# Knowledge Management Information Tool Web Analytics -15182

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## ABSTRACT

The Knowledge Management Information Tool (KM-IT) is a web-based [01] system developed to maintain and preserve the Department of Energy's (DOE's) D&D knowledge base. The system was developed by Florida International University's Applied Research Center (FIU-ARC) with the support of the D&D community including the DOE Office of Environmental Management, and with the active collaboration and support of the DOE's Energy Facility Contractors Group (EFCOG). The KM-IT system is a D&D community driven system tailored to serve the technical issues faced by the D&D workforce across the DOE Complex.

The D&D KM-IT is an interactive web-based system operational and available for free access at www.dndkm.org. [02] The D&D KM-IT is currently composed of the following tailored D&D modules: Web Crawler, Hotline, Technology, Document Library (including Hanford's and Savannah River Sites's ALARA Center Reports), Specialist Directory, Lessons Learned, Best Practices, Video/Picture Library, Vendors, Collaboration Tools, Training, and Mobile Systems. The Web Crawler dynamically searches through the D&D KM-IT repository as well as the web and displays search results based on the search criteria. The Hotline allows registered users to post questions/problems related to D&D and to receive solutions from a subject-matter specialist. The Technology module serves as repository of D&D technologies and contains technology/ demonstration fact sheets and vendor information. D&D community members can add Lessons Learned, Best Practices, Documents, and Pictures/Videos to the D&D KM-IT repository, after a formal approval process. The Vendor module provides a directory of commercial vendors who provide D&D related technologies, supplies, and services. D&D KM-IT makes excellent use of the knowledge that exists within the D&D community by allowing D&D project managers around the DOE complex to collaborate by sharing innovative ideas, past experiences, and practices and by maintaining a directory of subject matter specialists. The mobile version of the KM-IT can be accessed from m.dndkm.org [03] and currently has six active modules: Vendor, Technology, Picture/Video Library, Hotline, Lessons Learned and Specialist Directory.

Web analytics is a key tool being implemented by the D&D KM-IT project team in an effort to enhance the system to better meet users' needs. The D&D KM-IT project team incorporates web analytics as part of its operational elements to analyze information and key data points on how the system is being used. Web analytics is the measurement, collection, analysis and reporting of internet data for the purposes of understanding and optimizing web usage. The use of web analytics retains or attracts D&D community members to access and share knowledge through virtual collaboration on the KM-IT platform. D&D KM-IT web analytics measures details on the overall usage of the system without tracking personal information or specific user behavior: how many users visited the application, how many of those users were unique visitors, how visitors come to the system (i.e., by following a link to the system or by using the website URL via

bookmark or directly typing the address), what keywords were used to perform searches with the search engine, how long the average user stayed on a given screen or on the entire system and what links were clicked on. This information is used to identify which areas of the system are more popular than the others and provides information that can be used to streamline the application for a better user experience.

**INTRODUCTION**

Today's enterprise (whether corporate, government, academia, etc.) has come to recognize and value the life experiences acquired by the workforce and the importance of the lessons learned and best practices experience has inspired. This realization is no different for DOE's D&D community. With a highly diversified workforce of federal staffs, private companies, national labs, and universities, DOE EM's D&D workforce has developed an extensive "worker experience-base" over the years, which continues to grow with time and through the ongoing progress of its many projects. This experience represents a valuable and ever growing knowledge resource. However, the community often communicates information across multiple platforms and pathways that are frequently less than "seamlessly compatible." Without a dedicated effort applying the basic principles of knowledge management to collect, retain, and disseminate this knowledge in an organized and structured way, the very real potential exists of losing the collective knowledge of the aging workforce.

D&D KM-IT was built based on the requirements from DOE Headquarters to develop a repository and a dynamic system that makes excellent use of the knowledge that exists within the D&D community by allowing D&D project managers around the DOE complex to share innovative ideas, lessons learned, past experiences, and practices.

D&D KM-IT provides DOE with the ability to define, store, categorize, index and link digital information corresponding to D&D problem areas. The system allows users to search for and subscribe to relevant content and presents the content with sufficient flexibility to render it meaningful and applicable across multiple contexts of use.

Too frequently, people in one part of the D&D community "reinvent the wheel" or fail to solve problems quickly or in an optimum fashion because, while the knowledge they need may exist elsewhere, it is not known or accessible to them. This knowledge management tool helps to enhance collaboration and knowledge sharing while building upon the D&D knowledge base within the EM's D&D community. As the generational cycle of the D&D cleanup progresses into the future, the knowledge pool and its best practices for D&D applications will expand.

The objective of D&D KM-IT is to provide needed information to users when they need it and in an easily used format. The system uses the World Wide Web as the primary source for content in addition to information entered by the subject matter specialists and the broader D&D community.

In this paper, FIU ARC will present the approach to the long term vision of KM-IT to grow and mature into a self-sustaining knowledge repository through the active participation from the D&D community. Web analytics is used to measure, collect and analyze the usage of the system and perform optimization [04] and enhancement based on the web analytics results.

The active application of web analytics, a recognized IT tool, has proven to be very valuable to developers and administrators in helping to identify trends, what-if scenarios (e.g., what is working, what is not) and highlighting indicators where additional attention might be needed. By carefully analyzing this data, decisions can be made as to where resources need to be focused along with where enhancements might need to be explored. It is also important to keep in mind that the value of web-analytics grows with time and understanding. While every effort is made to develop an "objective picture" about the application, it is based on raw data and, therefore, it will contain elements of subjective interpretation. It is with the growing understanding of web data, in the context of web analytics, that a more objective view can be achieved.

**MATERIALS AND METHODS**

There are several different web analytics tools (including Google Analytics, Google Webmaster Tools, Alexa and Bing Webmaster tools as shown in Figure 1) available to knowledge management administrators/custodians or webmasters with each having both common and unique features.

**Google Analytics** [05] is a service offered by Google that generates detailed statistics about website traffic and sources of traffic. It tracks visitors from all referrers like search engines and social media, direct visits and referring sites.

**Google Webmaster Tool** [05] is a web service provided by Google to check indexing status and optimize visibility of the website. It allows web masters to submit and check sitemaps, check and set the crawler rate, list external and internal pages that link to the site, identify broken links and provide statistics about site indexes.

**Alexa** [06] provides commercial web traffic data with the help of toolbar that collects data on browsing behavior and transmits to the Alexa web site where it is stored and analyzed, forming the basis for the company's web traffic reporting.

**Bing Webmaster tool** [07] is a service provided by Bing Search engine which allows webmasters to add their sites to Bing index crawler. It also allows web master to troubleshoot crawling and indexing sites, sitemap creation, submission and ping tools, website statistics, consolidation of content submission and community resources.

Researchers at ARC have analyzed these web analytics tools and selected Google Analytics and Google Webmaster Tools for D&D KM-IT web analytics. These tools capture overall usage information for analysis and optimization. Google Web Analytics provides valuable information and insight into how the application is being used and helps predict the needs and interests of the user base as a whole rather than looking at specific individual behavior. Various parameters used to collect analytical information are page views (total number of web pages viewed), unique page views (user session per page), average time on the page, bounce rate (percentage of single-page visits where a visitor left the website after only viewing the entrance page) and percent exit (exit application from particular page).

**Figure 1. Web analytics tools**

With the information gained from the web analytics, various approaches are being taken to improve the D&D KM-IT system usage, including:

- Perform search engine optimization on the website to increase site traffic
- Supplement original content from other sources
- Get linked and get more backlinks
- Use of social media
- Promote web presence w/ newsletters, updates, direct email
- Collaborate with social media wikis such as Wikipedia and DOE's internal wiki, Powerpedia
- Engage user involvement via user advisory group and feedback loop on website
- Offer original and quality content
- Participate in conferences (e.g., Waste Management Symposium, DD&R, International Conference of Environment and Waste Management)
- Newsletters to registered D&D KM-IT users, subject matter specialists, and published vendors
- Periodical memos from DOE HQ to site managers
- Collaboration with other databases/systems like Decontamination and Decommissioning Science Consortium (DDSC), DOE Office of Scientific and Technical Information (OSTI) and Oak Ridge Associated Universities (ORAU)
- Engage DOE Project Directors and DOE Office of Corporate Information Technology (EM-72)

Visualizing Web Analytics Data

Infographics are used to present the analytical information in an easily-read graphical format. Infographics as defined in *Wikipedia* [08] are information graphics or pictorials, which are graphical or visual representations of information, data or knowledge, intended to present complex information quickly and clearly. They can improve cognition by utilizing graphics to enhance the human visual system's ability to see patterns and trends. The process of creating infographics can be referred to as data visualization, information design, or information

architecture. Some of the quarterly and annual D&D KM-IT Web Analytics data are used for building infographics.

**RESULTS AND DISCUSSION**

D&D KM-IT can be accessed from the web at www.dndkm.org.  The system home page, shown in Figure 2, provides the interface to connect to the various components of D&D KM-IT. The mobile version of D&D KM-IT is shown in Figure 3 is developed using Microsoft [09] platform.
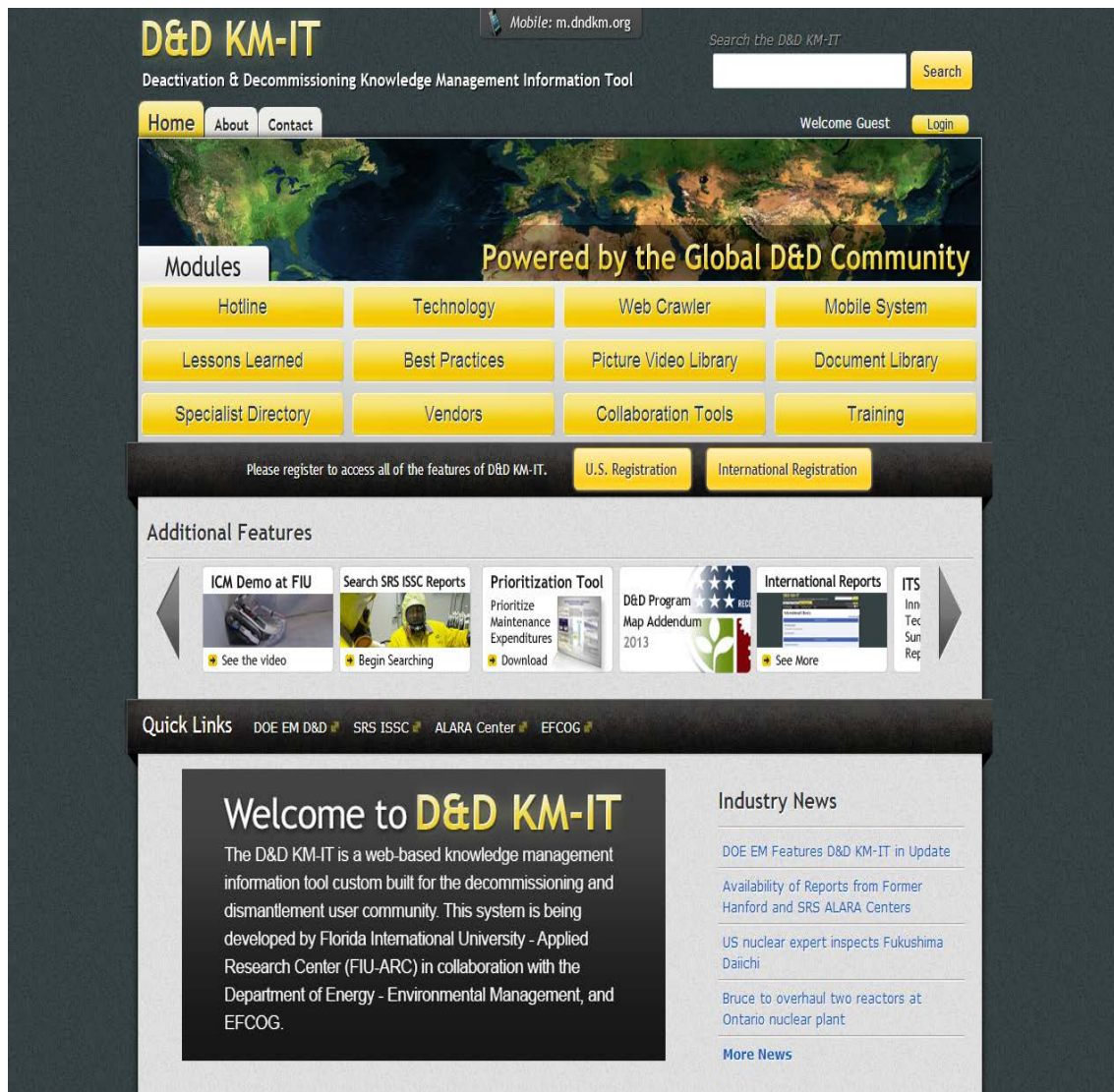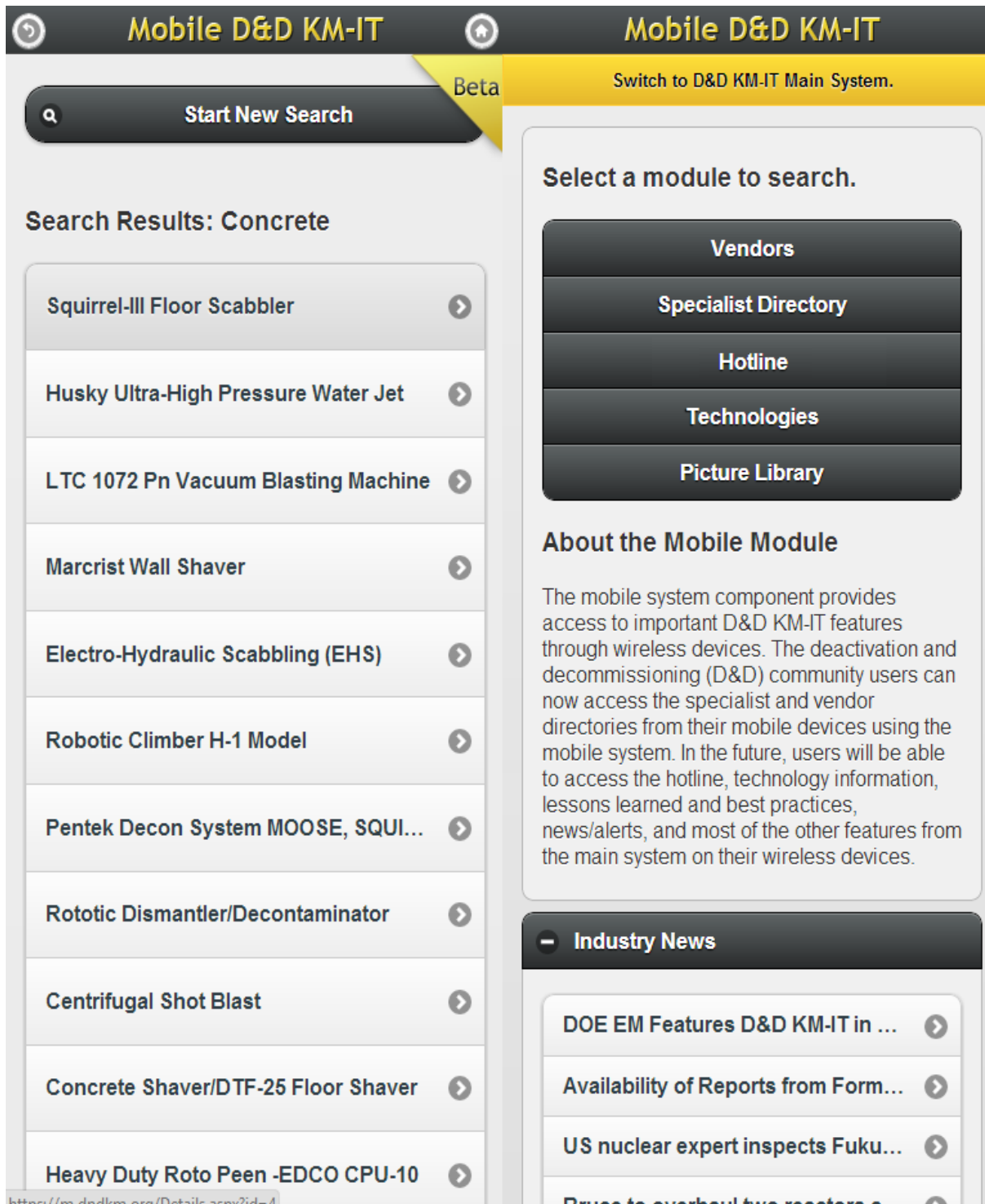


**Fig. 2. D&D KM-IT home page**

**Fig. 3. D&D KM-IT mobile system**

The Figure 4 shows the infographic developed by the D&D KM-IT team during the analysis of web data analytics in the preparation for the web analytical report on the second quarter of 2014 (April to June). It provides a sampling of how infographics can help in the visualization of key website indicators which are extracted from the web analytical reports based on the D&D KM-IT system usage. This sample infographics shows that there are around 11,200 page views and 4,000 visitors. It also shows that 75% of visitors are new compared to 25% of returning visitors. It also shows the average time a user spends on the site and the traffic type – direct traffic, referral and search engine traffic. Search engine traffic is the most popular one. Also, the infographic shows that 65% of the users are from the US followed by the UK, Canada, India and South Korea. Popular keywords section shows the interest of users as they come to the site looking for information linked to these keywords. It is also showing the most popular browser – Internet Explorer for search the content followed by Chrome and Firefox. Module destination shows the most popular module visited by users on KM-IT. Technology (23%) module is most popular followed by Vendor (10.6%) and Hotline (8.4%).
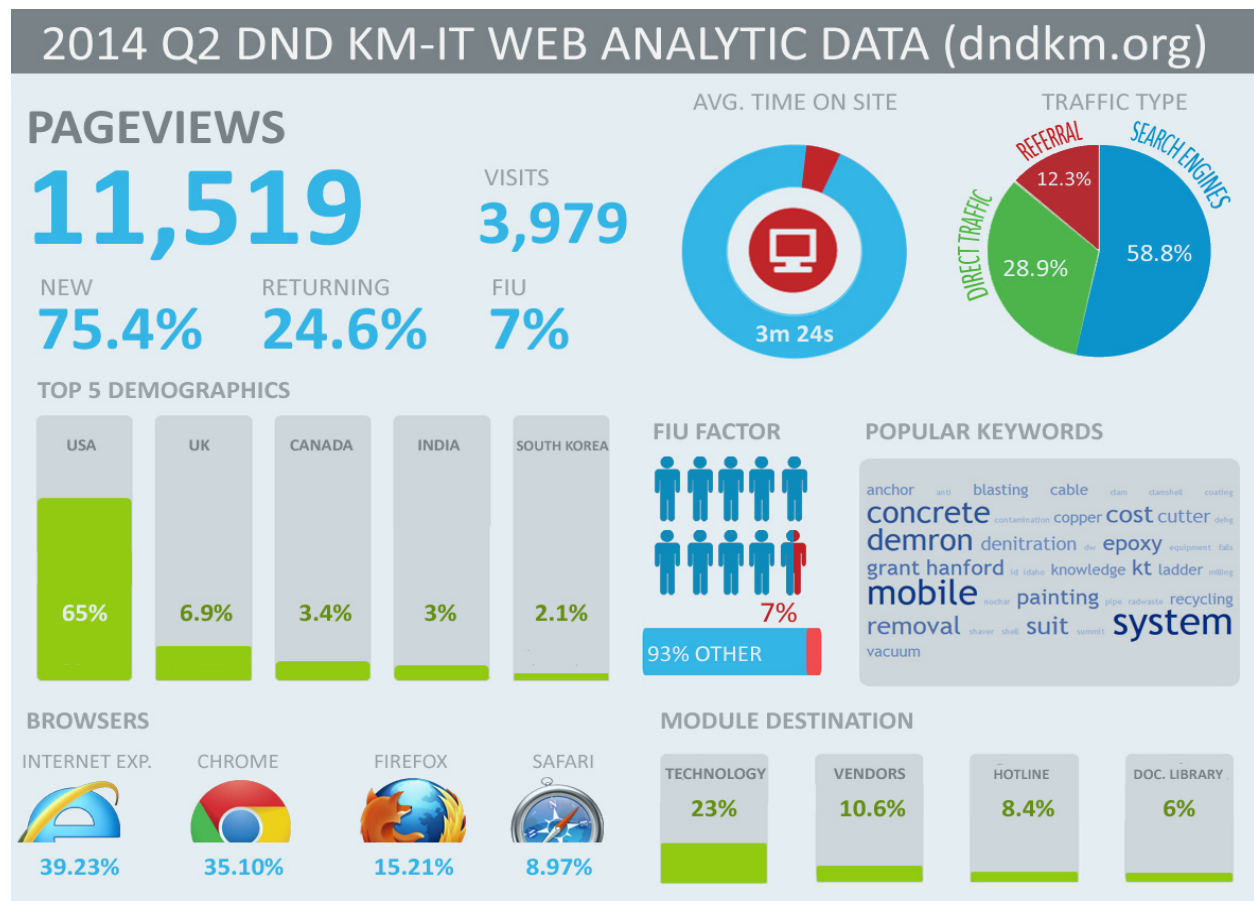


**Figure 4. Web analytical data for D&D KM-IT shown as infographic**

Currently, there are 649 registered users and 68 registered D&D subject matter specialists in the system along with 672 vendors and 710 D&D technologies. D&D KM-IT was officially launched during Waste Management 2012 and, since then, the number of vendors, technologies and users has substantially grown. Figure 5 shows the current statistics and growth since 2012.

Web analytics was used to capture frequently searched keywords, popular technologies, popular problems and solutions in the D&D KM-IT system. This information was used to develop corresponding modules to capture these events and displayed on the home page.
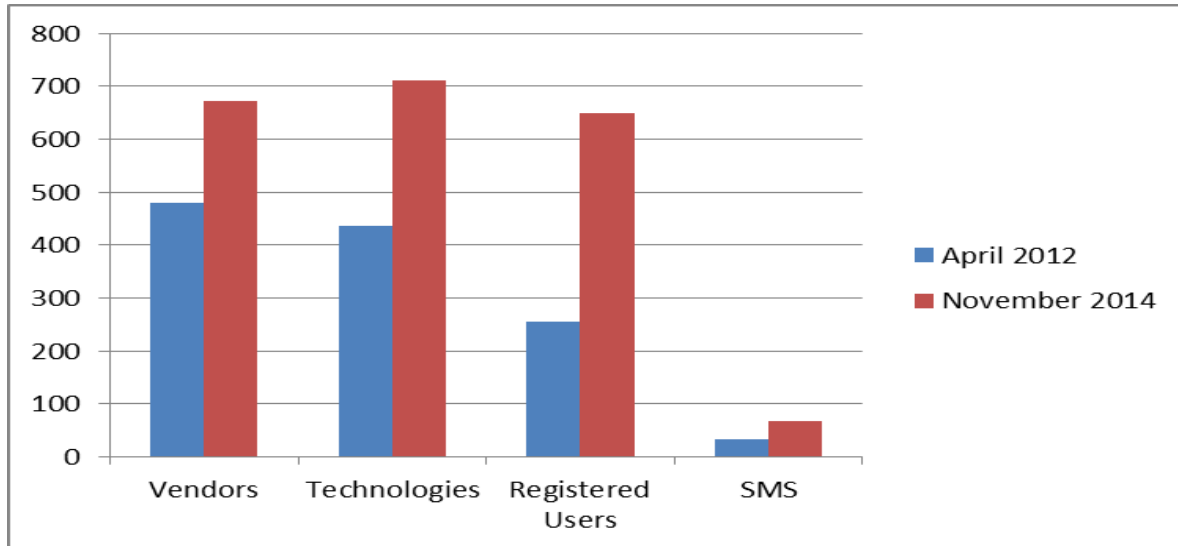


**Figure 5. Growth of D&D KM-IT from April 2012 to November 2014**

**CONCLUSION**

D&D KM-IT web analytics is an ongoing effort. It will continue to evolve over time due to a myriad of factors such as changing user-trends, changing search engine policies, protocols, algorithms, etc. to name just a very few. Each "slice of web data" that is taken for analysis needs to be done in the context of being time-based. For unless a major element or event can be attributed to large usage swings, all comparisons need to be framed not only period-to-period but also across the span of many time periods.

Web analytics are important tools to manage and evolve the D&D KM-IT to optimize its use by the D&D community. D&D KM-IT provides a single point of access to all D&D related activities through its knowledge base. It is a community driven system. D&D KM-IT makes D&D knowledge available to the people who need it at the time they need it and in a readily usable format. It uses the World Wide Web as the primary source for content in addition to information collected from subject matter specialists and the D&D community. It brings information in real time through web based custom search processes and its dynamic knowledge repository.

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