Faculty of Informatics and Design
Cape Peninsula University of Technology (CPUT)

The research as described in this document was done by the first author as noted below. He was a BTech student at the Cape Peninsula University of Technology (CPUT) in 2014 - the topic was given as a student project at Honours level. This working paper has not been peer reviewed, but has been edited for basic grammar and accuracy. References have been standardized as far as possible according to the Harvard system. Consider this document as a working paper, to be used for basic referencing but not as seminal source for research work. It could be useful for research in the fields of Website Visibility, Information Retrieval, and Search Engines.

Relationship between the use of dynamic webpages and high visibility through SEO

Author: Rushi Pandya
Student Number: 209236884

Supervisor: Prof M Weideman

Submitted October 2014 Edited, published December 2014
Field: Web Design
Topic: Website Visibility

Harvard Reference:

Pandya, R. & Weideman, M. 2014. Relationship between the use of dynamic webpages and high visibility through SEO. *Working Paper*, Cape Peninsula University of Technology, Cape Town. Available online: http://www.web-visibility.co.za/website-visibility-abstracts-seo.htm

Abstract

The look-and-feel of a website plays a vital role in first impressions of a visitor. Basing a website on static design might present a company's products/services to the visitor as being out of date. Static webpages normally do not offer user interaction, and are not the preferred option for online business and e-commerce platforms. One alternative is to use dynamic webpage design – it could provide a more positive user experience. However, if a dynamic website is not created with search engine optimisation in mind, it might reduce the visibility of the website to search engine crawlers. Therefore, it is required to find ways to mitigate the negative influences of dynamic webpages on visibility. A dynamic website was developed and its visibility monitored. After recording initial results, techniques were used to cancel the negative influence of elements of dynamic webpages on visibility. It was found that crawlers have trouble in navigating dynamic websites, and URLs were adapted to reduce this effect. Positive results were also achieved by feeding crawlers with components of static webpages.

Keywords: search engine optimisation, static webpage, dynamic webpage, web traffic.

1. Introduction

Static webpages are designed in such a way that the information that makes up the website does not change unless the developer purposefully makes changes and uploads them to the domain. Static webpages are laid out to appear more like a printed document, but can contain elements such as photos, graphics, hyperlinks, movie clips, and other media. The content of these static pages will not change unless the master file (normally an HTML file) is edited by a Web designer, and uploaded to a server.

In contrast, a dynamic webpage is a page which is not stored on the server but rather generated by a query prior being displayed on an end user's screen. It is therefore a virtual page which is generated on end user's demand and stops existing when user moves to the next page.

Dynamic webpages are inevitable in the 21st century and if they are not created in a Search Engine Optimisation (SEO) friendly way, they may reduce the visibility of the webpage. Dynamic webpages are not stored as files, being part of a website. They can only be viewed by a user at a later stage if the user generates the same query on the same (unaltered) database. According to Weideman's findings, website users are highly unlikely to want to go further than the third page of search engine results (Table 1). Most commercial websites need to rank well for certain search queries, to ensure a high traffic volume which relates strongly to high profits. These facts underline the importance of ensuring a high degree of visibility, especially for commercially oriented webpages.

Table 1: Tendency of users to visit only early search engine result page (SERP) (Weideman 2009)

What percentage of users read only the 1st SERP?	What percentage of users read only the 1st and 2nd SERP?	What percentage of users read only the 1st, 2nd and 3rd SERP?	Source
46.7%		83%	Neethling (2008)
	96%		Waganer (2009)
62%		90%	iProspect (2006)
	80%		George (2005)
		99%	Zhang and Dimitroff (2005)
85%			Henzinger et al. (2003)
58%			Jansen (2000)
85%			Silverstein et al.
67%	**88%**	**91%**	**Averages**

Static webpages are less in demand as online business requires more dynamic features on their webpages/websites. Achieving high visibility on search engines for online businesses has become a high priority in the business world. However, studies have shown that dynamic webpages have a tendency to negatively influence this visibility (Bruce *et al* 2006). This is becoming a problem for Web developers – hence the need of building a bridge between dynamic webpages and high visibility through SEO. This paper illustrates how this high visibility can be achieved and how the negative influence of dynamic webpages on achieving high visibility can be reduced.

2. Background to Research Problem

Achieving high visibility through SEO is a combination of art and science which cannot be fully quantified. There is a large amount of literature available on SEO, but the details of for example Google's algorithm remains a closely guarded trade secret.

There are a number of factors influencing the visibility of the website. Static webpages are created by human designers, and will be displayed in exactly the same way until the designer changes the content. They contain flat HTML code, which defines the structure and content of the webpage (Zhao 2004). Each time an HTML page is loaded, it looks the same as during the previous view. The only way the content of the HTML page will change is if the Web developer updates and republishes the file. Examples of static webpage files include those with an extension of .html or .htm. An example of a typical static webpage URL is:

www.standardbank.co.za

The way a dynamic webpage is displayed however, changes based on the user's needs and input. It also provides appropriate information to meet the user's demand, by retrieving the information from a connected database (Weideman 2009). This kind of webpage allows users to go beyond reading text and looking at graphics. It provides users with an interactive experience, with the user being in control of the information he/she views.

Dynamic pages use special characters in their URL which often prevents search engines from reading and indexing the data on that page. For example, "&id=" and "?". Weideman (2009) identifies them as 'stop characters'. These characters are generated by the database when users try to access the page, and they cause indexing problems. An example of a typical dynamic webpage URL is:

http://www.amazon.com/s/ref=nb_sb_noss?url=search-alias%3Daps&field-keywords=nikon+d5500

3. Literature Review

3.1 SEO

According to Ledford (2009) a search engine is a piece of software that uses algorithms to find and collect information about webpages. Some of this information is usually keywords or phrases that are possible indicators of what is contained on the webpage as a whole, the URL of the page, the code that makes up the page, and links into and out of the page. That information is then indexed.

On the front end, the software has a user interface where users enter a search term, normally a word or phrase, in an attempt to find specific information. When the user clicks a search button, an algorithm then examines the information stored in the back-end database and retrieves links to webpages that appear to match the search term the user entered (Thelwall 2002). SEO is a process which includes the optimisation of some of the elements listed in Figure 1.

Figure 1: Components of SEO (Conjecture n.d.)

There are at least two published attempts at identifying and weighing these elements (Sullivan n.d.; Weideman 2009). Both these models attempt to provide a weighted summary of the elements (positive and negative) which affect website rankings. Both models rank the quality and quantity of inlinks, and website content highly as positive ranking factors.

3.2 Website Traffic

This refers to the number of visitors to a website or a webpage, and can easily be recorded using any analytics system. To give the website owner an idea of how many people are visiting his or her site, when a user opens up the site, their presence is logged and any links they click on are monitored. When these numbers are investigated, it gives an idea of the owner of number of people that visited the website, and some of their activities (Cullen 1998). A website's success relies on the number of visitors it receives, and their subsequent actions. Analytics provide a way of measuring the success of a website, as the more traffic it gets, the more popular it is and the more likely it is to be successful (Bruce *et al* 2006). However, only those visitors who are converted to customers eventually produce income.

3.3 Static webpages

As noted before, static webpages appear more like a printed document when viewed through a browser. The code of a typical, simple static webpage is given below.

```
<html>
<head>
<title>Relationship between the use of dynamic webpage and high visibility through SEO</title>
</head>
<body>
<h1 align='centre'>
Welcome to Project 4!</h1>
</body>
</html>
```

Static pages do not often need to be updated. In this era where information needs constantly change it will be a time consuming job to update large numbers of static pages because every bit of information has to be hard coded in the HTML page. The main advantage of static pages however, is that they generate static URLs. Static URLs are easier to index, which is an advantage over dynamic URLs.

3.4 Dynamic webpages

According to Weideman (2009) a dynamic webpage is a webpage which is not stored on the server but rather generated by a query prior being displayed on an end user's screen. It is therefore a virtual page which is generated on end user's demand and stops existing when the user moves to the next page.

There are various descriptions of the needs of Web publishers - one of them is: "Basically, every Internet Web publisher wants good webpage visibility in search engine results so as to increase accessibility of their webpages. Unfortunately, many websites have poor visibility in search engine rankings or may not be listed at all due to various reasons" (Zhang *et al* 2004). A typical example of back end of dynamic page follows below.

```
<?php
$con=mysqli_connect("crickygeeky.com","project4","xyz789");
If(mysqli_connect_errno())  {
echo "Failed to connect to Mysql: ". Mysqli_connect_error();
}
$sql="CREAT DATABASE my_db";
If (mysqli_query($con,$sql))  {
echo "Database my_db created successfully";
}
else{
echo "Error creating database: " . mysquli_error($con);
}
?>
```

When a webpage is built dynamically it might exert a load which is the same as to serve many static pages (Anonymous 2008). It is well known that search engines find it difficult to analyse and crawl dynamic URLs, since this involves source trackers or IDs.

4. Research Problem

Dynamic webpages tend to influence the visibility of a website negatively, since search engine crawlers have limited success in following their URLs. Having a low degree of visibility will reduce user traffic which might cause the website owners a loss of income.

5. Research objective

The primary objective of this research was to build a bridge between the use of dynamic webpages and SEO in such a way that the negative influence on visibility is at least reduced.

6. Research Questions

Dynamic webpages have a negative influence on visibility of the website. This implies that the website will not rank well on the SERP. Therefore the research questions are:

- How can the effect of the use of dynamic webpages on visibility be measured?
- If it can be measured, what can be done to mitigate their negative influence?

7. Research Approach

The approach to a solution was action research based. In order to achieve the primary objectives, a dynamic cricketing website called http://crickygeeky.com was developed - see Figure 2. This website was created with the typical dynamic look-and-feel, including a photo slider, web responsiveness, a live cricket score, a dynamic Google map, and a newsletter subscription to daily posts.

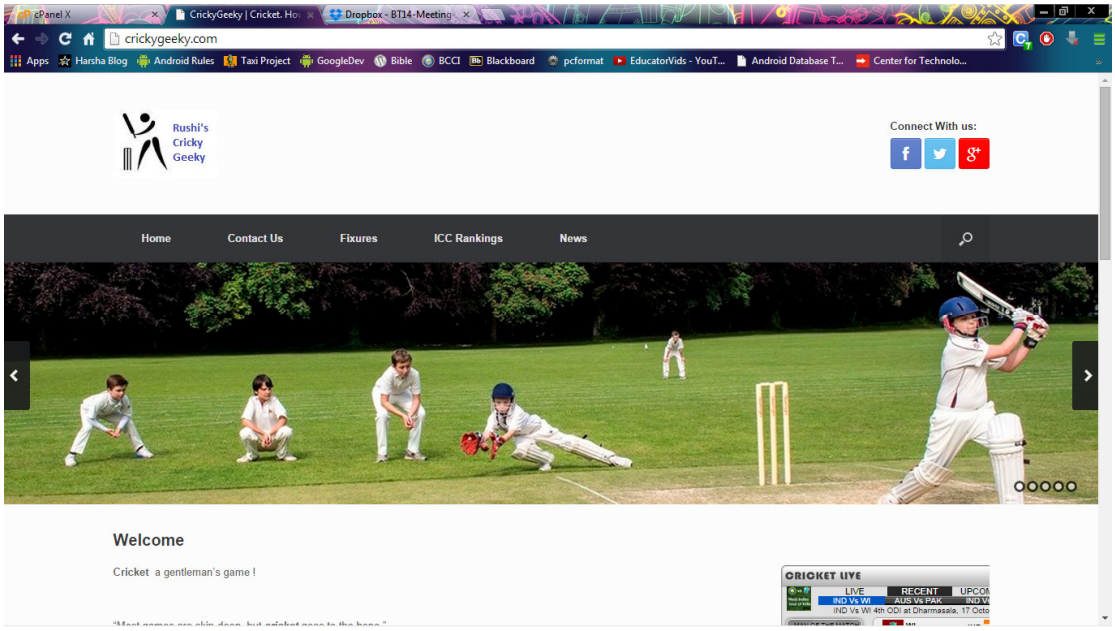


Figure 2: Homepage of dynamic website (crickygeeky 2014)

Once the website was developed, it was hosted on a live domain. After launching the website, the AWStats program (www.awstats.com) along with other online tools were used to track the visibility of this website. In order to measure the degree of negative influence of dynamic webpages, different techniques were used. These include:

- HTML coded metatags

- A static site-map
- Creation of a number of inbound links
- The use of targeted keywords in the body text

The AWStats online tool was used again to obtain the ranking, Web traffic data as well as other relevant information on the website's performance. Conclusions were drawn based on the results obtained through this process (Smith 2004).

8. Findings and interpretation

Results were retrieved using AWStats - see Figure 3 to Figure 6. All the data that captured in these four figures indicates activity of the test website which was developed for project purposes.

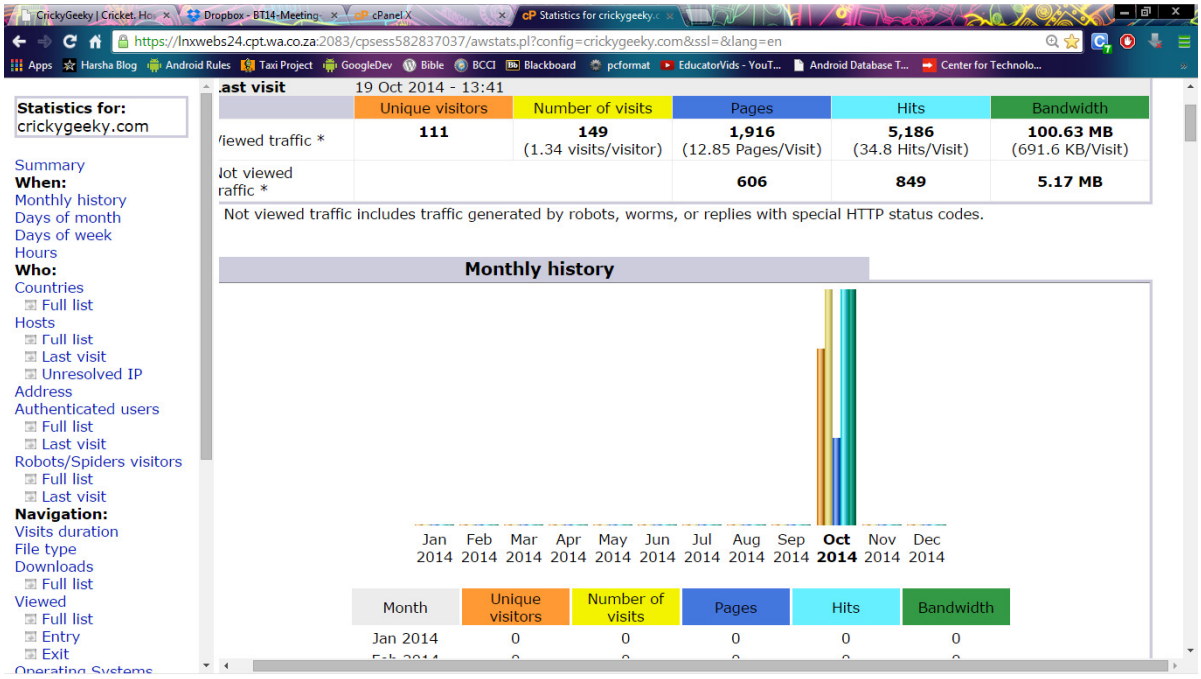


Figure 3: Website analysis: Monthly History (crickygeeky 2014)

The monthly history (Figure 3) indicates some spikes shortly after launch date, indicating that search engine crawlers have found and indexed the site.

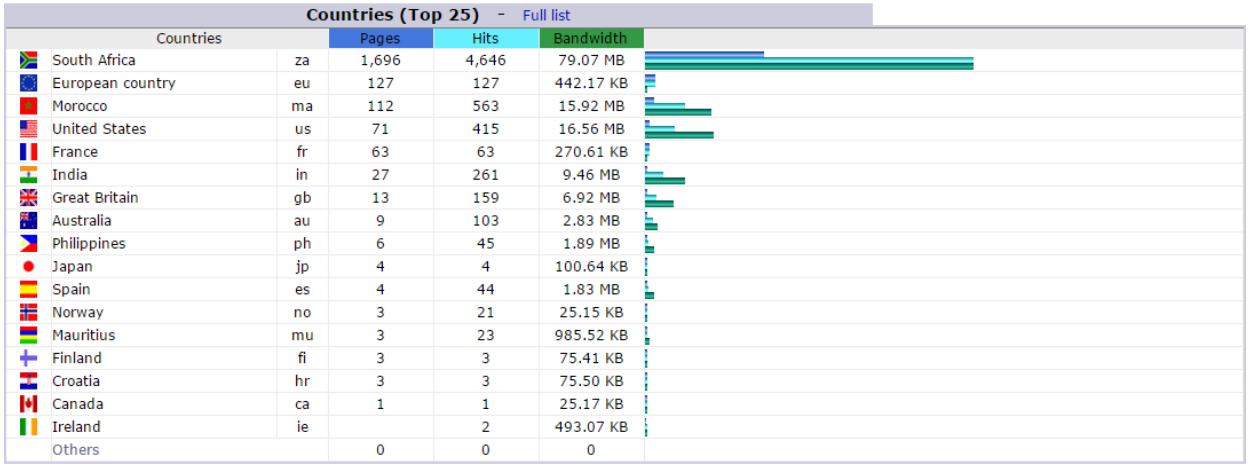


Figure 4: Website analysis: Visitor Country (crickygeeky 2014)

The record of visitors by country (Figure 4) indicates that most of the initial downloads were from South Africa, with other countries from all over the globe being represented further down.

Operating Systems (Top 10) - Full list/Versions - Unknown

Operating Systems	Hits	Percent
Windows	4,342	66.9 %
Linux	1,184	18.2 %
Unknown	441	6.8 %
Macintosh	383	5.9 %
BlackBerry	112	1.7 %
Symbian OS	21	0.3 %

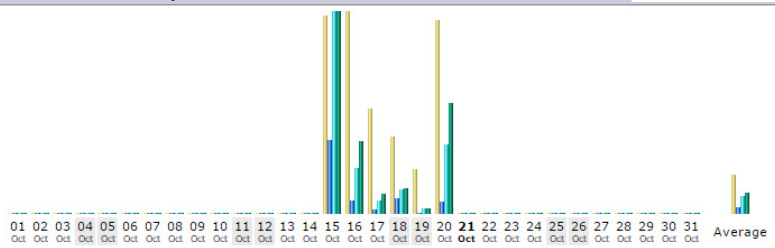
Browsers (Top 10) - Full list/Versions - Unknown

Browsers	Grabber	Hits	Percent
Google Chrome	No	4,615	71.1 %
Firefox	No	395	6 %
Safari	No	390	6 %
Android browser (PDA/Phone browser)	No	311	4.7 %
iBrowse	No	195	3 %
Opera	No	150	2.3 %
Mozilla	No	113	1.7 %
MS Internet Explorer	No	106	1.6 %
Unknown	?	77	1.1 %
IPhone (PDA/Phone browser)	No	59	0.9 %
Others		72	1.1 %

Figure 5: Website analysis: Browser and Operating System (crickygeeky 2014**)**

The record of visitors' operating systems and browsers (Figure 5) shows strong preferences for Windows and Linux, and Chrome, Firefox and Safari respectively.

Days of month



Day	Number of visits	Pages	Hits	Bandwidth
01 Oct 2014	0	0	0	0
02 Oct 2014	0	0	0	0
03 Oct 2014	0	0	0	0
04 Oct 2014	0	0	0	0
05 Oct 2014	0	0	0	0
06 Oct 2014	0	0	0	0
07 Oct 2014	0	0	0	0
08 Oct 2014	0	0	0	0
09 Oct 2014	0	0	0	0
10 Oct 2014	0	0	0	0
11 Oct 2014	0	0	0	0
12 Oct 2014	0	0	0	0
13 Oct 2014	0	0	0	0
14 Oct 2014	0	0	0	0
15 Oct 2014	49	1,334	3,658	63.55 MB
16 Oct 2014	50	228	819	22.94 MB
17 Oct 2014	26	79	235	6.23 MB
18 Oct 2014	19	268	431	7.82 MB
19 Oct 2014	11	18	87	1.76 MB
20 Oct 2014	48	218	1,253	34.63 MB

Figure 6: Website analysis: Visitors and Pageviews (crickygeeky 2014)

Figure 6 indicates a clear starting point in traffic, as search engine users started finding links to the test website on their SERPs and following these links.

9. Discussion of results

All the data was gathering was done based on traffic to the test website.

Figure 3 lists the monthly history of the website. It also illustrates the number of visitors, number of visits, number of hits, number of pages which were visited and total amount of bandwidth consumed. The graph also indicates the growth of the website over time.

In Figure 4 the country names are listed. It indicates that the website had visitors from various countries. It was surprising to note that some visitors were from countries which do not play international cricket – this includes some European countries (eg. France), and Morocco. It shows that different search engines are recognising the website and have indexed the content.

Figure 5 shows which operating system was used by visitors to visit the website. It also illustrates the type of browser visitors used.

Figure 6 indicates that some of the techniques employed to overcome the problems associated with dynamic websites were effective in creating a visitor flow to a dynamic website. Some of these techniques include:

- Some HTML code was used to create “food” for the crawlers.
- Metatags were coded as per industry standards.
- Dynamic URLs were supplemented by some static URLs.
- A site map was added.

10. Limitations of the study

There are no fixed steps to achieve high visibility. As stated earlier, algorithms of search engines are kept secret, which makes it difficult to predict the ranking of a website. In order to achieve high visibility, one has to mitigate the negative influence of dynamic webpages. This could be the stepping stone for future research.

11. Conclusions & recommendations

There is no easy solution to this problem as the dynamics of the search engine algorithms are kept secret. To build a bridge between dynamic webpages and visibility, first of all, the negative impact of dynamic pages had to be cancelled. This was done using certain tools and techniques. To put this theory into action, a dynamic website was developed.

As noted earlier, crawlers find it difficult to navigate through URLs which are generated by dynamic webpages. Therefore URLs were customised to improve the visibility of website. Furthermore, HTML code was used along with PHP and other scripting languages to create content which the crawlers could read.

This project was limited in scope, therefore the details of the dynamic webpage construct could not be improved. However, a way was found to improve dynamic webpage exposure to crawlers, simply by feeding crawlers with components of static webpages. Transposing those components from static pages to dynamic pages did not add any value to dynamic webpages in terms of features. It also did not provide the user with any extra features; however, it did give the crawler “food to eat”. For example, metatags are static components - they are invisible to the user but they are visible to crawlers. The same applies to HTML text too. It does not add value to dynamic webpage but it does provide some sustenance for the crawler. Therefore it is recommended to add as many static webpage components as possible to dynamic webpages.

In the end, the question still remains; how can the negative influence of dynamic webpages be nullified? This research could provide a stepping stone to answer this question.

References

Anonymous. 2008. Google Webmaster Central Blog. [Online]. Available: http://googlewebmastercentral.blogspot.com/2008/09/dynamic-urls-vs-static-urls.html [22 August 2014].

Bruce, W.N., Rosy, S. 2006. How Reliable are Website Rankings? *Implication for e-business advertising and internet search,* 7(2):238.

Conjecture corporation. n.d. [Online]. Available: http://www.wisegeek.com/what-is-an-seo-writer.htm [17 April 2014].

Cullen, R. 1998. Does performance measurement improve organizational effectiveness? A post-modern analysis. In: *Proceedings of the 2nd Northumbria International Conference on Performance Measurement*, September 1997. London: Newcastle-upon-Tyne: 22-56.

Ledford, JL. 2009. *Search Engine Optimization*. 2nd ed. Indianapolis: Wiley Publishing, Inc. 10-79.

Pandya, R. 2014. Rushi's CrickyGeeky. [Online]. Available: www.crickygeeky.com [20 October 2014].

Smith, A. 2004. An evaluation of Web development tools. *South African Journal of Information Management*, 6(4). [Online]. Available: http://www.sajim.co.za [16 July 2014].

Sullivan, D. n.d. *The Periodic Table of SEO Success Factors*. [Online]. Available: http://searchengineland.com/seotable [23 August 2014].

Thelwall, M. 2002. Subject gateway sites and search engine ranking. *Online Information Review* 26(2):101-107.

Weideman, M. 2009. *Website Visibility: The Theory and Practice of Improving Rankings*. Cambridge: Chandos. 179-205.

Zhang, J. and Dimitroff, A. 2004. Internet search engines' response to metadata Dublin Core implementation. *Journal of Information Science* 30(4):310-320.

Zhang, J. and Dimitroff, A. 2005. The impact of Webpage content characteristics on Webpage visibility in search engine results (Part I). *Information Processing and Management,* 41:665-690.

Zhao, L. 2004. Jump higher: Analyzing web-site rank in Google. *American Library Association,* 23(3):108-119.

Glossary

Algorithm: In relation to this study, it is a well-defined step-by-step procedure used by search engines to determine the ranking of results in relation to the end user search query.

Crawler: A computer program designed to travel across the Internet automatically, gathering information about websites in the process. It is also known as robot, bot or spider.

Domain: An Internet site, unique descriptor or address.

HTML: Hypertext Markup Language. It enables browser programs to display webpages in an understandable format.

Index: A file which contains all the data collected by the robot(s) of a search engine.

URL: Uniform Resource Locator. It is the address given to specific website.

Website Ranking: It refers to the position of the website as it appears on a search engine result page.

Acknowledgements

I would like to pay genuine gratitude to my Prof. Melius Weideman for the tireless support of my research, for his patience, motivation, financial aid, enthusiasm, as well as immense knowledge. Guidance which he provided helped me throughout the research and writing of this article. I could not have imagined having a better supervisor and mentor Project 4.

I would like to thank my fellow class mate Jaques Safari for offering me a free domain and Web hosting space. I would like to thank Ksheera Rama for always pushing me to walk that extra mile and being my inspiration. Last but not the least; I would like to thank my family: my parents Kirti bhai Pandya and Smruti Pandya, for providing me with much support physically as well as spiritually throughout my life.