Tech-Clarity

Tech-Clarity Insight:

The Business Value of Knowledge-Enabled Decision-Making

Improving Product Development and Engineering Decisions

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Executive Overview

Optimizing the multitude of important decisions in innovation, R&D, and product development requires more than hiring the right people. Effective product decision-making demands companies make the most relevant information available to decision-makers in the right context. Innovation and problem solving require a broad array of knowledge. This information is scattered across internal and external sources such as research libraries, patent databases, and more. Further, it consists of information in many formats, document types, and languages. Aggregating and accessing the right information from the exploding volume of digital information is a significant challenge, making knowledge access an important enabler of innovation. As Tech-Clarity's <u>Product Data Accessibility</u> report concludes, accessing accurate, timely information "*is vital to the health and profitability of a manufacturing company*."

> *Aggregating and accessing the right information from the exploding volume of digital information is a significant challenge.*

Modern search technology offers much better value than traditional, costly knowledge management approaches that require data to be centralized, harmonized, and categorized in advance of knowing what information will actually be needed! Purpose-built semantic research tools are emerging that provide much more focused results and cut search time dramatically. "*When you are searching a small amount of information, keyword searches will probably do well*," explains Sridhar Ranganathan, Technical Leader at Kimberly-Clark Corporation, "*But now with so much available information, just a keyword will return too much noise*." Semantic search offers more effective knowledge retrieval without having to organize information in advance, particularly when searching large volumes of information. "*Semantic search adds another dimension to the search to slice through the huge gobs of data you have more quickly*," Mr. Ranganathan explains.

> *Knowledge-enabled decision-making combines semantic search with engineering methods to help companies retrieve the most relevant information to make better decisions.*

Developing a targeted search to drive innovation decisions is dramatically improved by translating complex problems into the fundamental, conceptual challenges that need to be addressed. Proven engineering techniques offer the opportunity to methodically break problems down into systems elements or root causes so researchers can retrieve relevant information from the vast amount of digital knowledge available today. Defining the right question to ask helps researchers find solutions from others who have solved similar problems in the past, perhaps in a different industry. Knowledge-enabled decision-making combines semantic search with engineering methods to help companies frame

questions appropriately, allowing them to retrieve the most relevant information – across languages, industries and fields of study - to make better decisions.

> *A survey among power users shows that researchers are shortening the time it takes to find solutions by using semantic search.*
> *Peter Guse, Corporate Research, Innovation Management, Robert Bosch GmbH*

But how do you put a value on knowledge-enabled decision-making? The benefits can be invaluable, such as providing researchers with the insight to open up new markets, improve new products, or encourage greater innovation. It can also provide strategic benefits such as protecting intellectual property or discovering room to operate among existing patents. These benefits are both incredibly strategic and highly variable, but also difficult to quantify. Fortunately a highly concrete ROI is available even if companies disregard the strategic benefits and only consider tactical time savings, particularly when teams are already overworked and headcounts aren't growing. "*Even though quantifying the value is very hard, a survey among power users shows that researchers are shortening the time it takes to find solutions by using semantic search*," offers Peter Guse of Corporate Research, Innovation Management at Robert Bosch GmbH.

> *Applying the metrics derived from this research to a representative manufacturing company shows a cost savings of over $650,000 annually.*

This report provides a template to calculate these benefits based on tangible, bottom-line savings. This template is based on US census data and interviews for this paper. Applying the metrics derived from this research to a representative manufacturing company shows a cost savings of over $650,000 annually. While it's important to remember that these are the tactical benefits and they are potentially dwarfed by the benefits of finding a new innovative product, entering a new market, or finding room to operate within a tangled web of patents, it is likely more than enough to pay for the cost of implementing knowledge-enabled decision-making technology.

The Demand for Timely, Relevant Knowledge

Product innovation and engineering requires solving problems, making decisions and solving contradictions. There is a tremendous amount of business value available from improving engineering decision-making, as discussed in Tech-Clarity's <u>Improving Engineering Decision-Making in PLM</u>. The same is also true at a higher level for strategic decisions driving R&D, strategy, and corporate innovation. Manufacturers need to know where markets are headed, observe trends, and determine where competitors are investing to drive their strategy. Much of this information comes from outside of the enterprise. "*We try to identify 'weak signals' by monitoring the Internet during concept*

development to look for existing state of art concepts from patents and competitors," explains Peter Guse of Robert Bosch GmbH. Rolls-Royce also looks outside of their business for innovation, according to Dennis Duke of the Advanced Programs Team, "*Our Advanced Programs team was formed to innovate by looking at new technologies, seeing where the market is going, and understanding what our customers are doing for the future.*"

Manufacturers must find a way to turn vast stores of data into actionable knowledge.

Developing today's complex products creates a need to access specialized information in many domains and industries to innovate and solve technical challenges. This knowledge often lies outside of the organization's core expertise. For example, the root cause to a problem may have been solved or the basic science may have been developed in another industry and can be readily applied. To take advantage of this, manufacturers must find a way to turn vast stores of data - internal document stores, external premium content, websites, social media and more - into actionable knowledge. There is a huge opportunity to leverage internal and external knowledge sources to improve product innovation, development, processes and engineering decision-making if this data can be made readily accessible. As Richard Dodge of Corporate Research and Engineering at Kimberly-Clark describes "*It's important for us to be able to access information in order to identify opportunities.*"

Too Much Information and not Enough Knowledge

There are numerous sources of trusted authoritative science, design, and engineering knowledge available online in the form of patent databases, standards libraries, technical journals, "big data," and the "deep web" that is inaccessible to most search engines. These are in addition to the tremendous number of sources of information inside and outside enterprises including presentations, papers, research notes, and other digital information sources. But the volume of information is overwhelming and finding the more relevant information is nearly impossible with today's common approaches. Even accessing internal knowledge is difficult, as most companies "don't know what they know," lacking access to their collective corporate knowledge or subject matter experts. This is compounded by language and geography barriers and information silos common in most companies.

The irony is that companies aren't suffering from too little information but from too much.

Researchers need to find the most relevant information to develop the right insights. Although there are vast amounts of information available, The Digital Workplace:

Redefining Productivity in the Information Age from Infocentric Research finds that "*54% of decisions are made difficult by incomplete, inconsistent, and inadequate information*." Further, research firm IDC finds that "*60% of manufacturers claim they lack informed decision-making capabilities necessary to innovate*." Despite the explosion of digital knowledge, decisions-makers are starved for relevant, timely knowledge.

The irony is that companies aren't suffering from too little information but from too much. "*The amount of data being filed is exploding. Everyone has their own way of filing things so it's hard to access because some is on SharePoint, some is on shared drives, and some people still store things on their PC*," offers Dennis Duke of Rolls-Royce. "*It's hard to retrieve and leverage digital knowledge and apply it to what your are researching*." To complicate matters, the data is typically stored in hundreds of formats and disparate locations ranging from shared drives to portal sites.

Recognize why Knowledge Management Remains a Challenge

The knowledge management challenge is growing, but it is not new. It just hasn't been solved effectively in most companies. Much of the vital information they need is locked away in unstructured text and difficult to search or identify using traditional search methods. "*Our information is spread across a number of different sources including file shares and SAP portal rooms. It's often attached to individual departments so it's hard to access*," says Robert Bosch's Peter Guse. "*Embedded search is not good enough to retrieve the data. Big business units like ours have a lot of data buried in them*." This is a common scenario in today's business world. "*Not all company information is compiled into one place*," says Kimberly-Clark's Sridhar Ranganathan, "*We have summary forms, presentations, and technical reports in various forms and it's hard to identify connections from a plethora of different formats*."

> *We have summary forms, presentations, and technical reports in various forms and it's hard to identify connections from a plethora of different formats.*
> *Sridhar Ranganathan, Technical Leader, Kimberly-Clark Corporation*

Applying available knowledge is getting more important due to the erosion of internal knowledge from attrition, retirements and the aging workforce. According to Dennis Duke of Rolls-Royce, "*We recognized that people leave, people retire and we weren't doing a good job of capturing their knowledge*." But even with successful knowledge management efforts, accessing the right information is currently not easy in the majority of companies. And of course they do nothing to improve access to information outside of the business that you can't control and categorize. "*The amount of information available in terms of bytes is growing so rapidly you have to believe that searching at the very primary level is not going to get you to the small set of solutions you are looking for quickly*," offers Kimberly-Clark's Sridhar Ranganathan.

Knowledge management efforts have been difficult, often prove to be unsustainable, and are typically focused almost entirely on internal information. These efforts have good intentions, but require significant manual effort to categorize existing information into taxonomies and add meta-data. In addition, they require added discipline when storing new information. Perhaps the biggest challenge is having the foresight to know how people will want to retrieve the data later. Even when this is done effectively, businesses aren't likely to remain static so companies can categorize everything, so knowledge management efforts suffer from information entropy from reorganizations, mergers, and acquisitions. "*You can spend thousands on capturing and reorganizing information and then it's messed up again in five years*," explains Rolls-Royce's Dennis Duke.

> ***You can spend thousands on capturing and reorganizing information and then it's messed up again in five years.***
> *Dennis Duke, Advanced Programs Team, Rolls-Royce*

Improve Access to Knowledge with Semantic Search

Despite the challenges, there has been improvement. As the Tech-Clarity report on improving engineering decisions explains, there have been very significant strides in providing access to data. Tech-Clarity's Product Data Accessibility paper explains how new technologies can help solve the problem of finding and sharing information regardless of how and where it is stored.

As stated earlier, keyword search is entirely inadequate when applied to vast quantities of information. This search technique fails due to too many results, not too few. Most people have experienced this when searching for something using a tool like Google, which requires the researcher to read and understand how and if the information is relevant. Semantic search and indexing can help manufacturers overcome these hurdles. "*With semantics you can identify all of the data in your electrons in a straightforward way*," according to Dennis Duke of Rolls-Royce. "*You can pull archival data out that you don't know exists, or have no clue where it is without having to dig in, identify, and re-categorize information*."

> ***We got some results back from work seven years ago that we had forgotten about by indexing some things on our own hard drives using semantics.***
> *Sridhar Ranganathan, Kimberly-Clark*

New search techniques leverage indexes based on semantics, the relationship between words, making search much more accurate. By interpreting not just the words in the information being indexed but how they relate, semantics interprets the meaning behind the information. "*Semantics is a way to find information that is better than just a keyword*

search because it interprets language-based queries," says Kimberly-Clark's Sridhar Ranganathan. "*We got some results back from work seven years ago that we had forgotten about by indexing some things on our own hard drives using semantics. It's almost like a searchable memory for an organization, it's quite powerful*." Semantic search delivers highly relevant answers instead of just links to documents. "*Semantic search helps us find the right information much quicker, it is much better than other search tools*," offers Peter Guse of Robert Bosch. In addition to finding the information, semantic search tools can develop highly relevant, dynamic summaries of the content so researchers can read less and learn more, saving significant effort and allowing them to absorb more information.

Our tool helps us find relevant information even in Japanese documents and get a summary in English.
Peter Guse, Robert Bosch

Semantic search tools can also extend the knowledge of your organization by efficiently indexing external knowledge in addition to internal expertise. "*We can bring in context on the fly during cause-effect analysis*," says Richard Dodge of Kimberly-Clark. "*It's almost like having a whole set of reserve information at your fingertips that provides richness beyond what the participants bring with them*." More advanced semantic approaches can use synonyms to account for disparate terminology and even access information across language barriers, opening up information from industries with different vernacular or knowledge in other languages that they might not have access to otherwise. "*We have a lot of engineers in Japan and there is a big language barrier, but our tool helps us find relevant information even in Japanese documents and get a summary in English*," says Peter Guse of Robert Bosch. "*It's very helpful*."

One element of semantic search is trying to most effectively access information outside the walls of Kimberly-Clark that might be helpful to solve a problem.
Richard Dodge, Corporate Research and Engineering, Kimberly-Clark

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One final example of how semantic search can help is through what Tech-Clarity calls "social discovery." Through social discovery researchers might find the right information they are looking for, but can also find the right experts to collaborate with to solve the problem. "*One element of semantic search is trying to most effectively access information outside the walls of Kimberly-Clark that might be helpful to solve a problem*," explains Richard Dodge. "*All of our research isn't done in house, we work with universities and consortiums. Semantic search doesn't create open innovation relationships, but it could identify particular groups that we may want to partner with*."

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Understand the Basics of Semantic Search

According to Wikipedia:

- Semantics is the study of meaning. It focuses on the relation between signifiers, such as words, phrases, signs, and symbols, and what they stand for…
- Semantic search seeks to improve search accuracy by understanding searcher intent and the contextual meaning of terms … to generate more relevant results.

In essence, semantics search extends search capabilities by inferring the meaning of the sentence based on the structure of the text in addition to the words used. In this way, the search tool can look for information that matches the meaning of a phrase as opposed to the individual components. "*Semantics is different than dumb search,*" explains Rolls-Royce's Dennis Duke. "*It has the power to understand the question and analyze information that way.*" The added intelligence of semantics effectively acts as a subject matter expert on your behalf to find relevant information.

> *The added intelligence of semantics effectively acts as a subject matter expert on your behalf to find relevant information.*

Perhaps the best way to understand the difference between keyword search and semantic search is with a simple example. A quick Google search for "what causes diabetes" results in over 80 million results. On the other hand, a search on "diabetes causes what" also returns over 80 million results. Although these searches are trying to discover very different information, the results returned are largely the same links. This example demonstrates the limitations of keyword search because it is indifferent to the *meaning* intended by the searcher and only focuses on the individual *words*.

Extend Semantic Search with Advanced Search Tools

Semantic search is a key element of a knowledge-enabled decision environment, but there are additional enablers that can make the technology even more powerful. In order to efficiently access to the right information it's important to be able to properly frame the search, effectively asking the right question. Researchers often don't know what they are looking for, so they don't know how to search for it. Experience helps, but there are also tools to help define the question properly and guide researchers. "*You need the ability to think about and solve problems in a structured manner,*" according to Sridhar Ranganathan of Kimberly-Clark.

> *Researchers often don't know what they are looking for, so they don't know how to search for it.*

Search templates are useful tools that help people structure appropriate questions for semantic search. They help researchers look at information from different perspectives, using common relationships between words. These "lenses" such as cause-effect, parts-functions, methods, disadvantages, and others help frame questions properly. Advanced knowledge-enabled decision-making tools provide templates based on extensive experience using semantic search in R&D. Phrasing questions using the appropriate templates helps semantic technologies return the most relevant results. As Richard Dodge of Kimberly-Clark explains, "*We bring in different lenses, different perspectives, to get researchers in the mind of thinking about a problem a different way.*"

One particular lens that is getting a lot of attention is linked to customer sentiment. By looking for semantic constructs that indicate sentiment such as likes, dislikes, wants, and appreciates, companies can gain valuable insight from social media data sources such as Facebook, twitter, or other websites. This helps manufacturers gather the "voice of the customer" or analyze where their competition is performing well and where there are unmet needs.

Extend Semantic Search with Engineering Tools

Another class of tools that can help guide semantic search includes engineering-focused tools. These tools leverage proven engineering techniques to help better provide search criteria. One such technique is developing cause and effect models. "*If you take a couple of hours to build out a cause-effect model you can really generate some new insights, even for teams that have worked on something for some time,*" offers Kimberly-Clark's Richard Dodge. "*For example, we spent 2-3 hours furthering a cause-effect model on an existing project by looking at areas from scientific principles. We identified a couple of additional interesting approaches where we had come to a bottleneck and needed to reframe the solution.*"

> *We spent 2-3 hours furthering a cause-effect model on an existing project by looking at areas from scientific principles. We identified a couple of additional interesting approaches where we had come to a bottleneck.*
> *Richard Dodge, Kimberly-Clark*

Function modeling is another engineering tool that can help develop feeds to semantic search to better frame questions. Function modeling breaks a system into its fundamental conceptual activities. Then, individual functions can be targeted for improvement or the overall system can be targeted for simplification. Using this approach, it's easier to understand the basic issues to be addressed, making it easier to apply solutions from science that may have been developed for very different purposes.

Another example of an engineering technique that complements semantic search is root cause analysis. Identifying root causes using a number of proven methodologies helps focus research efforts on the most important issues, rather than symptoms of a problem. Like other tools, it helps define the problem more precisely and therefore helps pose the right questions for search. "*Innovation happens because you make non-obvious connections. You can find those from unrelated fields that have solved the problem before us,*" says Sridhar Ranganathan of Kimberly-Clark. "*Having a structured way of working through root causes allows us to find problems to solve.*"

> *Having a structured way of working through root causes*
> *allows us to find problems to solve.*
> Sridhar Ranganathan, Kimberly-Clark

These tools are only a few examples. There are other valuable tools such as FMEA, TRIZ, and more. Leveraging the right engineering methodologies in conjunction with semantic search retrieves more applicable information. It's important to understand that knowledge-enabled decision-making is more than technology. It involves new processes and requires people to learn to think a different way in order to get the best results. The right technology, however, can help implement these processes in a consistent, repeatable, sustainable way.

Understand the Value of Knowledge-Based Decision-Making

One of the most challenging parts of implementing knowledge-based decision-making is determining the potential benefits. Some manufacturers adopt the approach based on the belief that providing better knowledge to researchers, engineers, and product developers has inherent value. Others require more validation. Knowledge-based decision-making offers intangible benefits, but it also provides hard benefits that impact both top and bottom lines. For example, Boston Scientific presented at an industry user event that a team enabled with advanced knowledge-enabled decision tools was able to develop two times more intellectual property (IP) than a control group.

> *One of the most challenging parts of implementing knowledge-based*
> *decision-making is determining the potential benefits.*

The manufacturers interviewed described a variety of benefits, including:

- Getting decisions right the first time
- Having more confidence in strategic decisions
- Feeling comfortable that a search with few results means little information exists
- Finding information they might never have found otherwise

- Connecting internal and external domain experts based on what they know
- Minimizing the amount of experimental work required to get to a goal
- Extending the life of an existing product
- Avoiding obsolescence
- Doing less experimental work going down the wrong path

But how can you put a price on improving innovation? On solving a critical manufacturing problem? On finding room to operate around competitive patents? On finding a way to penetrate a new market? "*Determining value is a difficult question for corporate R&D*," admits Richard Dodge of Kimberly-Clark. "*We are way on the upside working on initial problem identification and the technology exploration stage. The benefit for researchers is identification of potential technical pathways, where we have demonstrated that semantics and tools can provide teams with new approaches they had not investigated*."

We have years and millions invested in information and don't have access to it. The value is so astronomical that we can't put a number on it.
Dennis Duke, Rolls-Royce

Knowledge management has always been a difficult pursuit to justify concretely. Although executives may intrinsically understand the value on better leveraging knowledge assets from a recently acquired company or preserving knowledge from a retiring workforce, it can be hard to track individual benefits back to the knowledge management effort. While some companies have measured innovation metrics like the number of patents or invention disclosures files, clearly it is hard to put a financial value on these. "*One of the biggest benefits is capturing data that would have walked out of the door. We have years and millions invested in information and don't have access to it*," offers Dennis Duke of Rolls-Royce. "*It's such a priceless thing and the value is so astronomical that we can't put a number on it*."

We identified solution approaches and strategies in a few hours that took the original project team several weeks.
Richard Dodge, Kimberly-Clark

Despite reporting benefits, the participants also reported having a hard time developing business justifications or ROI for acquiring these new capabilities. It is possible to quantify the value, but only after you determine what problem you are applying the approach to (and potentially only after you have solved it). "*We had already found solutions and approaches for one of our cost reduction projects but we decided to step back and look at the problem again with a different project team using knowledge-enabled decision-making techniques,*" recounts Richard Dodge of Kimberly-Clark. "*We*

identified three of the solution approaches and strategies in a few hours that took the original project team several weeks." In most cases, there is no direct comparison to make and no controlled experiment to compare what would happen without the advanced approach and technology. The benefits derived from a new innovation, entering into a new market, or launching a new product are probably too big for most executives to find credible anyway.

Quantify the Value of Knowledge-Based Decision-Making

One potential way to quantify the benefits is cost avoidance related to traditional knowledge management techniques. Semantic search offers tremendous savings from a total cost of ownership perspective over other knowledge management approaches because semantic search works within a customer's existing IT infrastructure and data sources. There is no need to move, organize, or prep data. For example, there is no need to pre-build taxonomies or tag information with metadata. Semantic search tools leverage the existing environment and automatically create knowledge bases from widely dispersed and unstructured content across hundreds of document types. The alternatives are very costly so there is a large cost savings.

We have dramatically reduced the time to find solutions
to problems we have solved before.
Peter Guse, Robert Bosch

The most straightforward approach to placing a value on knowledge-enabled decision-making, however, is by determining efficiency improvements based on the common denominator – time. All of the companies interviewed explained that they are making their vital researchers and engineers more productive. "*The solution has had a significant impact on task forces in our business units,*" says Peter Guse of Robert Bosch. "*We have dramatically reduced the time to find solutions to problems we have solved before.*" This ability for researchers to find what they need faster can be quantified. As Kimberly-Clark's Richard Dodge says "*You can quantify the efficiency gained in finding relevant information using the semantic searching capability.*"

When we wrote up our value proposition … we used very conservative numbers
and the investment makes sense pretty quickly.
Dennis Duke, Rolls-Royce

The time savings are significant even if you don't consider that researchers may never have found the answer at all without the advanced approach. "*It's hard to create a business case. When we wrote up our value proposition it came down to the mundane thing of being 20% more efficient at executing a certain number of searches a year and*

turning that into dollars," says Dennis Duke of Rolls-Royce. "*It's kind of that simple. We used very conservative numbers and the investment makes sense pretty quickly*." Others have achieved valuable time saving as well. "*It was hard to find solutions for reoccurring application problems in the field*," says Robert Bosch's Peter Guse. "*We have now cut this time significantly. We have also gained significant time reduction in research*." Richard Dodge of Kimberly-Clark says, "*If you compare semantic search to keyword search you should be able to quantify the saving. I would hesitate to say it is an order of magnitude, but it would be several multiples*."

If you compare semantic search to keyword search you should be able to quantify the saving. I would hesitate to say it is an order of magnitude, but it would be several multiples.
Richard Dodge, Kimberly-Clark

In addition to direct time savings, improving efficiency leads to additional benefits including faster time to market, which has significant business value by itself. It can also allow companies to recreate fewer solutions, minimize redundancy and reuse existing information to save additional time and resources beyond search. "*It not only cuts the time, it makes it possible to find relevant information where we weren't able to find it*," explains Peter Guse of Robert Bosch. "*In some cases the solution has been regenerated from scratch when we could save a lot of time reusing the solution*." But the most universal way to determine ROI is using time savings and increased productivity of technical resources.

It not only cuts the time, it makes it possible to find relevant information where we weren't able to find it. In some cases the solution has been regenerated from scratch.
Peter Guse, Robert Bosch

Calculate the Benefits

The following example is a sample benefit calculation using a fictitious manufacturer. The data used is based on research for this report and real experience with industry companies. It has been derived to provide a realistic example. This template can be used to calculate the benefits for your company by inserting appropriate statistics while maintaining a conservative approach.

The data used is based on research for this report and real experience with industry companies.

In order to make this example as realistic as possible, we gathered some base financial information from census and benchmark data and augmented it with estimates based on prior Tech-Clarity research and the interviews conducted for this paper. For the purposes of this example, we will use the following information:

Metric	Value	Source
Company revenue	$1 billion	Arbitrary example
R&D spend as a percent of revenue	5%, or $50 million	US Census data, rough average across manufacturing industries
Percent of R&D spent on headcount	20%, or $10 million	US Census data
Percent of R&D time spent on search	20%	Prior benchmarks, interviews for this paper
Potential time savings	33%	Conservative estimate from interviews for this paper

Table 1: Savings Template for Fictitious Company

Given these highly conservative assumptions, and using a similarly conservative approach to define the improvement opportunity available, significant business benefits can be achieved through knowledge-based decision-making. For our fictitious company in this example, the company could save one-third of their search time (33%), which represents 20% of the time spent by knowledge workers in R&D. Even with these conservative numbers, the savings would be (20% X 33%) of $10 million or $667,000 dollars per year. Note that this is a relatively simplistic approach to determine the value and only represents the tactical efficiency gained in search. The results are significant even though they disregard the value resulting from improved innovation, the ability to apply technology to new markets, getting products to market faster, or finding room to operate within a tangled web of international, technical patents.

> **Note 1: R&D spend and R&D spend on headcount are highly dependent on industry**
> **Note 2: Percent of time spent searching for data is conservative, based on benchmarks of time spent searching for data by knowledge workers**
> **Note 3: Potential time savings was developed as a conservative composite of information gathered from companies interviewed for this research**

Conclusion

Research for this paper shows that there are significant, strategic benefits available from using semantic search and enabling tools. The combination of search and tools, knowledge-enabled decision-making, helps companies address the challenge of finding and reusing knowledge given the vast and growing volume of structured and unstructured

data in today's corporate world. Without this approach, this information is difficult to access across so many disparate sources consisting of varied formats, locations, and languages.

Semantic search provides a much better approach and cuts search time dramatically and provides a more realistic approach than traditional knowledge management projects. "*How we file things has become less important*," explains Rolls-Royce's Dennis Duke. "*We can find information without having to change how disciplined we are with our filing system or spending the non-value-added, wasted effort to go back and clean up the data and file it because semantic search doesn't care*." In addition, engineering techniques and tools such as root cause analysis and device and process modeling can help companies get the most out of semantic search by helping focus and frame questions appropriately.

We can find information without having to change how disciplined we are with our filing system or spending the non-value-added, wasted effort to go back and clean up the data.
Dennis Duke, Rolls-Royce

The bottom line is that companies have the opportunity to gain many important, strategic benefits from adopting knowledge-enabled decision-making tools and techniques. These have large and perhaps overwhelming financial benefits, but a very healthy ROI is available from time savings even if those important strategic benefits are disregarded. This improved productivity is particularly important in today's manufacturing industry where teams are already overworked and headcounts aren't growing.

Time savings are tactical benefits, and they are potentially dwarfed by the benefits of finding a new innovative product, entering a new market, or finding room to operate within a tangled web of patents.

The value of time savings from knowledge-enabled decision-making is significant, as our example shows. The template in this report can be used for any company by inserting information to tailor the results to company and industry specifics. The results from our example include significant, bottom-line savings. What's important to remember is that the time savings are tactical benefits, and they are potentially dwarfed by the benefits of finding a new innovative product, entering a new market, or finding room to operate within a tangled web of patents. But it is enough to pay for the investment, which can deliver the calculated benefits and more.

Recommendations

Based on industry experience and research for this report, Tech-Clarity offers the following recommendations:

- Identify internal knowledge sources that can be mined to innovate and solve problems
- Leverage external sources for knowledge, including standards and patent libraries, authoritative industry and technical content, and the deep web
- Apply semantic search technology to quickly find relevant knowledge without wasting critical time searching and sifting through too many results
- Take advantage of engineering tools and techniques that can help frame the semantic search more precisely
- Take advantage of the strategic value and benefits of knowledge-enabled decision-making, but justify the project on the tactical time savings that will likely pay for the investment in the first year
- Extend knowledge-enabled decision-making across R&D and Engineering to take full advantage of the opportunity and expand ROI over time

About the Author

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