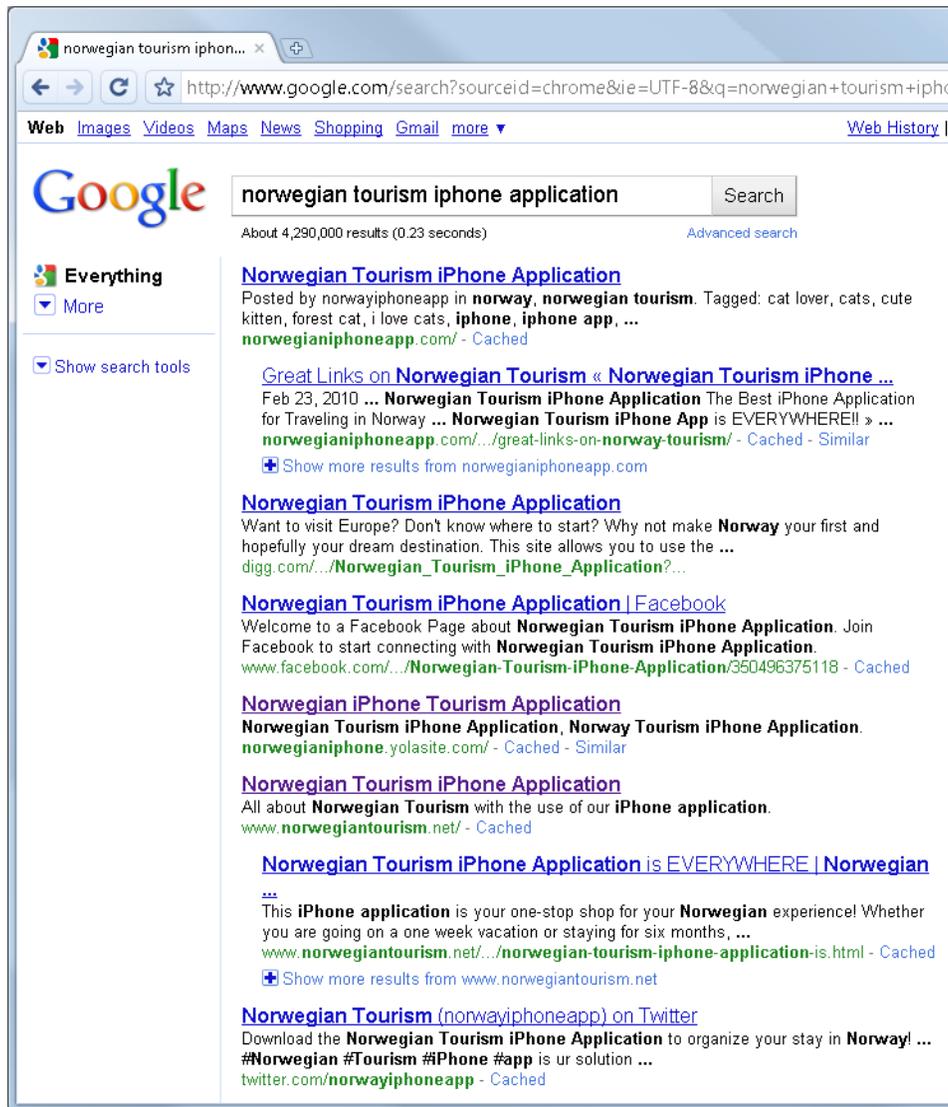


Figure 1. Google search results for "norwegian tourism iphone application."

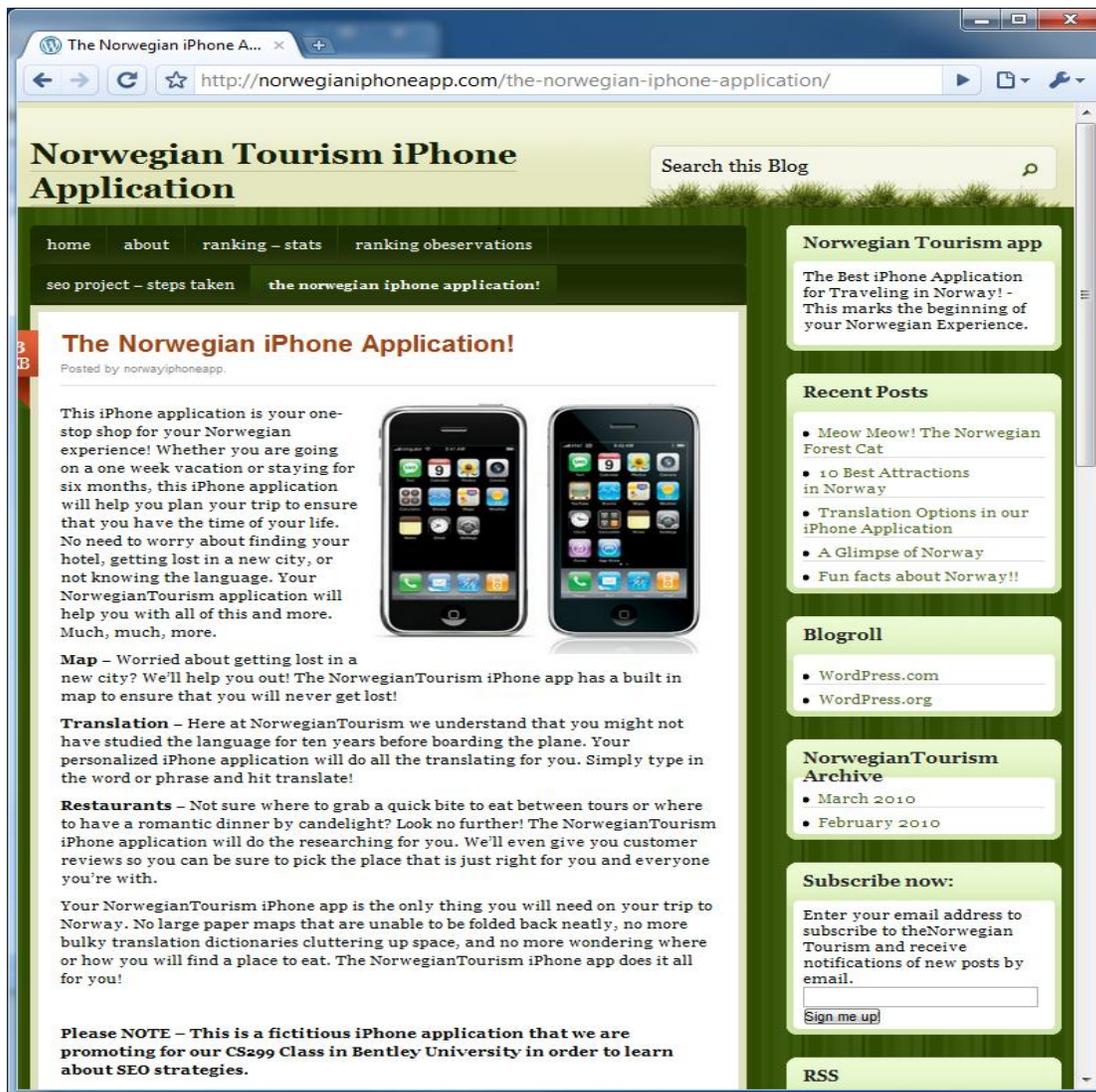


Figure 2 (a). Home page for norwegianiphoneapp.com implemented in WordPress.

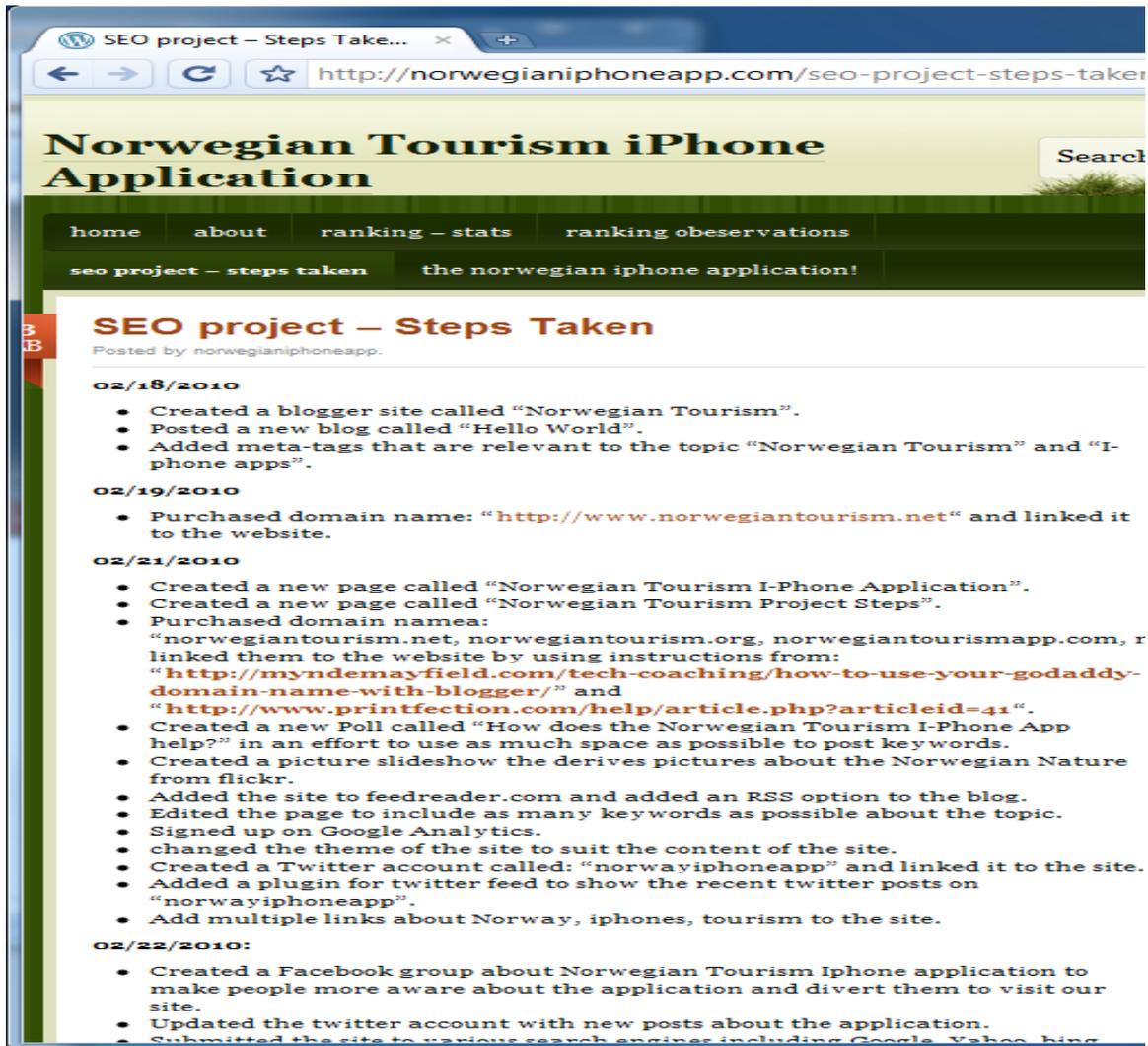


Figure 2(b). Steps taken to complete the SEO contest include creating a blog, purchasing a domain name, signing up for twitter, and submitting the site to various search engines.

Ranking Observations « ... x

http://norwegianiphoneapp.com/ranking-observations/

## Norwegian Tourism iPhone Application

Search this

home about ranking – stats ranking observations

seo project – steps taken the norwegian iphone application!

### Ranking Observations

Posted by norwegianiphoneapp.

**02/21/2010:**

- We have noticed that feedburner showed that there are 5 subscribers to our RSS feed. There were also 4 clicks on our first post “Hello World”.
- Updating our twitter account has worked. Our Twitter site now ranking the 2nd in Google.
- Our digg article is also ranked the 4th on Google this morning.
- at 5:00pm: digg’s article ranked 1st when searched with keywords like: “Norwegian Tourism Iphone” and 10th when searched with these keywords: “Norwegian Tourism”.
- Our twitter site has slipped through the ranks from the first place to the 3rd place and a new competitor has emerged in the 4th place (other groups).

**02/23/2010:**

- We are now ranked as the 1st site on bing.com using keywords like “norwegian tourism iphone application”.
- 6:10 pm: we are currently garnering the number 1 spot on bing.com and the 5th spot on google.com, yahoo is just being a pain!

**02/24/2010:**

- 11:00 am: we are now the first on google when search with keywords like “norwegian tourism iphone”. Our digg article has also placed 2nd. Our twitter page has dropped a few places – it needs to be updated.
- Yahoo has failed to submit our site in their search engine due to the meta tag not being discovered. Having a pre-hosted wordpress blog has appeared to be such a pain due to us not being able to edit the html codes.
- on Bing.com we are still number one but the competition is not far behind.

**02/25/2010:**

- A lot of groups have now managed to create a facebook and twitter accounts and that has influenced our rankings on the search engines. Yet, our twitter page still shows on the first page of Google but with a lower rank.
- After a lot of support from our Facebook Fanpage, our .com website is counted as 3rd after the Yola website. Our .net website is showing up
- Digg has managed to block our accounts and thus our article has disappeared!
- Bing is a work of wonder!! we have managed to stay the 1st on the website until now.
- Yahoo has started showing our website but as posts on wordpress itself and not the actual link. Yahoo is kind of worrying us because other people who still

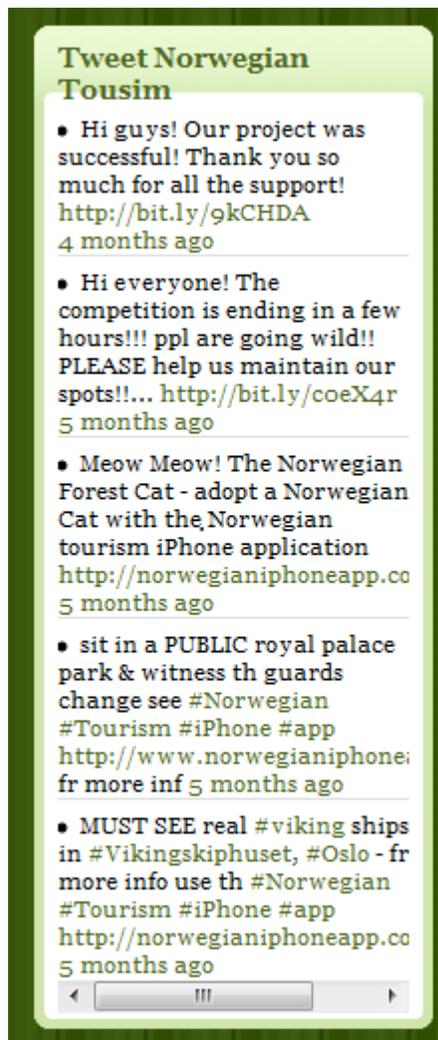


Figure 2(c). Ranking Observations at the start and end of the contest, and the site's Twitter feed

**Norwegian Tourism iPhone Application**

home about **ranking – stats** ranking observations

seo project – steps taken the norwegian iphone application!

**Ranking – Stats**  
Posted by norwayiphoneapp.

	Google	Yahoo	Bing
02/19/2010	-	-	-
02/20/2010	-	-	-
02/21/2010	Pos: 1 <sup>st</sup> (indirect link)	-	-
02/22/2010	Pos: 5 <sup>th</sup>	-	-
02/23/2010	Pos: 1 <sup>st</sup> and 2 <sup>nd</sup> (indirect link)	-	Pos: 1 <sup>st</sup>
02/24/2010	Pos: 3 <sup>rd</sup>	-	Pos: 1 <sup>st</sup>
02/25/2010	Pos: 3 <sup>rd</sup> and 4 <sup>th</sup>	Pos: 1 <sup>st</sup> (indirect link)	Pos: 1 <sup>st</sup>
02/26/2010	Pos: 3 <sup>rd</sup> and 4 <sup>th</sup>	Pos: 1 <sup>st</sup> (indirect link)	Pos: 1 <sup>st</sup>
02/27/2010	Pos: 2 <sup>nd</sup> and 3 <sup>rd</sup>	Pos: 2 <sup>nd</sup> (indirect link)	Pos: 1 <sup>st</sup>
02/28/2010	Pos: 1 <sup>st</sup> -4 <sup>th</sup> (both sites)	Pos: 1 <sup>st</sup>	Pos: 1 <sup>st</sup>
03/01/2010	Pos: 1 <sup>st</sup> -4 <sup>th</sup> (both sites)	Pos: 1 <sup>st</sup>	Pos: 1 <sup>st</sup>
03/02/2010	Pos: 1 <sup>st</sup> & 2 <sup>nd</sup> (.com) 5 <sup>th</sup> & 6 <sup>th</sup> (.net)	Pos: 1 <sup>st</sup>	Pos: 1 <sup>st</sup>
03/03/2010	Pos: 1 <sup>st</sup> & 2 <sup>nd</sup> (.com) 5 <sup>th</sup> & 6 <sup>th</sup> (.net)	Pos: 1 <sup>st</sup>	Pos: 1 <sup>st</sup>
03/04/2010	Pos: 1 <sup>st</sup> & 2 <sup>nd</sup> (.com) 5 <sup>th</sup> & 6 <sup>th</sup> (.net)	Pos: 1 <sup>st</sup>	Pos: 1 <sup>st</sup>
	Pos: 1 <sup>st</sup> & 2 <sup>nd</sup> (.com)	-	-

Figure 2(d). Placement in search results fluctuates the most on Google.



Figure 2(e). A Facebook Fan page to promote the Norwegian Tourism iPhone App Web site has 48 fans.

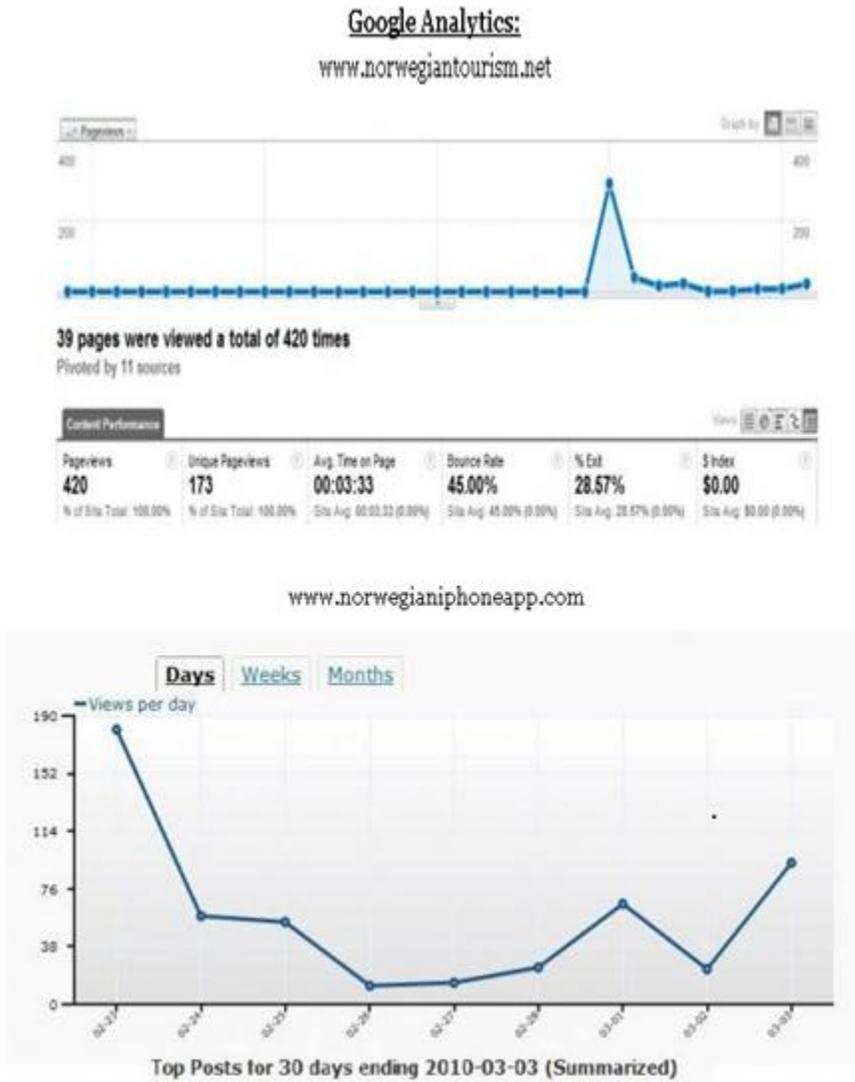


Figure 2(f). Google Analytics tracks site traffic.