



Marketing Internet Startups

Marketing niche engineering startups on the internet

*An Interactive Qualifying Project Report
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Abstract

This project studies the issue of marketing small and highly specialized engineering startups on the internet. The specific test company for this project designs human body modeling software for other engineering and science firms.

The growth of this project, measured in number of visits to the site, increased from about 11,000 in September of 2012 to a peak of about 36,000 visits per month by December of 2012. The growth continued in 2013 to almost 40,000 visits per month.

A growth of over 300% was in part due to leveraging some of the work and research done by the company's owner, and making the link between his work and his company on the web. Using a pre-existing academic network in order to publicize and market a relevant company or product is a technique that has proven very effective. This process can be repeated by any professor or academic professional trying to market their own company.

The concepts for marketing outlined in this paper can be applied easily by any startup in the United States, and likely across the globe.

Update: As of December 2013, the peak number of visitors has risen to about 52,000. This is almost five times the number of visits in September 2012 (11,000).

Acknowledgements

I would like to thank Professor Sergey N. Makarov for giving me the opportunity to try new methods of marketing with this company and giving me free reign to make things happen.

Viktor Makarov was also a huge help, by managing the company's website and providing me with weekly statistics about the site that made it incredibly easy to follow the effectiveness of the attempted methods.

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1. Introduction

In 2011, there were almost 600,000 [1] new startup companies in the United States alone. Marketing a company that has a broad target demographic can be achieved by very broad advertising and targeting techniques, such as using television and internet advertising. For progressively smaller markets, advertising must become more focused toward the target demographic in order to be effective, otherwise the money and effort spent advertising is wasted.

The company being observed in this case (let us call it 'Electromagnetics Software Inc.' or EMS for short), is one such niche engineering company. EMS specializes in modeling electromagnetic waves through various parts of the human body, capacitors, and other conductive materials by using software modules written in MATLAB. Most of the software modules on the site available for free as downloads, but the company also sells a high speed, sophisticated, and detailed EM Field Solver for the human body.

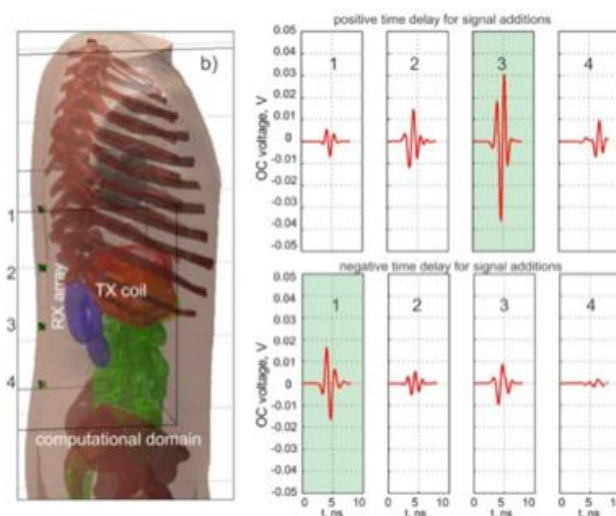


Figure 1 - RX array of orthogonal-coil antennas (left) and received open-circuit voltages (right)

Figure 1 above shows an example of some of the functionality of the EM Fields solver, which is available for \$299.99. The figures below shows an example of some of the models available for free on EMS's website.

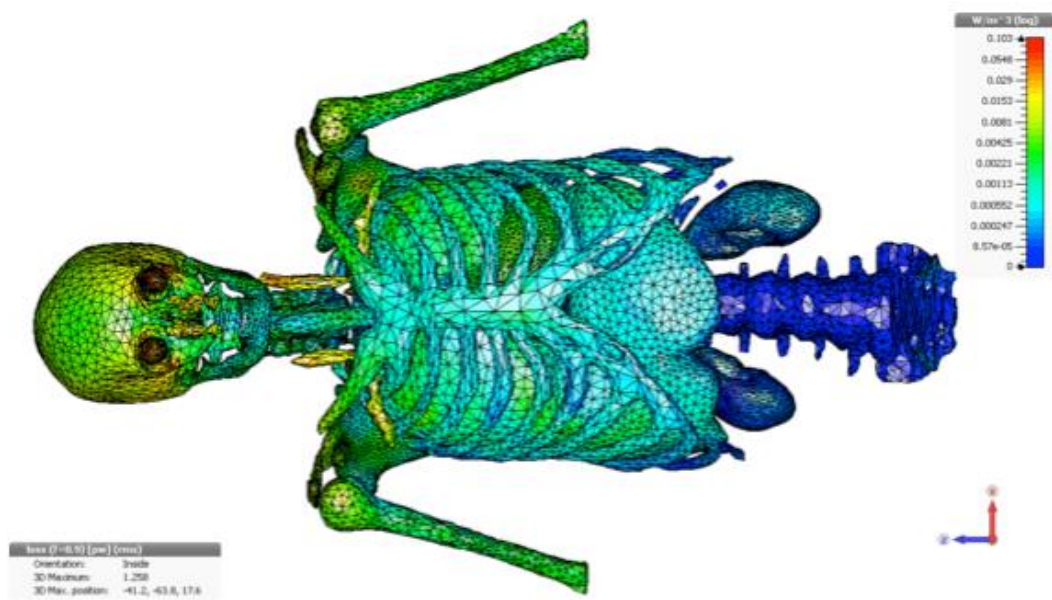


Figure 2 - Upper body human skeletal mesh

Since EMS's main focus lies with modeling the human body, it must follow that the target market will be people who wish to further study the effects of electromagnetic waves travelling through the human body.

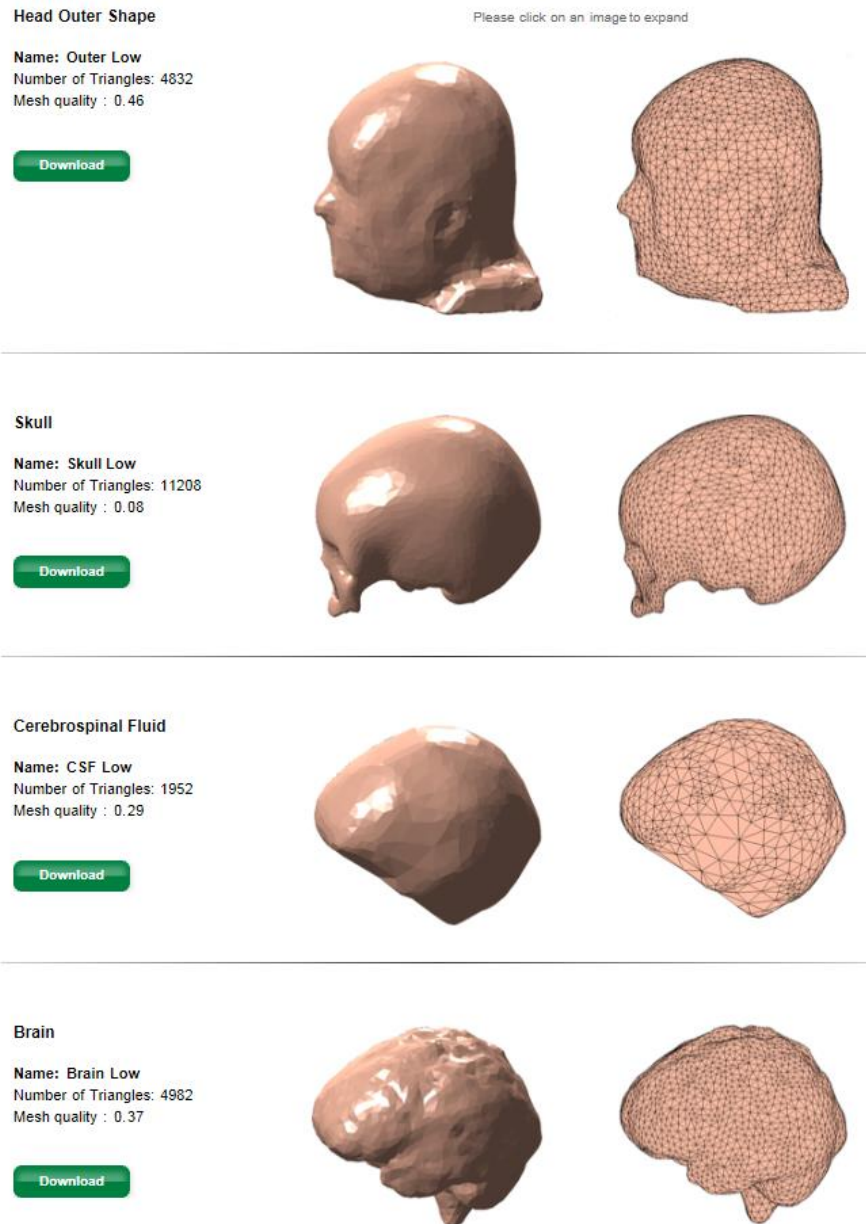


Figure 3 - A few of the downloadable human body meshes, downloadable for free

Many such studies exist, and there has been steady growth in this sector as computers and mobile devices become more prevalent in our daily lives. A simple search on the IEEE Digital Library for “effects of electromagnetic radiation human body” returns over 400 results [2]. This shows that a substantial number of academics in the engineering and medical community are studying the effects of EM waves through the human body.

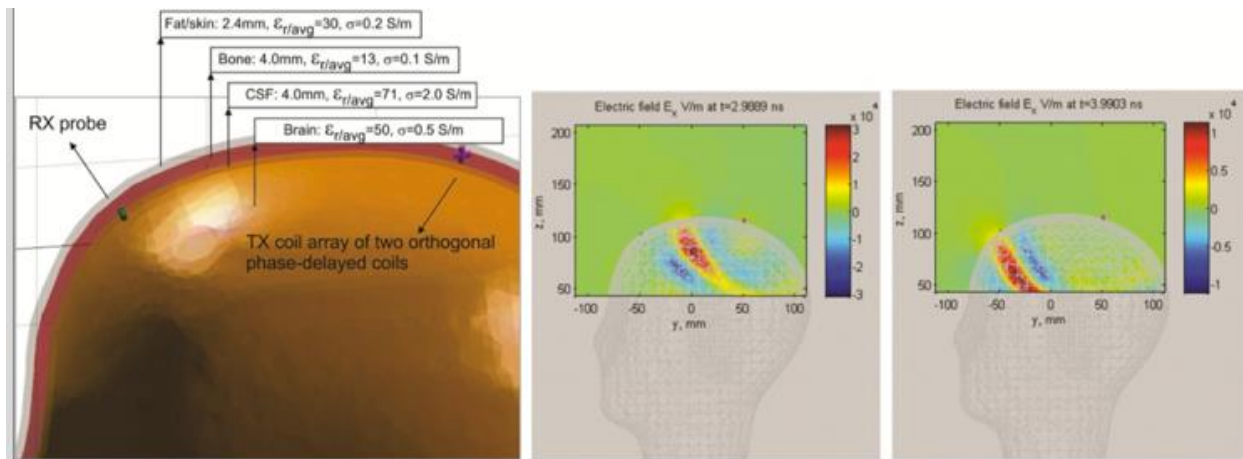


Figure 4 - An inhomogeneous model of a human head [3].

Since the concept of EM radiation travelling through the human body is still being researched extensively and is not a heavily commercialized product yet, the specific target demographic for EMS at this time is professors and researchers who are studying the effects of Electromagnetic Radiation through the human body.

2. Background

To market a startup company on the internet, you must first increase its internet ‘footprint’ [4]. The more relevant websites it shows up on, the better. The basic idea is to maximize the number of hits the site receives each month. By increasing the number of visitors, you increase your publicity and the likelihood of someone purchasing or downloading something from the site. The focus of this project was first to obtain publicity through the free software. Making money off the EM Solver is not primary goal at this time, since that will happen as traffic to the site increases and the startup matures.

Another important factor in increasing the ‘footprint’ of your website is Search Engine Optimization. By making changes to the way your website is laid out and its code is written, you can ensure that it will be more likely to land a higher spot in an internet search for any related topics [5]. For example, a Google search for “Electromagnetic modeling human body” would ideally return EMS’s website as the first result (and also be useful for the searcher).

2.1 How search engines work

Search engines build an “index” of web sites and provide results by calculating how relevant they are to the search [6]. In order to build this index, search engines must “crawl” through the entire internet and read all websites, links, and associated content. Indexed content is stored on the search engine’s server hard drives. This indexed content will be referenced when a search query is made.

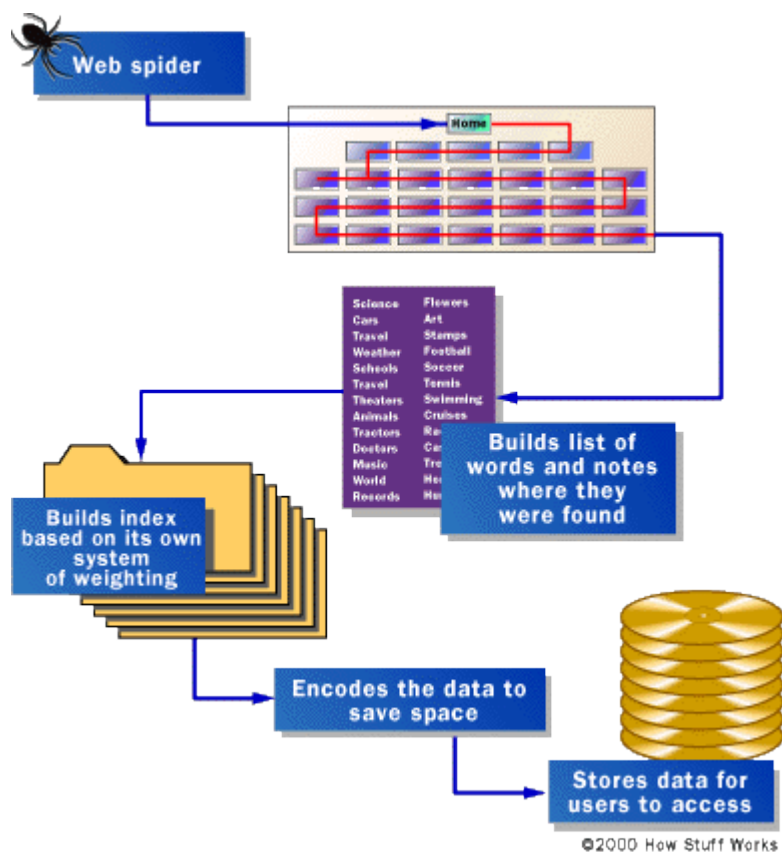


Figure 5 - Flowchart for the "crawling" process [7]

Every time a query is made, the engine must trawl through its massive indices and return all relevant results. Modern search engines go one step further by returning all relevant results in order of most relevant and/or useful to least relevant and/or useful. The meaning of relevance and usefulness has evolved quite a bit since the early days of search engines. Originally search engines simply used to count the number of words on a page to decide relevance. For example, if I were to search “caravan,” the top results would likely be for the Dodge Caravan car rather than trade caravans simply because the Dodge Caravan uses the word “caravan” or related words more times. Today, there are over a hundred metrics with varying weights assigned to them used to provide the most valuable results. One of the most important metrics, with a very high weight assigned to it is “Page Authority,” which is the number of times a specific page or site has been referenced or linked by others on the web [8].

Determining page authority takes into account several factors: number of unique IPs linking to the page, number of root domains (basically main pages) linking to the page, root domains linking to the page while using the exact same anchor text as the page, and number of likes and social shares (Facebook, google plus, etc.) [8]. There are of course many other factors just within the page authority metric, but these examples are sufficient to show the complexity and depth of modern search engine and indexing algorithms.

2.2 Human interaction with search engines

Human interaction with search engines is typically quite generic. The first step is of course for a user to need a question answered. They formulate this need for a solution into a string of words, which is called the “query.” The query is entered into the search engine, which checks its indexes for matches. It calculates the best matches and returns them in the appropriate order. The user then browses through the results and picks one that he or she believes is the most promising. The user looks through the link for a solution or a likely link to that solution. If the user finds what they need, the search engine has done its job.

Otherwise, the user goes back to the list of links and tries to find another likely match. If this process is repeated and no satisfactory result can be found, the user attempts to change the query. Once a match is found, the user leaves satisfied. If they need more answers or solutions they repeat this process [5] [6]. The flow chart on page 14 illustrates this process.

On average, people will run repeat the process shown in the flowchart three times before [7] becoming satisfied with the result. All search engines are constantly trying to reduce this average because if they do, it means they provided more useful and relevant search results the first time. For example, if a user looks up a term using Bing!, they might end up re-running the search three or four times. They might make the same search on Google and get their results on the second or third try. It’s likely that this user will default to Google in the future. Therefore search engines are always trying to improve their algorithms in order to be considered “better” than their competitors.

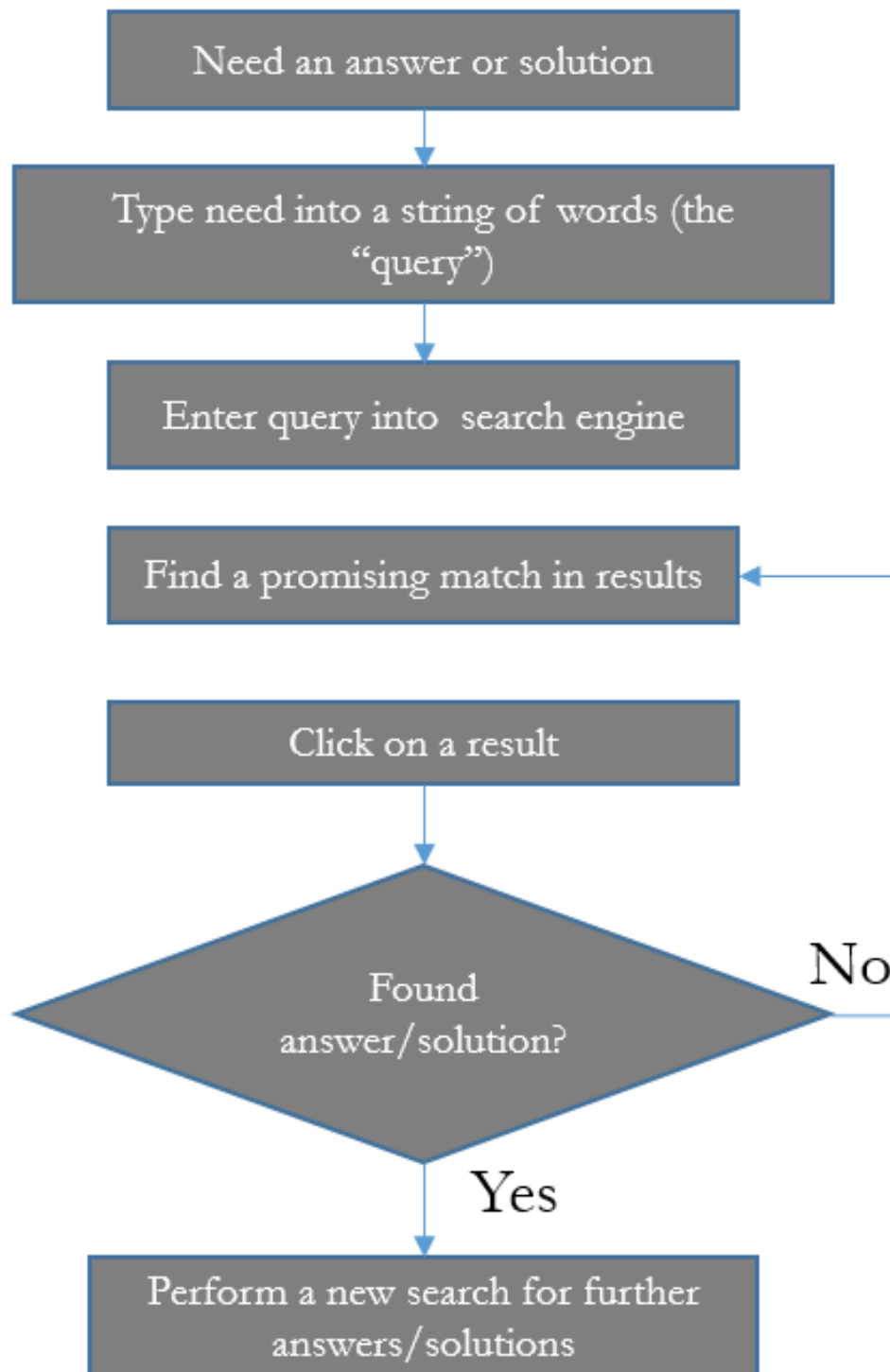


Figure 6 - Human interaction with search engines

Search queries can be broken down into three main categories: “Do,” “know,” and “go.”

These categories are broken down in the table below [8].

Do	Action queries, like “buy a plane ticket” or “play a video”
Know	Informational queries in which the user seeks answers, such as data about an electronic component, top speed of a car, or the best seafood restaurant in Boston.
Go	Navigational queries that seek a specific website, like the Nissan Motors (try Nissan.com) home page.

As of August 2011, 59% of all adult internet users use search engines [9]. While might sound like a surprisingly low percentage, it is important to note that this makes search engines the second most popular feature of the internet (email is the first). The search engine has effectively replaced the yellow pages, based on a 2011 report. 76% of respondents to the report used search engines to find local business information [10]. As search engines are becoming more prevalent in everyday usage, it is all the more important for those attempting to market startups and smaller companies to understand how to take full advantage of search engines.

2.3 Search Engine Marketing

A successful website must be easy to use for a human user, but it must also be simple to navigate and index for a search engine. Making a site that is usable both by humans and computers is the challenge search engine marketers face. Therefore, it is important to learn more about the ranking algorithms of all relevant search engines in order to optimize one's website. Showing information to a user is relatively easy, since both the creator and users are human. The indexing algorithms unfortunately see things very differently. For example, a heavily image-based site with words and headings held inside images will look very rich full to a human. An indexing algorithm might see the same page very differently. Below is an example of a page that does not store too much of its information inside images, and labels images when it does do so [4].

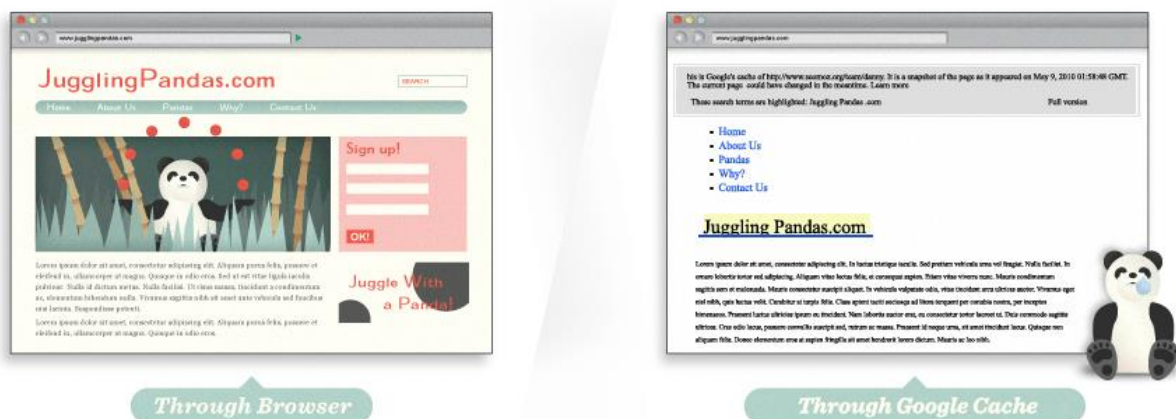


Figure 7 - What users see and what indexing algorithms see [8]

The images shown above are an example of a well-designed website. The user sees a content-rich, conveniently laid out webpage, and the indexing algorithm can easily read and

interpret the contents so it can show this webpage to even more users. Below is an example of a site that is poorly optimized for search engines.

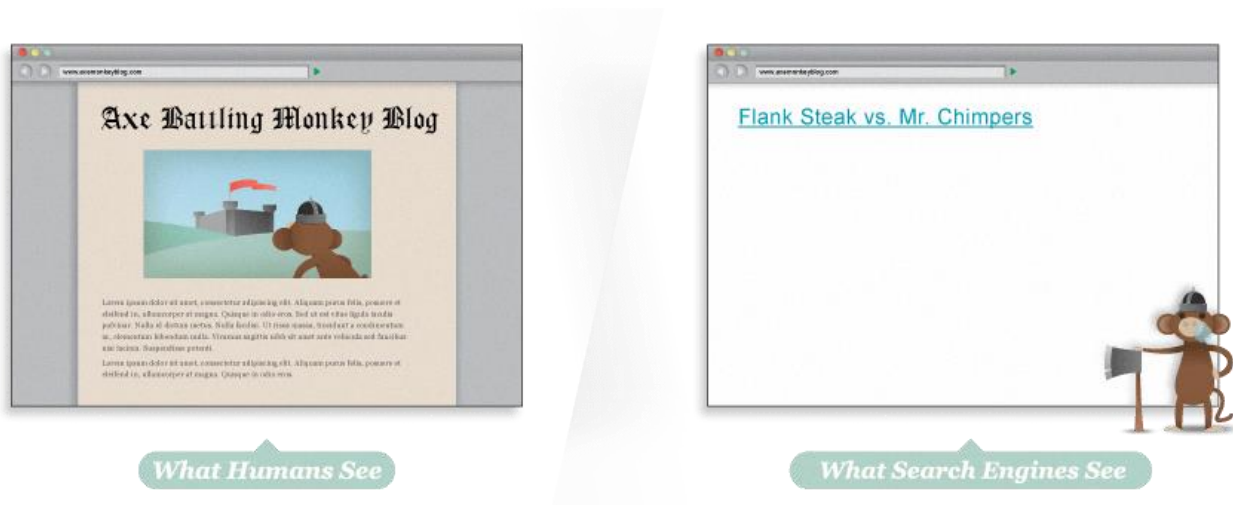


Figure 8 - What users see, and what search engines see [8]

The image shown above is nicely laid out for humans, but the search engine only sees five words. These five words are taken out of context, as the computer can't see the rest of the text, so the algorithm won't know how to rank these words. In short, this site would rank very poorly indeed.

It is important to note that modern search engines do not just rely on reading keywords to rank a specific site. As mentioned in Section 2.1, search engines use hundreds of factors to decide the rank of a webpage in their indexing algorithms [8]. In the early days of search engines, indexing algorithms were not quite as complex and did simply read for keywords and rank sites based on those. The result was "keyword stuffing," a form of keyword abuse in which developers and marketing teams threw as many keywords as possible into their pages, even if they were not related [5]. This led to undesirable and low quality search

ranking, so search engine designers changed their algorithms to the more modern ones we know today. Keywords are now just one of many ranking factors of a website.

Another very important aspect of ranking high in search engine results is who you're linked to. The more high-ranking sites linking to you, the better. For example, I might not have a very high-ranking website, but as soon as I get a link on the front page of the New York Times, my ranking will shoot up to the top of any search relevant to me (partially because I've been linked by a very high ranking site but also because I'll also be a very popular search term if I'm on the front page of the New York Times) [11]. Who links to your site is probably one of the most important factors. It is important that your site is linked by *relevant* sites.



Figure 9 - Links and references to well-known companies within EMS's field

For example, if my site on World War II fighter aircraft is linked on the 2014 FIFA World Cup page, indexing algorithms will calculate a very low relevancy and it won't affect my ranking much. If my site is linked by the History Channel or other relevant websites, I will see a jump in my ranking. Aside from algorithm ranking, there is a human factor to this. As my page is linked by more well-known pages, it will receive more traffic, which means it will ideally become well-known in its own right, which means it will be linked to on other pages, which will increase its popularity further. This snowball effect is the ideal situation for any website and is something every marketer should attempt to achieve.

3. Proposed Solutions

At the beginning of the project, the EMS website was receiving approximately 11,000 hits per month. Various tactics were employed to increase the number of hits the website was receiving. Before making any changes the website itself was analyzed. Professor Makarov had a team already working to optimize the site, so changing the code of the site itself was outside the scope of this project. Assessing the actual usability was more important in this case. The next objective was to research areas on the internet where interest could be garnered and the company could be better advertised to potentially interested parties. It is important to note that the solutions outlined by this project were not the only ones in existence. There were other teams working separately on going to scientific conferences and presenting EMS and its software to interested parties. This was an extremely important factor in increasing the number of visitors the site received.

Process for assessing and improving sites

- Assess usability
- Make changes to site layout as needed
- Advertise site
 - Improve online footprint
 - Introduce site and company to relevant users via conferences
 - Leveraging pre-existing pages on other sites
- Assess site statistics, compare to numbers at the beginning

3.1 Improving site layout

Overall, the company site was well-maintained and easy to navigate. The site was professional, clear, and simple to follow. The focus and objective of the company itself was clearly stated at the very forefront of the webpage.

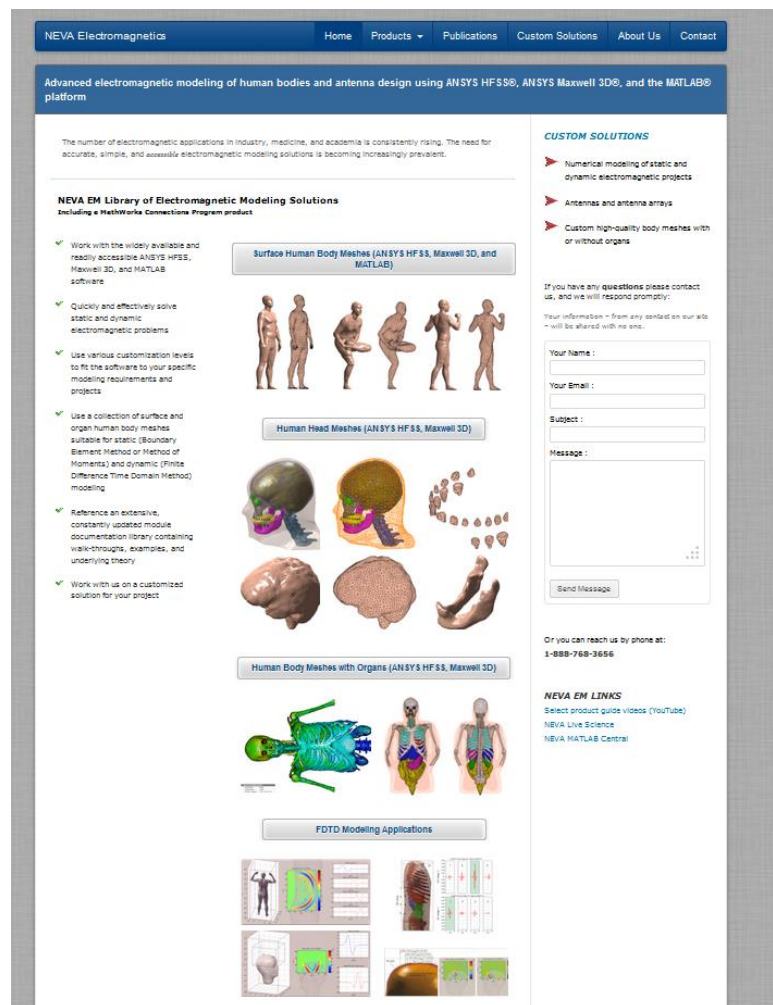


Figure 10 - A site layout with clearly defined sections at the top, images to illustrate content on the homepage, and text (outside of images) captioning all images

One major flaw was that some areas of the site were too layered. In order to get a first-time visitor to a download link for one of the free MATLAB scripts, the user had to travel through

two extraneous pages that simply stood in their way. The removal of all such extraneous pages was recommended. Throughout the course of this project, updates and upgrades to the company website were made regularly. As seen in Section 4, this affected the number of unique visitors and how long they continued to browse the site.

Update: As of December 2013, the site layout has changed significantly as a result of constant updating.

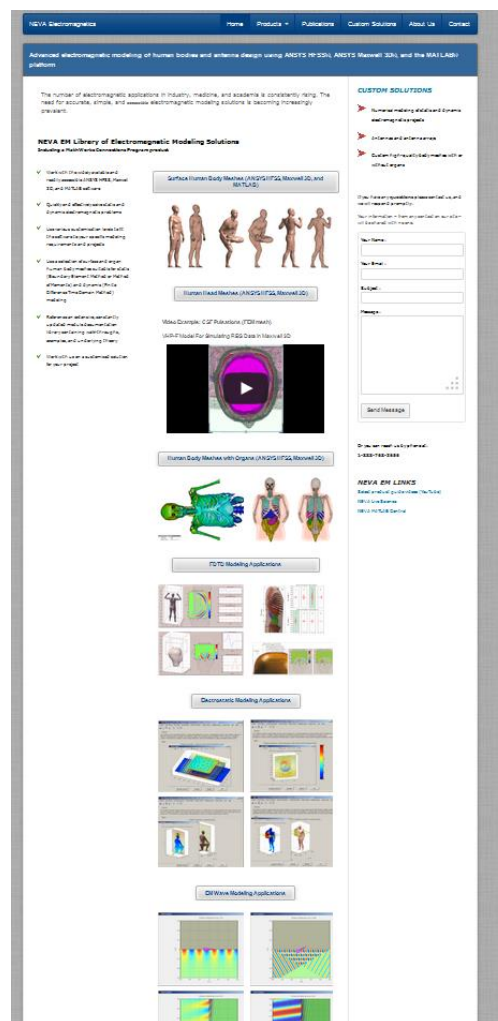


Figure 11 - Update EMS Website

The main page of the site doesn't look very different, but following links is rather streamlined at this point. The site is now much easier to navigate and understand. By placing models an increased number of relevant models to the main page, it is more likely that user will be enticed into clicking and moving deeper in to the website.

The tabs at the top of the page are now filled out and better-organized.

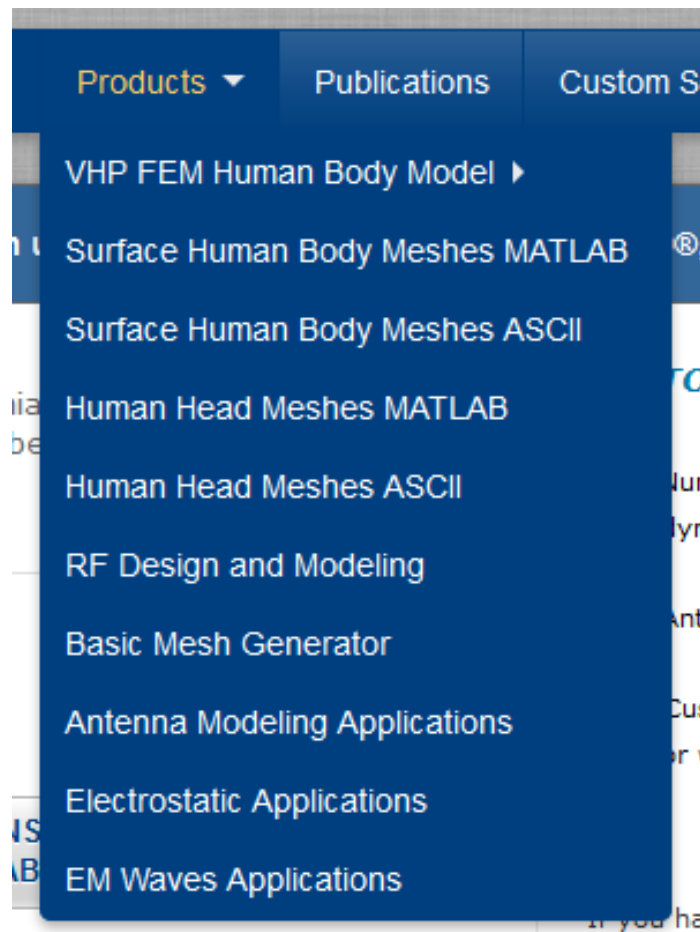


Figure 12 - Products dropdown menu on website

If a visitor is interested in a specific mesh that is available for free, they no longer have to click through several links to get to the download page. There is a simple 'download' button

next to each mesh, with a “Useful scripts” section and a quick how-to section on how to use the scripts.

Surface Human Body Meshes for MATLAB

-MATLAB 2011a or newer-

To display the body meshes, the following MATLAB script may be used:

```
[FileName, PathName] = uigetfile('*.bod','Select the body mesh file to open');
S = load(FileName, '-mat');
P = S.P; t = S.t;
patch('Faces', t, 'Vertices', P, 'FaceColor', [1 0.75 0.65], 'EdgeColor', 'k');
axis 'equal'; axis 'tight'; set(gca, 'YDir', 'normal');
xlabel('x, m'); ylabel('y, m'); view(70, 25); grid on;
```

Useful Scripts

[Meshviewer.m](#)

[Normalcheck.m](#)

HIGH DEFINITION MESHES

The provided meshes are of good quality.
For **high definition** meshes, please contact us:


1-888-768-3656

or:

[Contact Form](#)

Person 1 Arms Up


Person: 30 year old male
Position: Standing, arms raised
Number of Triangles (Fine): 201308
Mesh quality (Coarse): 0.45
Number of Triangles (Coarse): 6792



[Download](#)

VHP FEM Human Body Model ▾

- Surface Human Body Meshes MATLAB
- Surface Human Body Meshes ASCII
- Human Head Meshes MATLAB
- Human Head Meshes ASCII
- RF Design and Modeling
- Basic Mesh Generator
- Antenna Modeling Applications
- Electrostatic Applications
- EM Waves Applications

 [Surface Triangular Human Body Meshes](#)

Surface human body meshes suitable for electromagnetic and acoustic modeling. Obtained with a 3D Model WB4 laser scanner manufactured by Cyberware. Four male volunteers were scanned in a number of different positions, producing almost 30 datasets for analysis.

Figure 13 - Layout for download of mesh with relevant information easily visible and well-organized on the page

As we can see on the right side, there are tabs to look through other sets of meshes. There is also a PDF link which explains what is going on with the meshes. On the left side, there is data about the mesh itself, with contact information and how-to information at the top in case users are having trouble.

3.2 Leveraging preexisting pages on other sites

The owner of EMS, a Professor, is already very well-known in the field of antennas and electromagnetic fields. He has written a very popular book on the topic of Antenna and EM Modeling in MATLAB. He has also published many papers on the topics of Antennas and EM fields. A search for “Sergey N. Makarov” on the Institute of Electrical and Electronics Engineers (IEEE) Digital Library returns over 40 results. Simply by increasing his publicity, the publicity of EMS itself could be improved [11]. The most obvious proposal was to put a link to EMS in his Amazon.com author biography. His amazon page is well-visited due to the popularity of his books.

The logical progression led us to consider that we should post links to the EMS website in places where people would first look when they are searching for information relevant to the software written by EMS. One such site is Wikipedia.org. Most people looking for a basic, high level overview on a topic usually end up on Wikipedia, since it is often very high on the results list of an internet search. For example, if someone wished to learn about Bioelectromagnetics, they are very likely to end up on the Wikipedia page for such information. By adding useful information to the page that references the work of Professor Makarov or his company, EMS, it increases the likelihood that someone will land on EMS’s website looking for more information. While the Bioelectromagnetics page is unlikely to yield a high number of useful hits, other pages were far more relevant and therefore more likely to be helpful. For example, the page for Computational Electromagnetics contains a list of useful software and links to the respective companies providing such software. By

Another tactic used was to contribute new pages to Wikipedia based on some of the research conducted by Professor Makarov. By adding pages with scientific information that wasn't yet on Wikipedia, the content of the site would be improved, and it would increase publicity for EMS as well as Professor Makarov's works.

4. Effectiveness of proposed solutions

The solutions outlined in Section 3 were implemented over the course of a few months. As they were rolled out, the number of visits to the site increased significantly. Of course, this is not due entirely to this project alone. As mentioned earlier, there were other groups doing very important work that also increased the number of visits to the site. Much of the improvement seen below is due to their efforts.

The main goal of this project was to increase the number of visits to the website. As shown by the graph below, the number of hits started out around 11,000 per month in September, and increased at a very fast rate for the next two months.

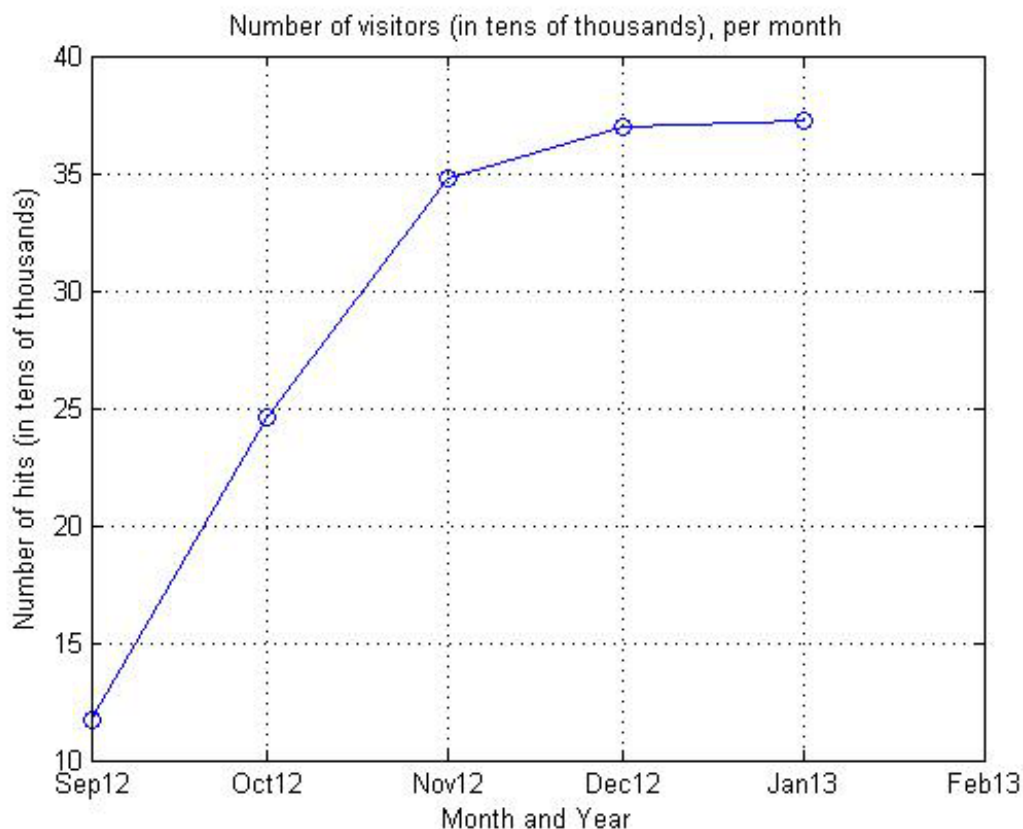


Figure 15 - Number of visits (in tens of thousands) per month

The number of visits began to level off in December, and almost completely leveled off by January. The project ended in December, showing that this project was effective in reaching its goals. Of course, this project was not the only contributor to the drastic increase in visitors. Professor Makarov and others were marketing the company, which played a major role in the success of the project.

Update: As of December 2013, the site traffic of EMS has increased to average around 50,000 visitors each month and seems to be holding steady for the time being.

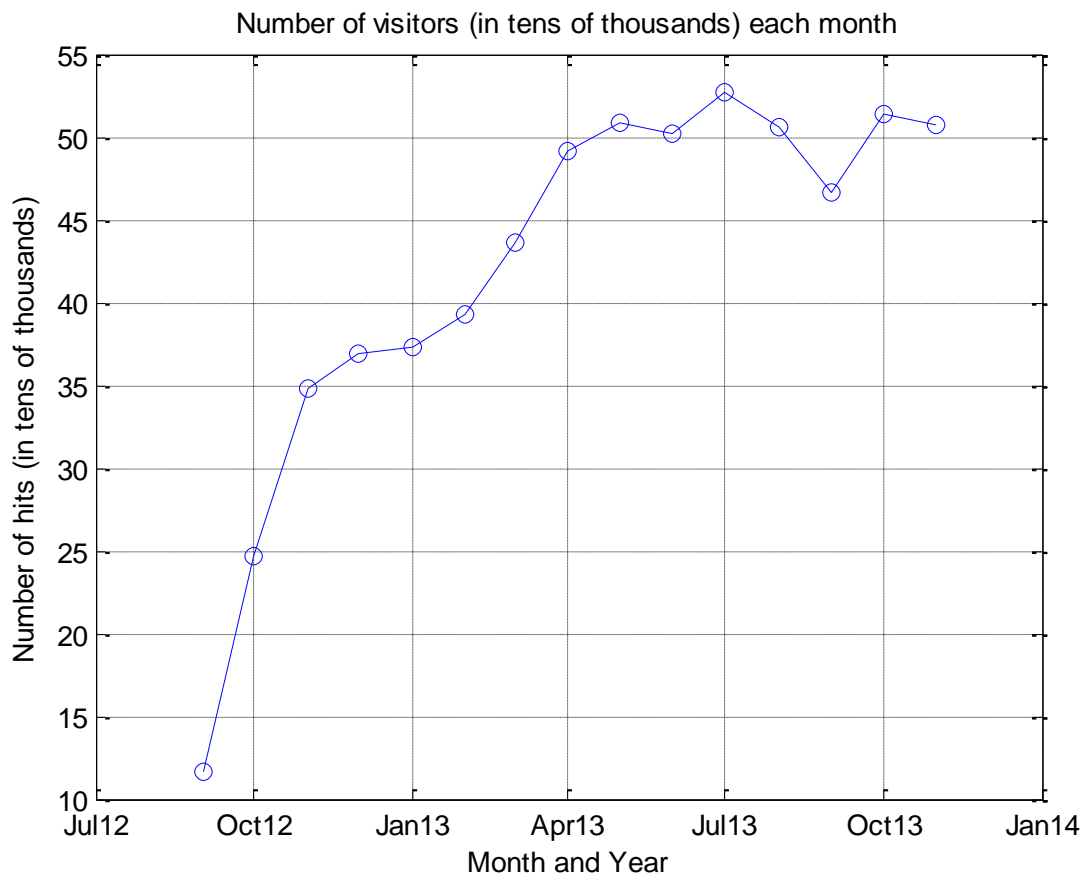


Figure 16 - Site traffic update

4.1 Breakdown of site activity

As we can see in the graph, there have been a fair number of spikes in site traffic. The first major spike, in Autumn of 2012, shows a huge increase from just over ten thousand visitors to about thirty-five thousand. This can be seen in the graph below:

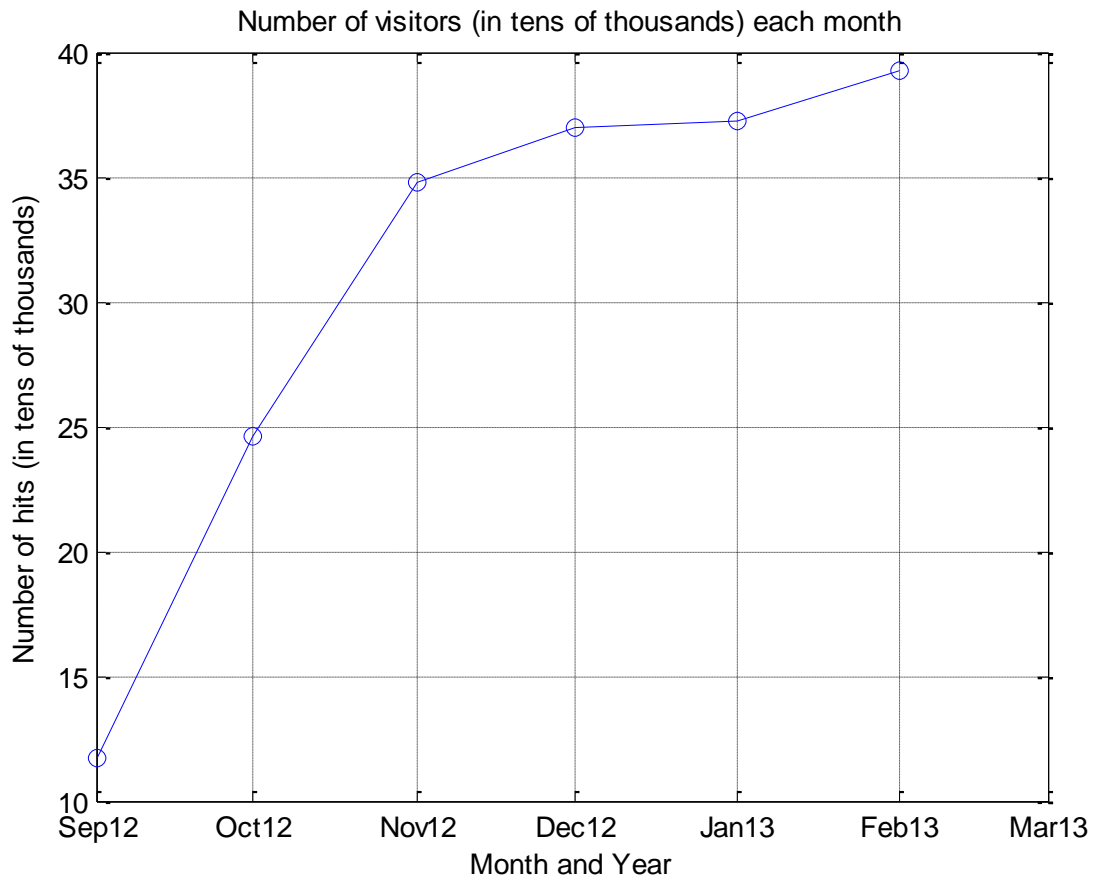


Figure 17 - Site traffic Sept. 2012 to Feb. 2013

This massive shift is due in part to several activities. The first and likely the most important of these activities were all of the conferences and major contracts being pulled in by employees of EMS in the summer and throughout autumn.

The unique visitors curve began to flatten out in the winter from late Autumn to January 2013, as seen in the graph below.

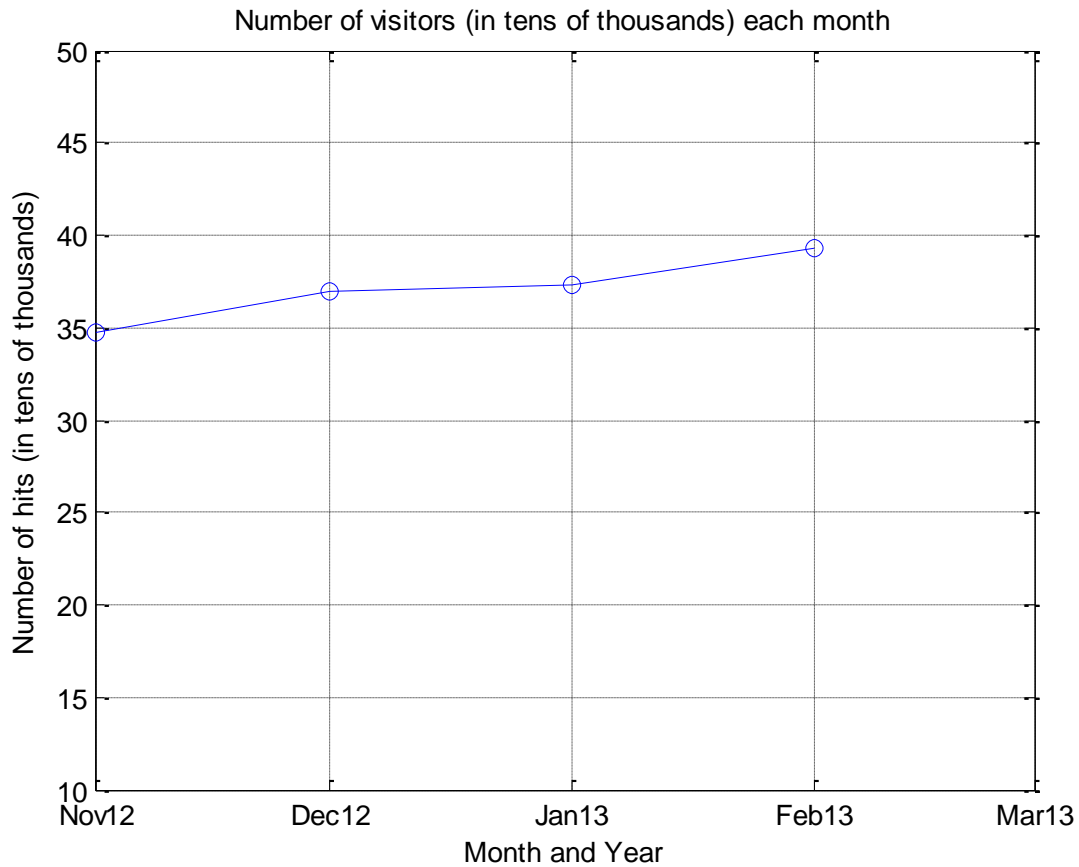


Figure 18 - Unique visitors curve flattens Winter 2012-2013

There is a slight rise in the numbers through January. This is likely because major website updates were implemented in January while employees of the company were also working making presentations at conferences. A new contract was also initiated around this time. We can see in the graph below that the number of visitors picks up correspondingly. All the way into April.

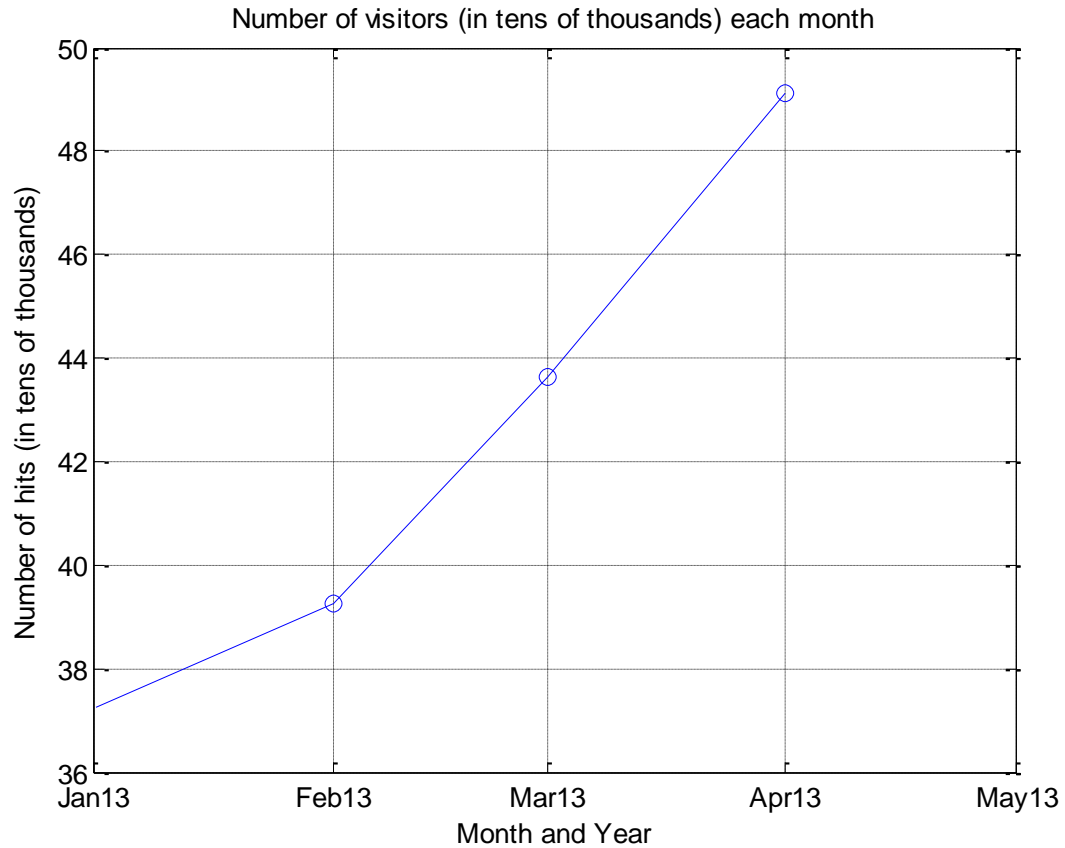


Figure 19 - Another spike in traffic from February 2013 to April 2013

After this rather large spike in visitors (about thirty-eight thousand to almost fifty thousand) we continue to see an increase at a reduced rate until there is a slight dip in users after May of 2013. This is quickly remedied in by July, which sets a new peak.

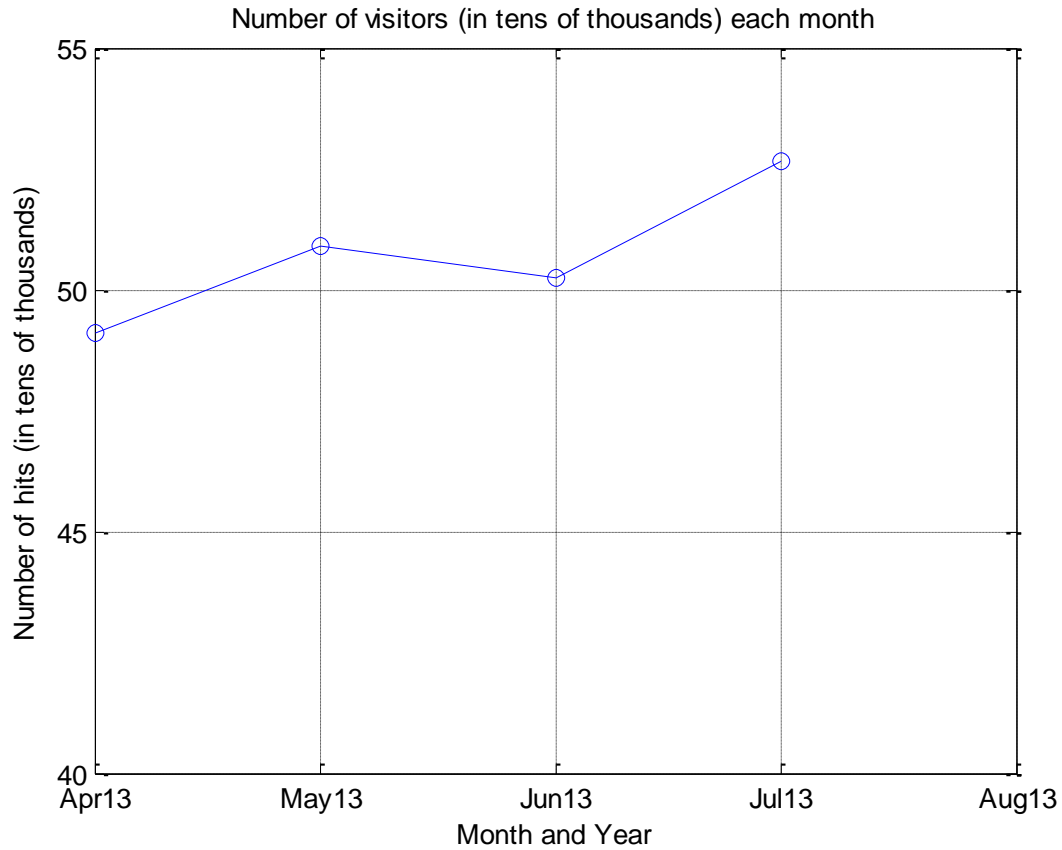


Figure 20 - Slight slump in late spring followed by a peak in July

The slump from May to June can be explained by a lack of presentations and events for the company accompanied with some major site updates. This is only a slight decrease in visitors (perhaps only about one thousand). Following this slump is a spike which is the peak number of visitors to the site. This was likely due to a new contract for EMS and the major website upgrades and reorganizations improving user interaction.

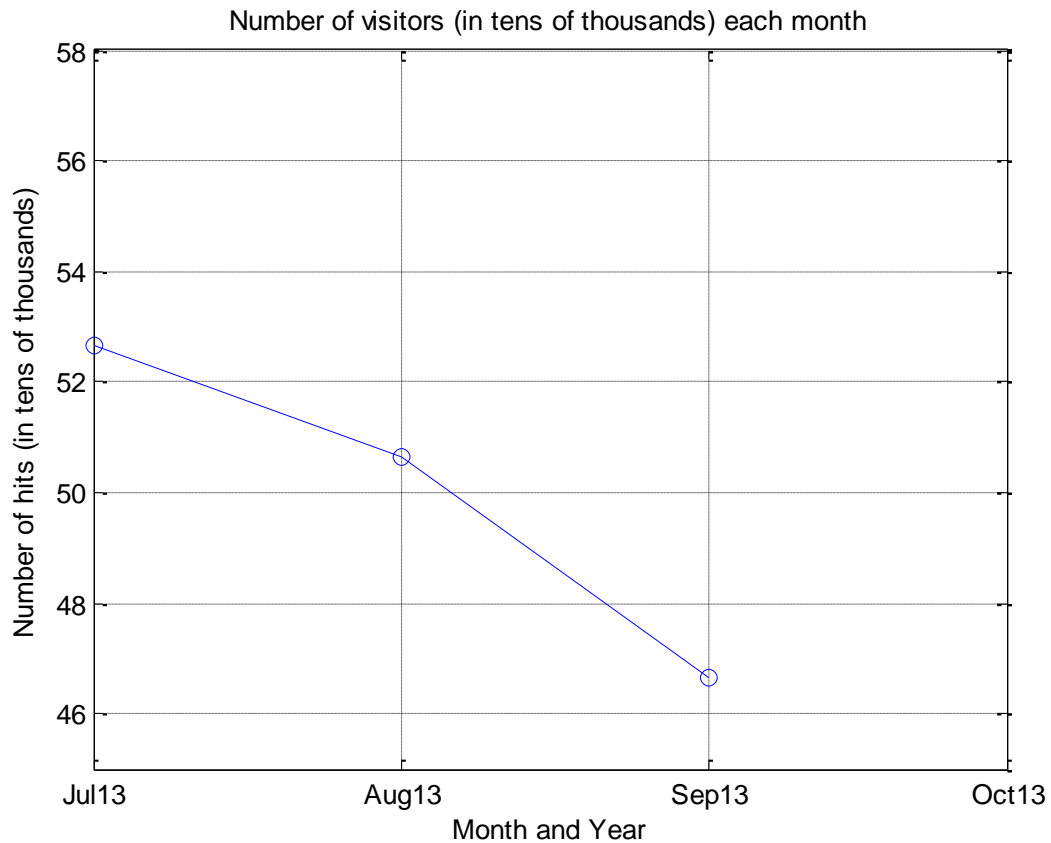


Figure 21 - Drop from July 2013 to Sept 2013

In the figure above we see a significant drop in the number of users. In July 2013 we reach a peak of just over fifty-two thousand visitors, and by September of 2013 we are below forty-seven thousand. There are several reasons for this, the biggest of which is simply a lack of activity from the company. From July to September, there were no conferences, no presentations, no new contracts, no site updates, and no uploads of new content. This is a great example of how carefully and attentively the website of a startup must be nurtured. The number of visitors each month dropped by about 13% by September of 2013, and if left unchecked, the site would lose most of its momentum.

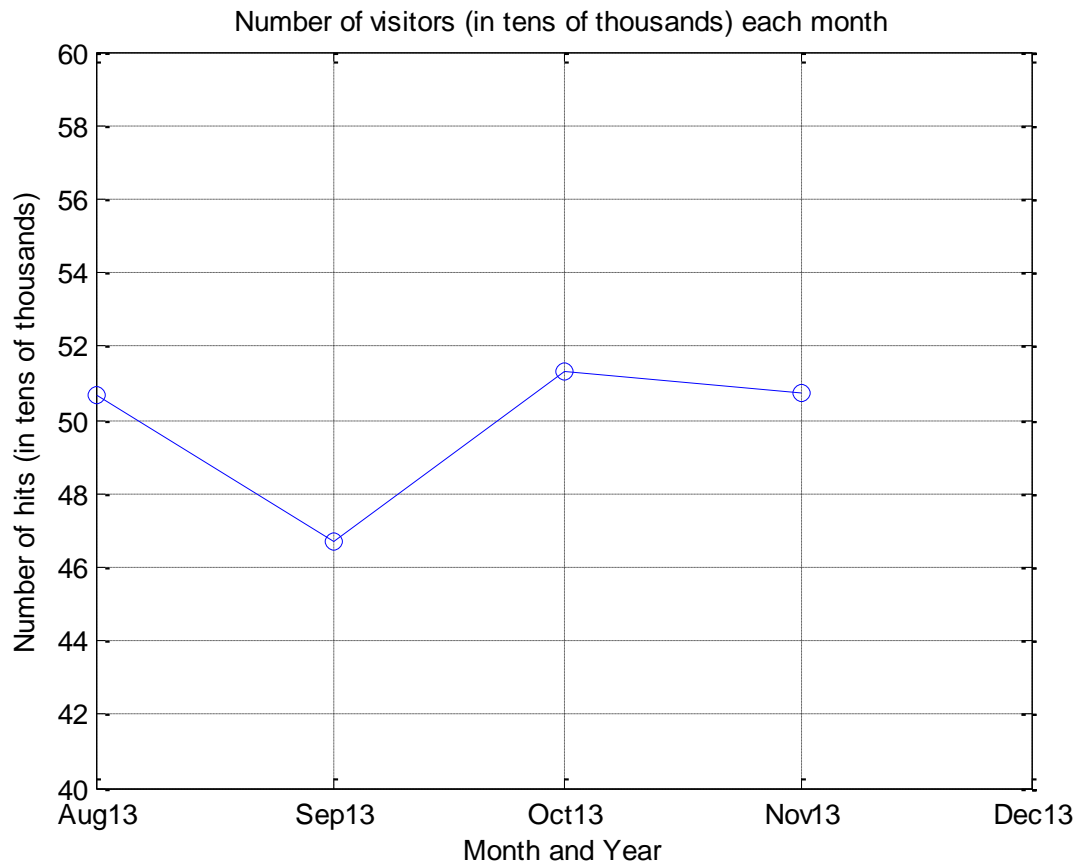


Figure 22 - Rebound in early autumn

In September, we see a major rebound to levels that are almost at peak. There is a slight dip from October 2013 to November 2013, but it's small to the point of being insignificant. This gain is due to the work being done over the summer, which was finally displayed in late August and early September. Toward the end of August and early in September, there were two site updates, uploads of new models, and a major conference presentation. These factors brought the site traffic of EMS back up to peak levels, with only a slight dip in the following month of October.

5. Conclusion

This project can be considered a success. Site traffic increased, which was the goal of this project. The marketing techniques used in this project cover some ideas that could be used by other scientific startup companies to increase their internet footprint. Optimizing a search engine from a technical perspective isn't too difficult (good site layout, easy to read for search engine indexers, etc.). The difficult part is getting links connected to other well-known relevant web sites that will give your site a certain level of authority. The solutions used by this project are very basic methods that will hopefully be expanded upon in the future to increase the effectiveness of the techniques. The most helpful technique which consistently drove site traffic higher was the physical presence of company members at conferences and other relevant events. By representing the company and the website at conferences, interest in the company and the site was generated. This interest caused people to look the website up online, which significantly boosted site traffic. In order to maintain growth, it is always imperative to maintain a constant physical presence at relevant events.

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