

Online Solutions: Looking to the Future of KnowledgeBase Management

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ABSTRACT

The Princeton University Help Desk KnowledgeBase (KB) is a searchable online information system that publishes Princeton-specific computer solutions to better serve the University community. Heavily used internally by all Office of Information Technology (OIT) support staff, the KB is also marketed and publicized to the entire University community to promote online self-help.

Over the past six years the KnowledgeBase has been molded to consolidate and streamline the documentation provided by OIT, gaining recognition and respect for its usefulness. The Help Desk has been able to increase productivity and its success rate of solving customer problems, with quantifiable results in the numbers of users serviced via the Help Desk web site. This presentation will provide a current look at the Help Desk KnowledgeBase, how it is used, and the plans for future development.

Categories and Subject Descriptors

H.3.5 [Online Information Services]: Web-based services

General Terms

Management, Documentation, Design, Human Factors, Standardization.

Keywords

Knowledgebase, On-line documentation, information, retrieval.

1. INTRODUCTION

One of the rudimentary troubles with the World Wide Web is the glut of information that proliferates, yet then lies fallow as no one updates, maintains or culls the material content. Documentation specialists and information managers constantly battle with issues that arise as operating systems evolve, online services grow and die and the escalation of technology barrels along at warp speed. It is oft repeated and acknowledged that no one knows everything about everything, as perhaps they used to in the past.

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Even the young mavericks in today's tech fields acknowledge that while exhaustive application documentation may be extraneous in this age of "computers should be as easy to use as toasters," there will always be an urgent need to provide answers to the inherent problems in an application or service. Bugs, caveats, and "gotchas" are so prevalent in our computing environment that the average user doesn't even question the poor manufacturing standard set in the software industry today.

Hence the burgeoning need for Help Desk service centers and the resource tools necessary to support the question and answer behavior model. Customer support, in the form of a Help Desk or Information Center, is now a recognized necessity and rapidly growing arm of any academic or business organization. Since the Help Desk is often a setting of rapid turnover, employers must battle with how to empower their Help Desk employees with knowledge quickly and effectively. In an academic Help Desk, students are often the mainstays of the organization, and due to their relatively short tenure, constant education and ongoing training are required.

Thus a system that can simultaneously fill the roles of a training tool, an information resource, and a self-help mechanism is required to empower IT staff and customers alike with answers. At Princeton, the online KnowledgeBase has been designed and maintained to fill these crucial needs concurrently. When a customer calls the Help Desk with a question, the answer they receive from the staff member over the phone is the same answer they could have found online themselves. It is also the same answer that has been provided in a training session to that same staff member, and the same answer provided to OIT departmental support staff when questions are raised. The content is also formatted into printable brochures and flyers for marketing purposes. As the single source of data regarding policy, procedure, and computing practices at Princeton, the KnowledgeBase solutions can be "wrapped" in any package and delivered to different audiences having already been edited, proofed, and approved. This paper will discuss the current design, status and usage of the KB, as well as the future goals of its designers.

2. USAGE

The Office of Information Technology (OIT) at Princeton University has always leaned heavily on the services of a stalwart and skillful Help Desk as the single point of contact for any computing problem. Faculty, staff and students alike learn to dial 8-HELP as soon as they set foot on campus, and often months prior to their arrival. Estimated at approximately 15,000 customers, the demographics of the Help Desk customer base also include alumni of the University, parents of current students, as well as prospective students and their parents.

The KnowledgeBase is an online information system that publishes solutions in order to serve this community more effectively. For the past six years, the KB has been molded and crafted to streamline and consolidate the information provided. As an IT unit, OIT has actively and aggressively marketed the Help Desk as the single point of contact for customers with computing problems, and since the inception of the Web the Help Desk has focused on this medium as the primary communication tool with customers. This has permeated all OIT publications and web sites, with the standard "Contact the Help Desk for any questions" directive at the bottom of the page. Web administrators are encouraged to link to the Help Desk web site rather than merely create a "mailto:" link in order to promote the Help Desk web page as a central location for future and emergency outage information as well relevant headlines. Pointing to a web site encourages users to help themselves to possible solutions before contacting the Help Desk.

Customers can contact the Help Desk via telephone, e-mail, or through a walk-in clinic. Each customer contact generates the creation of a trouble ticket. Customer e-mail messages have always required focused and detail-oriented staff members, and the ease and rapid response mechanism of the Help Desk to these e-mail questions has long been an area of required improvements. It has always been acknowledged that the ability to e-mail a response including formatted "boilerplate" would alleviate having to type the same response over and over again. This primary need to respond quickly and effectively to e-mail has been crucial to the Help Desk, and has necessitated that the KnowledgeBase be an integral component of the ticket tracking system and that the two be married in their design.

Concurrently, the Help Desk requires a tool to provide telephone consultants with scripted answers to commonly asked questions by customers over the phone. Design groundwork began in 1997 to change the format and arrangement of existing documentation to user-friendly solutions which are organized in a question and answer layout. A warm and fuzzy handholding approach became the goal as opposed to a technical dialogue approach. Having a single source of data that is heavily relied upon has proven to be very effective in empowering support staff. Telephone consultants are heavily trained to search for answers to customer questions in this repository of information. They benefit from the second person grammar structure, as they are able to literally read (with a little acting skill) solutions over the phone. Empowering the Help Desk consultant with the information they need quickly is a substantial win.

3. DESIGN

Design of the OIT KnowledgeBase has stemmed from Help Desk needs and usage requirements. Traditionally the software in use by the standard Help Desk is a customer contact ticket tracking system with an integrated KnowledgeBase, and Princeton is no exception to this model. The KB is designed to be a hub, or central source of data, so that OIT computing and technology policy, procedure, and practice can always be found. Content is highly Princeton specific. Information found in vendor online databases is not replicated nor "cut and pasted" as that information may change; instead pointers to external sources are used. The KnowledgeBase does not copy, paste, or replicate information already provided on the Princeton web, but instead points to other online databases or web sites that are actively updated and maintained. The constant upkeep and scanning of solutions for current, correct, and relevant information

is the secret of its success. Any conflicting information is removed or resolved, and any extraneous solutions are removed to reduce the "noise" of redundancy. This propagates the fundamental design concept of single source of data.

Another prevailing design concept is that the information must be concise - for every customer query, the recall versus relevancy quotient must be high. It is considered a successful search when a user types in two to three keywords and garners hits of approximately 5 to 10 solutions. The belief is that a short list of 5 to 10 solutions is much more effective than 50 to 100, which appear in a long list that confuses the customer. Out of the short list, one of those solutions will answer the searcher's question or at least point them in the right direction. Solution keywords are actively adjusted to ensure that when an online query is asked of the KB, frustration with information glut and long lists of links do not ensue. When the fisherman throws his net into the sea, he retrieves as much fish as he can realistically eat and carry back to his village; not a payload that he is unable to digest and share with others.

Another fundamental design concept integrated into the online KnowledgeBase is the belief that the end user should be directed and taught to find answers in a self-help fashion. This concept has led to the creation of numerous access methods to the KB that are itemized and discussed in the next section.

3.1 KnowledgeBase Access Methods

Without contextually relevant web links, a targeted audience will not find online information and content. Web sites that rely exclusively on their unique presence and unique web address will inherently fail as users will not know the information is there. Through the design of threaded and complimentary access methods to the KB solutions, the Help Desk has strengthened its presence and authority online. Using web portals from the OIT main web site and an inherent hierarchical design to its structure, the KB further propagates its role as the single source of OIT information online. Additionally, librarianship concepts of subject classification schemas and alpha-index methodologies are employed to further aid users in navigating the database.

3.1.1 Key Word Search Method

This is the most common method of accessing solutions. A single search field is provided for customers to type their questions. Most type two to three words which is the norm and behavior that proves to provide satisfactory results across most web search engines. The HTML code that renders the KB search field can be supplied on any web page that is used to provide customer access to the solutions. A Key Word Search returns solutions that match attached thesaurus concepts only. This ensures high relevancy to queries.

3.1.2 Full Text Search Method

If the Key Word Search is unsuccessful, customers may select to search the full content of the KB solutions, titles and summary fields. This often returns a larger number of solutions that have lower relevancy to the subject matter contained in the query.

3.1.3 Browse through Subject Catalog Method

Just as in a library, customers are not sure of the true nature of their question. They may use the wrong terminology for their searches, or they may want an overview of information first. Drilling down through a "Tree of Knowledge" that categorizes and organizes

information by subject (imagine the Dewey Decimal System) provides users with the ability to serendipitously find related information that they might not have known they required prior to scanning “like” solutions. Browsing a subject catalog affords advanced users the ability to see all solutions classified within a subject heading. This type of search can be found on the Yahoo search engine home page, but cannot be found on the Google home page, which solely provides a search field.

3.1.4 A to Z Services Index Method

Provided by the Web administrator of the central OIT site, the A to Z index provides users with the ability to browse through an alphabetical listing of OIT services. Different from a Key Word search or subject classification catalog, the alphabetical listing of OIT services affords customers the ability to quickly click down to pertinent information. Imagine this search method as equal to the way you would have used an alphabetized library card catalog of yesteryear. The A-Z Index points to KnowledgeBase solutions, which fortifies and strengthens the KB as the single source of data on the OIT web. The OIT webmaster provides invaluable input into the validity and conciseness of the solutions, and offers a second set of editorial eyes.

3.1.5 Frequently Asked Questions (FAQ) Method

To strengthen and support the tiered hierarchical structure of the KB, a link from the Help Desk home page points to solutions designated as FAQs, which provide links to commonly asked questions on a particular subject. The FAQ solutions provide a top tier overview of services that may have their own documentation on another web site, to which the KB then points. The goal is to provide brief summaries and links to all services and documentation offered by OIT from within the KB, without replicating the content. This enhances the design concept that the KB can be used as the single search tool that acts as an information hub. FAQs are familiar to end users, and the FAQ search is the most heavily used access method after key word and full text searching.

3.1.6 Princeton Google Search Access Method

The unique University search engine provided by Google, when implemented at Princeton, was a very big win for the Help Desk KnowledgeBase. Most web visits to Princeton begin with the Search link on the University home page. As the Google indexing mechanism spiders through the Help Desk web site indexing all the KB solutions, a Princeton home page search for computing terms returns KB solutions titled “*From the Help Desk Knowledgebase.*” This text string informs the user and simultaneously markets and publicizes the KnowledgeBase in a substantial way.

4. MAINTENANCE

Since going online with an integrated ticket tracking and KnowledgeBase system in the '90's, the Help Desk has migrated and evolved through two off-the-shelf software solutions, and now utilizes a homegrown Perl-based open source solution called OPM. The online tool contains a highly sophisticated ticket escalation system with customizable notification methods for ticket transfers. The organizational business rules and policies of OIT evolved as the system grew, providing de facto service level agreements between departments where none existed previously.

Currently, there are approximately 1300 active solutions in the KnowledgeBase. Contained within the Help Desk ticket tracking

system called OPM, the system runs on a Dell PowerEdge Windows 2000 quad processor computer with 4 gigs of RAM running IIS version 5. The KB search engine is written in Perl 5 making calls into a Microsoft SQL database running on the same server. The data is dumped every 2 minutes to a local copy and everything is backed up nightly. The KnowledgeBase is online 24 hours, 7 days a week, and 365 days a year.

As the KnowledgeBase has developed and matured, the Help Desk actively sought more services to document and support. As buy-in from departments, both external and internal to OIT, saw the benefits of a centralized database, continuous input from many sources began to occur naturally. Important relationships between the Help Desk and the service providers developed as communication improved.

The OIT KnowledgeBase Administrator has been the single full time employee dedicated to the KB since its formal inception in 1997. Primarily this means maintaining the solutions within the KnowledgeBase based upon the input of many who edit, proofread, and desire the content to be correct. IT staff keep the content up-to-date by providing information through the ticket tracking system as well as sending information to solution@princeton.edu. Solutions are updated daily. Telephone consultants shout out imperfections and edits are made on the spot. Although one person actively touches the KB on a daily basis, all of OIT has contributed to make it the single source of data it is today.

The success of the KnowledgeBase is often attributed to the built-in thesaurus, which tabulates like words and concepts in order to funnel customer queries to the solutions desired. The use of the thesaurus enables the customer to enter words in what appears to be a natural language query, but actually uses a database table to create relationships between words.

Every night a report is generated by the system, which shows what words are typed into the KB search field and the number of hits that are generated from solutions. If “0” hits are reported, the administrator is able to alter the thesaurus to ensure that future entries of these words or others like them generate relevant solution hits. This thesaurus and its maintenance is labor intensive and requires constant tweaking in order to work properly. It is this interactive style of feedback and adjustment of the solutions that enables the KB to grow and flourish.

5. ACHIEVEMENTS

The KB has become recognized within OIT for its usefulness. Many realize that providing edited and dynamic answers administered centrally, reduces their own effort and has substantial gains for all.

The Help Desk has achieved qualifiable and quantifiable success through the use of an online repository of information that consolidates answers into a database that is searchable not only by Help Desk staff, but by the academic community at large. Achievements include the following:

- Evolved a mechanism for customers to quickly solve computer problems on their own - eliminating the frustration of having to ask for help.
- Taught the customer that using the Help Desk web site can provide the same answer that a Help Desk staff member can provide via a telephone or e-mail response.

- Overcame the hurdle of including images in KB solutions.
 - Overcame the hurdle of e-mailing solutions and including the rendered hypertext and images to customers.
 - Provided Princeton-specific questions and answers, rather than complicated, difficult to understand documentation.
 - Created a web site that has marketability and a catch phrase.
 - Standardized the formatting of the documentation into a recognizable entity and created a method of document creation that is simple to use.
 - Eliminated the scatter of html documents.
 - Changed solutions to provide specific answers geared to answer a specific question, rather than give an overview of a topic. This enables the rapid answer to the specific question.
 - Re-designed and eliminated frames, allowing for book-marking of solutions.
 - Increased productivity and the success rate of solving customer problems. Goals set forth while building the Help Desk web site have been met, with significant results.
 - Evolved into policy authority for centralized and decentralized computer support representatives throughout the University.
4. Enable a list of retrieved solutions to show more columns including the results of the aforementioned Solved Count in Item 3.
 5. Enable the ability to sort solutions by Category, Subject, Solved Count, and any Default Sort defined by administrators.
 6. Enable the dynamic creation of “Related Solutions” based upon the solution being viewed.
 7. Enable the dynamic creation of a list of Frequently Asked Questions based upon customer searches (useful documents in the last 10 days) as the academic calendar turns.
 8. Implement a “Print this KB solution” mechanism that eliminates extraneous design elements.
 9. Implement an “E-mail this KB solution” mechanism that eliminates extraneous design elements yet sends enclosed images.
 10. Provide a “Back to Search Results” link at the bottom of each solution.
 11. Eliminate the Browser Back button from all forward and backward navigation within the KB.
 12. Reduce the number of clicks involved in navigating the KB by providing side by side renderings of classification categories and the solutions contained within that category.
 13. Enable an option at the bottom of the solutions that will notify the customer if the content changes – “Contact me if this solution has been updated.”
 14. Enable a “Contact the Help Desk” button at the bottom of each solution, so that users can quickly proceed to getting direct help from an available consultant.

6. THE FUTURE

To truly take the KnowledgeBase to its next level, the interface must be redesigned, with extensive thought given to interactivity and communication feedback methods. Providing the ability to search for answers, as well as providing the opportunity to give feedback, is what makes a site successful.

True gains can only be made if a site is interactive in the sense that communication happens along two paths; in and out. With customer feedback, information can be patterned and shaped to forecast customer’s queries.

Recently, the KnowledgeBase has found a new home with a newly created group called OIT Communication Services. Still within the Support Services department, the KB will now have the united efforts of a Senior Editor as well as a Technical Editor to improve the service and take it to the next level. The KnowledgeBase will spend the next year in evaluation and design assessment and a Project Plan will be written to determine how to proceed with the following goals:

1. Enable the ability to save frequently accessed solutions in a “My Account” styled environment with log in capabilities. Customers should be able to store solutions in a personalized area that would enable the grouping of a subset of solutions based upon their own preferences.
2. Show the category of each solution with the retrieval list and make this “hot” so that categories can be browsed easily.
3. Enable customer feedback regarding solution usefulness to their queries, in the form of a “Did this solve your computing problem?” (Currently if a solution is not useful, the only recourse is for the customer to e-mail or call and ask a question in order to comment on KB content.)

7. CONCLUSION

While the web has increasingly become a heavily used tool in our academic environment and the community has become skilled in looking to the web for information, the Help Desk has been able to increase productivity and the success rate of solving customer problems. Goals set forth while building the Help Desk web site have been met, with significant results. The primary desire of the OIT Help Desk is to empower users to help themselves. With empowerment comes increased productivity and less dependency on others to solve computing problems. An empowered computer user is a happy computer user.

Statistical analysis of incidents solved, web site visits, and polling techniques that ask customers questions regarding their use of Help Desk services show marked increase each month in the number of customers served. Marketing and publicity of the Help Desk web site have also raised awareness of the tool, further expanding the successful problem solving capabilities of the customer.

For the KB to reach the next technical level required to sustain its growth, customer interactivity and ease of use will need to be addressed and implemented.