The Insider's Guide to Self-Service Knowledge Retrieval Technology

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Introduction

Effective self-service is a cornerstone of most customer service operations today. Companies are driven to deliver self-service for a number of reasons: the first is that effective online self-service offers a proven, strong ROI primarily by deflecting live service calls. Companies are increasingly squeezed to do more with less – fewer human resources, shrinking budgets. The more customers can help themselves in finding answers to their questions, the lower the burden on the contact center. A second driver compelling companies to implement self-service is that it has become an expectation of their increasingly web-savvy customer base. Customers demand 24x7 effective self-service. Competitive pressure and differentiation is yet another reason.

The benefits of effective self-service are well known: cost savings, higher service levels, happier customers. But the ramifications of poor self-service can be significant. Failure or difficulty in finding information can result in increased user frustration and ultimately attrition. Someone who doesn't find quality online self-service with one company will likely look elsewhere and an existing or potential customer will be lost.

Poor self-service can and does take many forms including: hard-to-use, non-intuitive interfaces; search engines that return reams of irrelevant information or nothing at all; outdated knowledgebase content; lack of escalation to assisted support.

This paper discusses various technologies available today for the retrieval and presentation of online information for the purpose of self-service, and highlights RightNow's unique and award-winning approach. Specifically, the paper delves into RightNow's various innovative Artificial Intelligence (AI) technologies that are the basis of this information quest, the implications for AI in this area, and how we expect to expand this approach into additional areas.

What's Out There Today

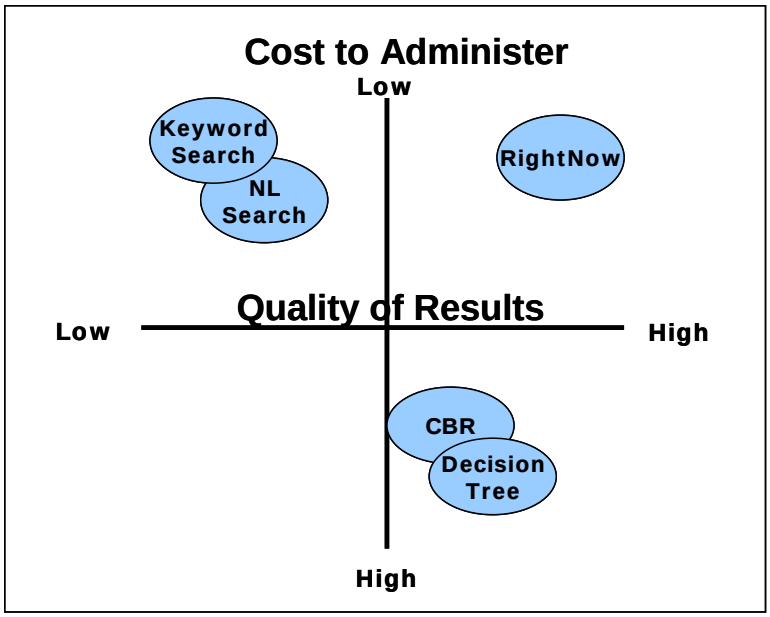
Numerous technologies exist for the "self-service" retrieval and presentation of information on the web. Most solutions are based on search engine technology. While fairly effective for perusing general information on the Internet, search engine-based technologies are ineffective for customer self-service (eService) applications, primarily because they lack accuracy and relevance. In recent years, more sophisticated technologies have attempted to improve upon standard keyword search by replacing the arcane Boolean terms with a natural language input mechanism. However, these improvements have primarily focused on making the input or question formation more intuitive, but have not changed the nature of the search output – a "Hail Mary" list of possible answers with no assured precision of finding the right one.

Other solutions are based on more structured knowledge, commonly known as case-based reasoning (CBR) and decision-tree technologies. While they allow for better replication of the "symptom/cause/diagnosis/remedy" process, this only accounts for a very small percentage of support issues. Moreover, the Achilles Heel of these solutions has been their complexity to use and onerous cost to administer and maintain.

RightNow's Approach

RightNow Technologies has developed an innovative service solution that provides the highest quality results while simultaneously providing a simple to use and inexpensive to administer

interface. Part of RightNow's approach is to predict the correct information needs before the user does anything, and consider searching only as a fall-back option, instead of as a primary tool. Usage statistics bear out the approach: 80% of users choose non-searching options[1]. RightNow's unique solution to the information quest problem has placed us as the best eService market product for two consecutive years by Gartner Research[2]. In addition, the minimal administrative overhead required for this industry-leading functionality has resulted in RightNow Technologies winning the Nucleus Research, Inc ROI award for CRM for an unprecedented three consecutive years.



RightNow Differentiators

RightNow is able to succeed with its technology because AI algorithms are not treated as hammers in search of a nail. That is, RightNow doesn't favor a particular approach because it will be universally applicable. Rather, RightNow evaluates particular problems from a high level and evaluates the best approaches to a solution. The problem definition usually dictates a small suite of appropriate techniques. Others working in this area limit themselves to a particular approach, even when it is not the best one for the task. This focus often limits the quality of their solution.

The primary problem to solve in a service environment is how to direct the simple and repetitive questions to a self-service channel, while routing the difficult or unusual inquiries to well-trained staff members. This appropriate routing requires that the system be structured in such a way that the people seeking a simple solution are able to find that solution faster than if they were to pick up the phone and call their support center. Thus, the immediate usefulness of the self-service channel is of paramount importance if it is to be adopted. However, immediate usefulness is more far-reaching than most people consider.

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[1] Internal research

[2] Esteban Kolsky, Gartner, MarketScope for Web Self-Service, 2H04; MarketScope: E-Service Suites, 1H04; E-Service Suite 1H03 Magic Quadrant

Several key pieces combine into a measure of immediate usefulness:
1. Information availability—does the information exist in the system?
2. Retrieval process—how many actions are required to access the information?
3. Cognitive load—how much does the user need to know before they can find what they seek?

1. The first measure of usefulness is whether information is available for access. This measure is usually all that most systems consider. With traditional customer service knowledge retrieval technologies, content experts are recruited to make a guess at both the desired content and the particular focus. Once the expert has produced all the content they feel is needed, the knowledge base is considered complete. From this point of view, if the system has a simple method for publishing answers to questions (whether those answers are static documents or dynamic solutions) this goal is met. Unfortunately, the more dynamic the content, the higher the level of effort to create and maintain it. Customer service content is dynamic by nature. Companies are often unable or unwilling to apply the heavy human resource burden for this knowledge maintenance, resulting in out-of-date and inaccurate content. This leads to customer frustration and increased support costs as customers return to costly phone support.

Rather than relying on pre-publishing all the possible content, RightNow takes a more organic approach. In following an organic framework, the system encourages the transfer of tacit knowledge into explicit knowledge that is available for subsequent inquiries. For example, if the user can't find a knowledge item, a quick and simple route is provided to directly ask support personnel his question. The support personnel can then easily add this question and the answer to the published information. The RightNow approach eliminates the need to sequester your content experts, which saves money and expedites the timeframe to bring the self-service knowledge base online.

The RightNow system also organically grows and learns with each user interaction—information relationships are automatically collected when users view content in the same session. When subsequent users visit existing content, these organically grown relationships are then offered under the premise that, "people like you have found this other information interesting, as well." This "self-learning" approach is one of RightNow's patented areas of expertise. It is also a key contributor to the technology's minimal administrative overhead that has helped garner RightNow its ROI leadership accolades.

Finally, a system health report is available to identify when there are end-user questions that have no match in the information repository. This report suggests where to focus when creating new content for end-user consumption. These are commonly referred to as "content holes", and their identification is a key to the ongoing accuracy and effectiveness of a self-service solution.

2. The process for accessing knowledge items is as important as the availability of that information. Important points to consider are: (A) How many actions does the user have to perform to find the information they seek? (B) Do they need to review several documents with ambiguous titles? (C) Do they need to drill through several pages into lists of search results? (D) Do they need to use a variety of search terms or advanced search functions? The basic analysis comes down to the more keystrokes and mouse-clicks a user has to

perform, on average, the less useful is the self-service site. And if the self-service site is not useful, the user will resort to more expensive live-assist channels.

The analysis of standard Internet search engine logs indicate that the majority of users look at only the first page of results (54%), that they only enter one query (53%), and then only look at two or fewer documents (43%)[3]. These numbers tell us that either Internet search engines are incredibly accurate, or searchers are often leaving unsatisfied. In the Internet search case it is likely the latter—only 52%[4] of the results actually viewed were considered relevant upon deeper examination by the study authors. Thus, RightNow learns that additional actions, such as browsing deeper into a result list, or entering a subsequent query, are so onerous to users that they are more willing to accept poor results than try harder to find their answer.

What RightNow has learned from these user preferences is to focus on minimizing user effort. RightNow knows that most users also only view the first page of results, look at two or fewer documents, and, when they opt to search, they enter about two search queries. This is why RightNow's primary approach of predicting user needs without the need to search is so effective. It is important to note, however, that when searching is required, the RightNow system is designed to provide better, more accurate search results to search queries than full Internet search engines. RightNow's algorithmic approach is tuned to focus on smaller document repositories of hundreds to tens-of-thousands instead of the trillions available on the Internet. These fine-tuned searching processes allow for a more vague language usage and allow 'close' results if exact results are not available.

Various measures of success indicate that even if users can't find their information, they are easily able to escalate their question to a human, and hence, still perceive their interaction as positive[5]. Thus, when provided with a standard search interface, whether on the Internet or within the RightNow product, user behavior remains consistent. In addition, any information retrieval system needs to have a variety of methods for keeping users interested by either immediately providing the correct answer or alternatively providing an easy route to escalation, since users are unlikely to put forth substantial effort toward searching.

3. Finally, and most importantly for a customer service application, the cognitive load for the user must be considered. Cognitive load refers to the users' level of knowledge of the system and abstract knowledge of the domain necessary to successfully interact with the system—the higher the difference between the users' ability and the system expectations, the higher the cognitive load. Evaluations of cognitive load must take into consideration end-users who don't have specialized knowledge of the vocabulary necessary to produce accurate search queries. In fact, the elimination of searching whenever possible decreases cognitive load, as the act of searching requires one know how to search. RightNow believes that high cognitive load is one reason users choose to only enter one or two queries—if you can only think of one way to phrase your question, you are at a loss if that query does not provide the hoped-for documents. This failure of traditional search translates to failure of the self-service channel, resulting in unsatisfied customers, attrition, and increased workload on your support representatives due to higher call volumes.

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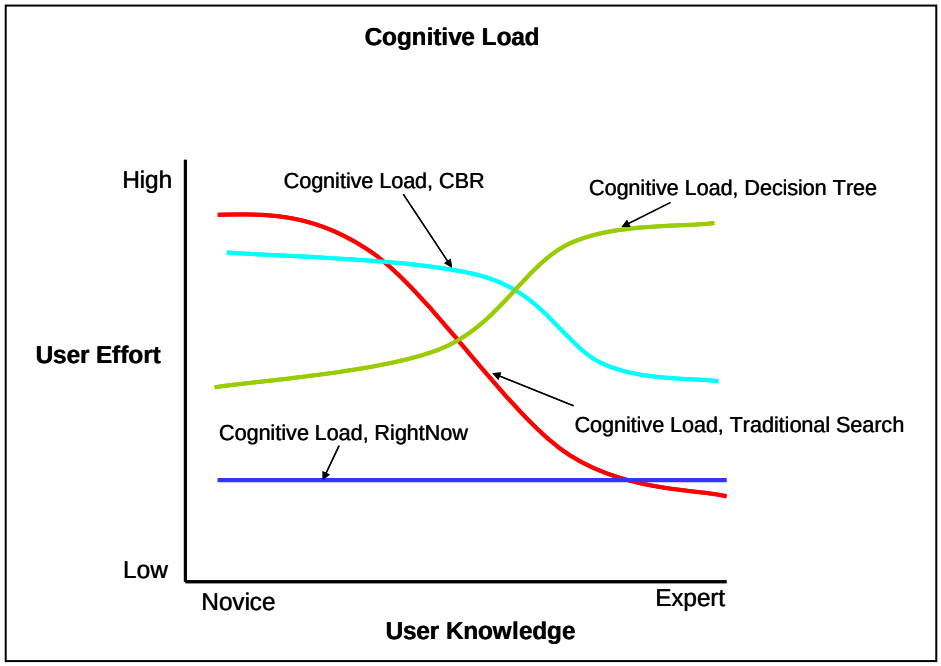
[3] Bernard J. Jensen and Amanda Spink, Analysis of Web Documents Retrieved and Viewed, International Conference on Internet Computing, 2003

[4] ibid.

[5] Doug Warner, et. al. Mining user session data to facilitate user interaction with a customer service knowledge base in RightNow Web, ACM Knowledge Discovery and Data Mining Conference, 2001

Cognitive load is even higher for more structured knowledge base tools such as traditional case-based and decision-tree technologies. These systems require the user to have specific knowledge of the content domain. For this reason, while tools like CBR can be useful to technical support personnel, they are completely ineffective as a customer self-service solution. Furthermore, decision tree technologies diminish in their usefulness (increase in cognitive load) as user expertise increases because they force all users, regardless of expertise, down a rigid path, whereas expert users prefer to leverage shortcuts.

RightNow provides an innovative interface that reduces cognitive load. Unlike traditional search approaches that fail to enable novice users, RightNow developed a patented[6] approach to predict the most likely information sought by any user, regardless of experience. The approach relies on targeted analysis of each user interaction to identify, based on each user's activity, when individuals have similar information interests. This prediction of the user's needs (before a user even initiates a search query) is so successful that 80% of users choose not to search!



Again, when presented with a standard search interface and an initial list of predictions, an average of 80% of users choose exclusively from the list of predictions and never enter a search term. These users have no need to use a search engine since their desired results are immediately available without one. They don't waste time considering and typing multiple queries since the answer is right before their eyes. In addition, if they view an answer that is not exactly what they were looking for, the organically grown answer relationships[7] provide a quick link to what other similar users have found helpful. In other words, the cognitive load is least when you simply need to select from a list of available suggestions as soon as you enter the site.

[6] U.S. Patents 6,434,550, 6,665,655
[7] U.S. Patent 6,842,748

RightNow's claim of 80% of users successfully interacting without searching comes from a wide range of site sizes. Below is a table summarizing user interactions, considering only those users who viewed a document, showing more than 700,000 user interactions from six different sites using the RightNow service product at the end of 2004. This selection of sites saw a 600 fold difference in usage in that time period, yet the smallest and largest sites each had only about 22% of users entering a search term. On average across all sites, only 21.67% of users ever entered a search term. 22% of users entering search terms means 78% of users did not enter search terms. Imagine a system where you get your information directly and immediately without the effort of searching for what you want. That system is the RightNow Technologies Service product.

	USER SESSIONS	SESSIONS WITH SEARCHES	SESSIONS WITHOUT SEARCHES
Site 1	623	21.98%	**78.02%**
Site 2	1873	13.70%	**86.30%**
Site 3	6596	22.52%	**77.48%**
Site 4	118570	32.65%	**67.35%**
Site 5	223453	15.34%	**84.66%**
Site 6	353464	22.01%	**77.99%**
Total	704579	21.67%	**78.33%**

RightNow's research suggests that a full-functioning search engine, while useful, should not be the primary focus of a support application; search engines are secondary to providing useful information. Their primary use is for simplifying access to the obscure information most sought by the advanced users of a product. To put it another way, products that require or focus on the search engine for customer self-service are obsolete. Because RightNow's products have shown that a significant proportion of users prefer to avoid searching, if possible, RightNow developed a means to interact with users in a way that is most rewarding for them. Result: higher levels of self-service adoption, higher customer satisfaction, and lower costs through call avoidance.

RightNow Methods for Finding Information

RightNow offers no less than five significant paths to users seeking web-based information. Most significant is RightNow's patented[8] approach for predicting user questions and delivering answers. RightNow also offers an alternate, patent pending, browse interface which automatically organizes content into conceptually related groups. By organizing data in this way, end-users can browse easily through relevant content. RightNow provides the full-featured search engine that is tuned for corporate customer service environments. We provide intelligent decision-tree functionality that leverages patented AI technology to quickly guide users to answers. And, if users are still unable to find the information they want, as a "last-ditch" effort prior to escalation RightNow provides sophisticated algorithms for automatically suggesting other content that may solve the user's problem.

While not the emphasis of this paper, RightNow also offers a unique voice self-service path to information retrieval. RightNow's patented solution[9] enables users to seek and find the same information via speech prompts as they do via the web.

[8] U.S. Patents 6,434,550, 6,665,655, 6,842,748
[9] U.S. Patent 6,850,949

Answer Prediction

Where RightNow truly excels is with its ability to predict a user's needs as soon as the user accesses the site. This multi-patented[10] approach leverages each interaction with each customer to further refine its understanding of your domain. As mentioned earlier, 80% of users prefer to use the predicted answers instead of trying to search. These answer predictions arise from the system automatically adapting to end-user actions by re-ranking an initial list of answers by usefulness as well as providing relationships between individual answers when the users are observed using the answers in the same session.

This approach adapts to long-term user interests, and is powerful enough to recognize seasonal trends. Plus, since every customer interaction is treated as a learning opportunity, explicit user actions are not required (such as the ubiquitous, 'Did this answer your question?' button) to keep the system automatically performing at a high level. Finally, these answer predictions are both global and local. That is, each user sees a list of potentially useful documents as soon as they enter, and they also see a list of recommendations specific to a document they are viewing in detail.

Browse

RightNow also offers a patent pending function to automatically detect the structure embedded in your content and present that embedded structure as a navigation aid to the user. This alternate information retrieval interface:

1. finds the conceptual organization of your documents,
2. extracts and distills that structure into a hierarchical representation,
3. provides a succinct description of each group, and
4. offers that information sorted by usefulness.

This highly advanced process works completely without the need for administrative oversight, but certainly supports administrative influence in both the hierarchical organization and group descriptions if that level of customization is desired.

The browsable interface aids users who are unfamiliar with the particular language used in the site and rather come looking for information from a conceptual standpoint. Where they might not have the detailed knowledge necessary to construct a search query, they certainly are able to recognize the conceptual group and drill down to find the content. This use of recognition memory is yet another way the system reduces cognitive load; recognition memory is more accessible than recall memory. This is why multiple choice tests are easier than short answer tests, and why browsing is easier than searching.

Traditional Search

The traditional search approach used by RightNow is very powerful. The RightNow engine works well on both structured and unstructured data, and even offers parametric search capabilities. Importantly, this engine is tuned to work well on corporate-sized data repositories—from hundreds of documents to tens-of-thousands of documents. Because different techniques apply when searching these repositories than when searching larger data banks, the RightNow engine is capable of finding approximate matches in the data as well as exact matches.

[10] ibid.

To help illustrate this value, consider the following: if a user enters a five word search query, where only four of those words exist in your system, a traditional search approach would return no results; the RightNow engine, however, will return the four word matches. In addition, RightNow's engine is built to be able to determine if these longer queries are keyword-based or natural language-based, and respond appropriately. Numerous other features exist in the engine to further match user queries to documents:

- If a user enters a pluralized word form when a document contains only the singular form, the engine will return the singular form.
- If a user enters a relevant acronym or common misspelling when your documents contain only the expanded term and correct spellings, the engine is capable of returning the correct document.
- If a user enters a query deemed important by the administrator, the engine is able to push specific content for that specific query (for example, advertising content pushes to user product queries).

The RightNow search engine also contains the ability to work with 'AND' searches as well as 'OR' searches. In addition, when using the default 'OR' searching, RightNow leverages natural language processing ability and bias resulting matches to the most shared number of terms with the search query, always resulting in the best matches appearing at the top of the list. To further generalize searches within corporate-sized repositories, RightNow uses word stemming to reduce all words to their roots before performing the search. Also, RightNow's engine has an ontological processing module further helping to find matches even when the user enters inappropriate queries. The ontological processing module has two levels: a general level that provides "out-of-the-box" support to correct for broad spelling and term misuse, as well as a "corporate" level that allows individual organizations to add their own specific vernacular. However, to minimize the risk of over-generalization with stemming and ontologies, the RightNow search engine also considers the context for each individual word and phrase within the search query and how those contexts match with what exists in the matched documents.

RightNow's engine also has the ability to provide feedback to users to help them refine their searching. The engine indicates which terms were not used for searching, which were not found, and which were misspelled. In addition, it can even use common searches as recommendations for finding related information. Further, a parametric searching capability is integral to the search behavior and applies, out-of-the-box, to every search performed on the system; this parametric search capability allows users to re-sort or filter their results for a more individually interpretable presentation.

It is important to note that all these advanced features work without administrative oversight. New content automatically becomes searchable as soon as it is published, with no extra requirements for the search functionality. The engine maintains itself and provides a high level of accuracy out-of-the box. However, should you have extreme needs, this engine is easily configured and highly customizable, even to the point of exposing all aspects of the scoring algorithm to administrative manipulation with no need for professional services customization. While most people never need to bother with the advanced configuration capabilities of this engine, they are readily available should the need arise.

One example of "administrative override" is in the use of Topic Words. This feature allows specific, targeted connections between search terms and documents (either RightNow Answers or web pages). With Topic Words, the administrator can easily create a connection between a given search query and the desired content to allow more prominent positioning of important information. The Topic Words feature is a powerful marketing tool that can be leveraged to drive user behavior in numerous ways. For instance, it can enable a marketing team to augment customer support searches with product up-sell or cross-sell opportunities. It can also be used to more prominently display service bulletins.

Choosing between the browsable interface and the traditional search interface is similar to choosing between using Yahoo.com and Google.com when searching the Internet. Google searches require users to produce the search term for the engine to function, while the traditional Yahoo browsable approach can proceed by recognizing relevant content and drilling down a hierarchy to find specific information. With RightNow, not only are both the traditional text search as well as browsing options available out-of-the box, each also has the answer prediction functionality built in.

SmartGuide™

RightNow's SmartGuide™ provides intelligent decision-tree functionality to quickly guide users to answers. As mentioned earlier in this paper, traditional decision trees force all users, regardless of skill, through the same rigid series of "branching" questions from beginning to end. While this may be helpful to novice users, it can be highly burdensome to expert users (resulting in high cognitive load). Unlike traditional decision trees, SmartGuide™ uses patented AI technology to adapt to each user's input and intelligently "shortcut" directly to the correct answer. The learned shortcuts are suggested as alternate branches to take during the decision tree process, allowing novice users to follow the default, fully scripted route, while allowing expert users to jump ahead, skipping the pieces they are confident they have already addressed. As a result, SmartGuide™ reduces cognitive load for users across the full spectrum of experience levels.

Escalation and Automatic Response

As a final aid to users who are unable to find an answer to their questions through the answer prediction, traditional search or browse interfaces, an escalation path is easily accessible from all points in the process. This escalation provides the ability to submit complete questions directly to a customer service agent. However, the RightNow system can easily be configured to determine if a conceptual match to the question already exists before it goes to a human. Thus, as a last-ditch effort, the system combines all its information, from the natural language searching to the conceptual groupings, to analyze the underlying focus of a user's inquiry. Should this analysis produce any candidate matches, these are suggested back to the user before allowing the user to continue with his submission to a support representative.

Voice Self-Service

As mentioned in the introduction, one of the key objectives and benefits of self-service is to deflect calls that required live assistance. The fact remains that 60% of customer inquiries are still via the phone. Yet traditional web self-service vendors do not have a solution to this challenge. RightNow's voice self-service solution enables users to access the same knowledge base and retrieve the same information via speech prompts as they do via web input, which further increases the percentage of live inquiries that can be

deflected. RightNow is the only vendor that offers self-service solutions that incorporate both web and voice channels.

Summary

RightNow considers technology, AI in particular, an important and differentiating aspect of its product offerings. RightNow Technologies provides the full searching capabilities available in any other search engine. And we offer browsing and guided resolution capabilities. But we are not satisfied with that level of functionality—RightNow strives to exceed the common knowledge retrieval experience. In an effort to maximize both the ease and quality of information retrieval, RightNow has fundamentally changed the traditional information retrieval process. This innovative patented approach offers 4 out of 5 people a better experience, while still providing that 5th person the traditional interface to which they are accustomed. And we have extended the self-service information retrieval process to include both web and voice access points.

Furthermore, RightNow's organic approach to the ongoing "care and feeding" of the content minimizes administrative costs. The result is an award-winning, industry leading self-service solution that maximizes effectiveness, usability, call deflection, and ROI.

Future Direction

RightNow plans on continuing this industry-leading focus on high functionality, low maintenance features by initially focusing on two primary areas: expanding the Answer Prediction framework to function seamlessly with any web pages on a corporate site, and learning ontological relationships between items in the knowledge base. The ontology learning module will be even more robust and wide reaching than the current word relationship capabilities that allow simple investigation of the conceptual content of support incidents, high-level analytics operations, and enhanced search capabilities.

About the Author

Doug Warner leads a group of active researchers contributing directly to RightNow's innovative technology. Doug left his doctoral studies in Psychology and Computer Science at the University of New Mexico to join RightNow in 1999. Prior to RightNow, Doug worked on computational modeling research and the visualization of complex, abstract information using virtual reality. His work included novel web-based techniques for decreasing students' study time yet increasing their comprehension.

Since joining RightNow Doug has been granted five U.S. and international patents on artificial intelligence and information retrieval, with numerous others pending. He has co-authored six academic papers, one of which won the "Innovative Applications in Artificial Intelligence" award. Doug has an MS degree in Cognitive Psychology from the University of New Mexico and a BS degree in Computer Science and Psychology from the New Mexico Institute of Mining and Technology.

About RightNow Technologies

RightNow (NASDAQ: RNOW) provides organizations with industry-leading on demand CRM solutions to build customer-focused businesses. RightNow's acclaimed technology,

comprehensive services and commitment to customer success deliver high returns on investment for its customers. More than 1,300 organizations worldwide use RightNow solutions including British Airways, British Telecom, Cisco Systems, Continental Tire North America, John Deere, Nikon and the Social Security Administration. Founded in 1997, RightNow is headquartered in Bozeman, Montana, with additional offices in North America, Europe, Australia and Asia. For further information, please visit www.rightnow.com.