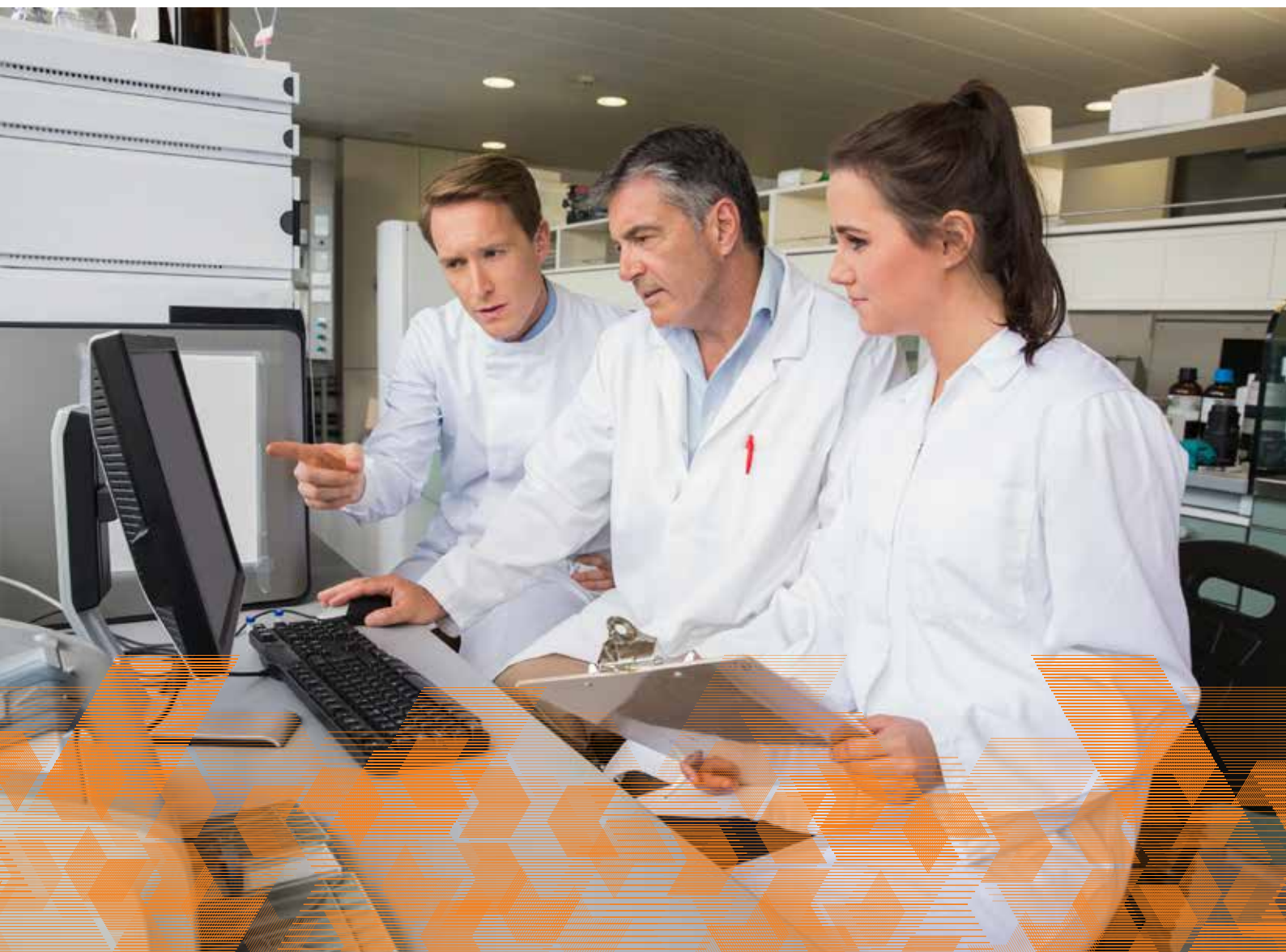


KNOVEL DESIGN PARTNER PERSPECTIVES

Knovel Journal Modules as a Resource for Design and Development Engineers



SUMMARY

In response to customer feedback, development of Knovel Journal Modules started in 2014 and a beta version focused on Chemical Engineering was made available to select customers from February to July 2015. This document summarizes key observations and findings from 2014-2015 customer interview and observation sessions.



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“We are constantly asking ourselves if this is this best way to do what we’re doing and we are often on a three- or five-year plan to make changes.” — Senior Engineer, Chemicals Industry

CREATING WHAT’S NEXT: TAKING KNOVEL A STEP FURTHER WITH JOURNAL MODULES

In markets where regulatory pressures are high and new technologies are constantly evolving, companies must not only assess new techniques to drive competitiveness and innovation but also which assets and resources can help deliver requisite insights. Valuable tools include sources of current, trustworthy and targeted information that extend the engineer’s productivity and expertise as well as support a company’s technical due diligence for engineering design and development.

In the chemicals industry, for example, competition, regulatory and other market developments have increased pressures on engineering teams to create and improve solutions for the following business needs:

- Diversifying and expanding product portfolios
- Achieving optimal production levels and minimal plant disruptions
- Delivering new and differentiated products that achieve commercial success
- Responding to changes in environmental and safety regulations and raw material prices
- Maintaining up-to-date knowledge on market-shaping trends such as sustainability and advanced materials

Another example can be seen in the oil and gas industry, where health, safety and environmental concerns are high and other market pressures like fluctuations in oil prices, the need to go into harsh environments like the Arctic, unplanned equipment outages, and shortages in experienced staff are increasing demands on engineering teams.

Today’s engineers need reliable technical data to respond to business needs and market changes. They need data to be discoverable and easy to process – mentally and literally – so they can properly assimilate reliable assumptions and insights into their work. Outsell’s “End User Study: Engineering and Science Professionals” from February 2014 approximates that 9 hours or 25% of an engineer’s week is spent on gathering and analyzing external information. This is a key insight for organizations with growing or established engineering teams, as obstacles to accessing usable information can significantly impact the quality and value of the engineer’s work.

But what insights are critical for engineers? With 15 years serving the needs of engineers from industries such as Chemicals, Oil and Gas, Engineering Design and Construction, Equipment Manufacturing and Aerospace, the Knovel team at Elsevier has found that engineers consistently need:

- Technical decisions that can be traced back to reputable sources and proper due diligence
- Access to best practice information as they solve problems with expensive stakes and consequences
- New and current insights for exploring new solutions and improving existing approaches

These needs are critical in the design and development stages for a new product or process, as illustrated in Figure 1.

Research Driven	Development and Design Driven			Process Drive	
Requirements / Research	Development	Preliminary Design	Detail Design	Manufacture / Construction	Operations
Customer requirements	Problem and requirements definition	Feasibility assessments / tradeoffs studies	Design validation using simulation software	Manufacturing logistics plan and schedule	Maintenance and set up of logistics, distribution and service links
Market and technologies benchmarking and research	Concept generation and selection	Analytical models	Design refinements and engineering drawings	Specify & produce equipment and tooling	Provide technical support maintain processes
Identification of relevant standards	Design specifications	Preliminary design review	Formal documentation and production plan	Functional testing / verification testing	Overhaul, repair & modifications

The development and design stages of the engineering workflow have some of the biggest demands for technical information.

Figure 1. Phases of the engineering design and development workflow

Knovel is an established resource for best practice insights and validated data—primarily used in the applied stages of the engineering lifecycle to increase productivity in designing for construction, mass implementation and commercial production of products. Engineers use Knovel to gain knowledge about unfamiliar topics, look at validated approaches and applications of a technology or best practice process, or access equations and material properties data. Since 2001, Knovel has been aggregating and processing information from its now over 40 technical reference content offerings and premium databases. The platform’s underlying data is sourced from and developed with over 120 sources, which include book publishers, subject matter experts and professional societies.

However, there are classes of information traditionally not covered within Knovel. Longtime users have expressed a need for visibility into emerging technical insights, noting that such insights come from scholarly journals, conference proceedings, case studies, and trade publications (See Figure 2).

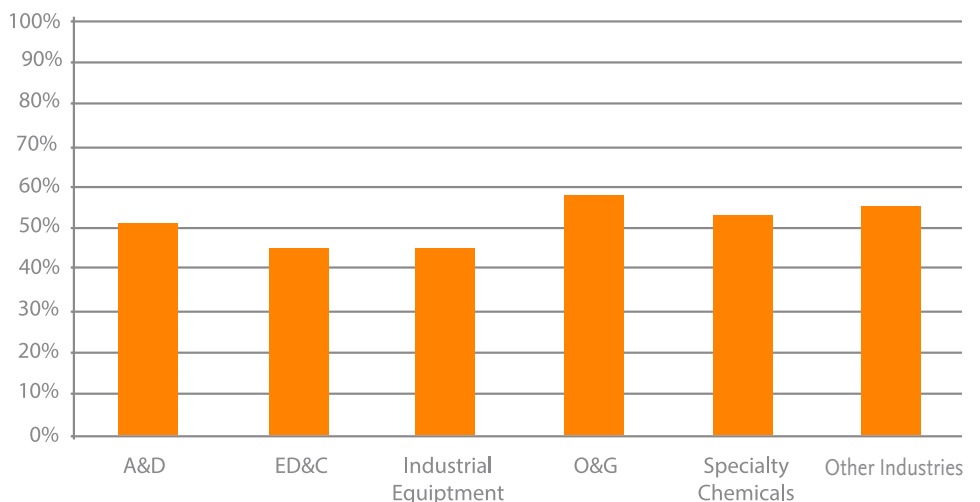


Figure 2. % of Knovel user respondents in select industries who indicated “Journals” in response to the question: “Aside from Knovel, what other information sources and tools do you most frequently use in your work?”

(Source: 2014 Knovel Customer Renewal Survey; Base = 2,000+ respondents)

WHAT IS THE KNOVEL DESIGN PARTNER PROGRAM?

Established in 2009, this program brings together information professionals, engineering team leaders and end user engineers from select customer organizations to provide important design insights and feedback to the Knovel Product team. Through in-depth interviews and observation sessions wherein users discuss and demonstrate their use of Knovel in the live product environment, the Knovel Product team gains valuable information about how Knovel can be improved.

In response, the Knovel team began developing Knovel Journal Modules, which are discipline-specific resources designed to expand the value of Knovel by enabling engineers to discover emerging technology developments within the same interface they use to access best practice insights and validated data.

The first release, the **Knovel Journal Module for Chemical Engineering**, went into ‘beta’ testing with select customers from February-July 2015, as part of the Knovel Design Partner Program*. The beta project, together with customer interviews from 2014 product development efforts has yielded feedback from engineers, information managers and technical buyers of Knovel. This document summarizes key findings from customer interactions and helps readers understand and assess the value and relevance of Knovel Journal Modules as an additional resource for engineering teams working in design and development.

THE ENGINEERING IMPERATIVE FOR EMERGING INSIGHTS

For any engineering problem, there is no single answer. Engineers balance many conflicting constraints to arrive at an optimal answer – one that best balances performance, economic, social, environmental, and even regulatory issues. To do this, engineers require regular and easy access to emerging technology insights so they can better:

1. Evaluate the trade-offs (performance, risks) in selecting certain technologies, materials or designs for their project
2. Find the latest technical data and results to solidify approaches and make their designs, processes, and simulations more accurate
3. Benchmark against experimental methods and conditions used by others
4. Troubleshoot existing design failures

Some examples of supporting quotes gathered from customer interviews and observation sessions:

“In areas where there is strong focus on recent developments, there is inclination to heavily utilize journals because there is so much that is developed every day.”
— **Manager of Engineering Resources and Training, Oil and Gas Industry**

“Journal articles may have details for a practical problem we are trying to tackle.”
— **Process Development Engineer, Chemicals Industry**

“Some technologies can become an engineering dinosaur because of such things as relatively high energy use. If we know of a new technology that is coming of age that could present a viable new approach for solving the energy use issue, we want to stay on top of the developments because at some point somebody will come up with an appropriate solution that we need to be aware of.” —**Senior Engineer, Chemicals Industry**

“We are constantly asking ourselves if this is this best way to do what we’re doing and we are often on a three- or five-year plan to make changes. We like to look at what competitors are doing—seeing if it’s in literature and seeing if maybe there’s a smarter way to do it.” —**Senior Engineer, Chemicals Industry**

“When I need to get the basics, Knovel’s technical reference is my choice, but for keeping up-to-date, journals are what I need.” —**Engineer**

In summary, companies need to help engineers keep up-to-date on new developments in order to support:

- **Competitiveness:** Engineering teams, especially those who work in fast-developing or highly competitive market spaces such as advanced materials or oil and gas, must keep up with competitors when it comes to understanding the latest research and breakthroughs
- **Efficiency and Cost Reduction:** With time-to-market and internal cost pressures straining engineering teams, insights that used to be garnered from attending industry and academic events need to be accessed more quickly and efficiently – and often online
- **Experienced Engineers’ Need to Go Beyond ‘The Basics’:** Emerging technical literature offers more experienced engineers with insights that open up new lines of thinking and build upon existing expertise
- **Organizational Emphasis on Innovation:** Even in difficult markets and in companies wherein the pressure to ‘do more with less’ resources is becoming the ‘norm’, the call for innovation and staying on top of “cutting edge thinking” remains strong

Keeping these user and business drivers in mind, the Knovel team endeavored to investigate how best to expand Knovel for this need and solve the gaps in current options available to engineers.

DEFINING A BETTER OPTION

The previously mentioned Outsell’s “End User Study: Engineering and Science Professionals” provides a good summary of challenges engineers encounter when trying to access useful technical information. (See Figure 3).

PROBLEMS AND OBSTACLES FOR ENGINEERS AND SCIENTISTS

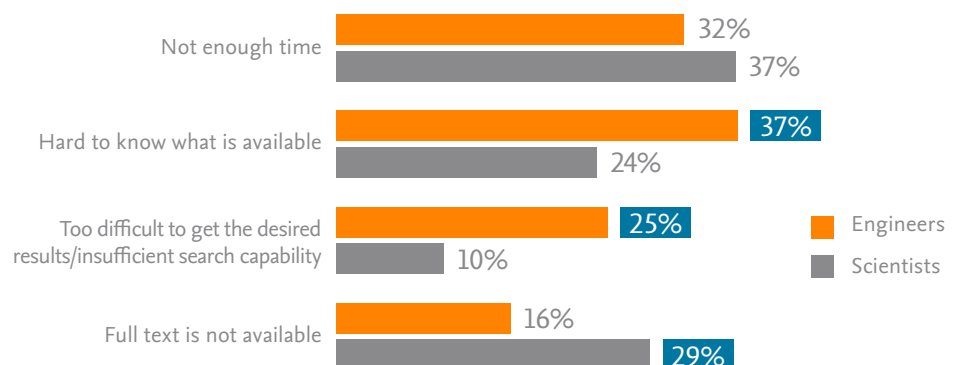


Figure 3. Scientists and engineers respond to the question: In general which of the following factors do you consider to be the 3 major problems or obstacles to getting the information you need to do your work? (Source: Outsell’s End-User Study 2013; Base: Engineers (n=100), Scientists (n=100))

Since 2001, Knovel has addressed these obstacles through delivering applied engineering information sourced from technical references and materials databases. It aggregates and processes full-text content and databases from a diverse collection of sources. By doing so, Knovel makes insights about proven technologies, approaches and processes easily discoverable, digestible and usable within a unified platform experience.

“I would just be interested in getting the bloody answer to my problem. I’m not interested on whether the answer to my problem has been given by the community five days ago or fifty years ago.”

– Engineer, Oil and Gas Industry

“We need to have some kind of prioritization or pre-selection. What should I be interested in? What should I have access to based on what you know about my scope and my company’s needs?”

– Engineer, Chemicals Industry

On the other hand, some of the resources engineers turn to for cutting-edge, experimental and early stage technologies and approaches are as follows:

1. Industry and academic events
2. Individual title subscriptions to full-text journals
3. Publisher-specific full-text journal platforms
4. Employing external consultants
5. Internal colleagues
6. Product information from vendors

A closer look at these options reveals some challenges. For instance, the cost and time associated with external consultants or traveling to industry conferences were mentioned as rationale for looking more towards ‘self-serve’ online information solutions. Moreover, employing external consultants, seeking input from colleagues and sourcing literature from vendors can be subject to selection bias and limit innovation. Finally, two key observations revealed that simply having engineers use individual title subscriptions or publisher-specific platforms is insufficient:

- 1. Using multiple platforms to solve ONE engineering problem burdens and frustrates the user.** Engineers often start with a practical design or development problem such as developing a more wear-resistant component, and they want a fuller picture around the technology or topic – including proven approaches and best practices as well as cutting-edge, emerging developments – without having to access multiple platforms, each with different features. Using Knovel to access proven best practices and approaches around a topic, then having to search for a journal article using a different full-text journal platform like ScienceDirect or SpringerLink to access the emerging technical insights around the same topic requires the engineer to re-create the same search in two platforms with different types of search capabilities. As a result, the engineer’s workflow is made more complex and tedious and administrators are forced to spend additional time training and re-training users on multiple platforms.
- 2. Engineers do not have a solution for getting the latest, most relevant ‘applied’ engineering insights from journals, regardless of journal title or publisher.** It is not surprising to discover this as a gap for journal-based content solutions, given that the same is true in terms of how engineers need insights to be made accessible from technical reference sources and materials and substance databases. Engineers recognize and worry about how the answer to their problem can be found in a title or publisher they are NOT familiar with. They don’t have the time to constantly ensure their suite of titles and publisher platforms are the most current and relevant based on market changes. In addition, there is a clear preference from engineers to make careful distinctions between purely scholarly and theoretical research journals versus more applied engineering journals. The current option of picking a few titles or publishers that offer full-text journal access potentially not only more time and effort for the user and the administrator of information resources, but also means missing access to applicable insights that may be found in an unfamiliar or unsubscribed journal title.

DEVELOPING A SOLUTION: ABOUT KNOVEL JOURNAL MODULES

To address the previously described customer needs and gaps, the Knovel team developed Knovel Journal Modules, which are discipline-specific resources that expand the value of Knovel by enabling engineers to discover emerging technology developments from journal content within the same user experience as information from the technical reference content offerings and materials databases.

Like other resources found in Knovel today, the basic approach with Knovel Journal Modules is that the content access is 'turned on' and users can leverage Knovel's engineering-specific search and interactive content capabilities to cull insights from a curated set of engineering journals sourced from multiple publishers.

Knovel Journal Modules are intended to be 'discipline-specific' and consistent with the subscription model used in Knovel's technical reference content offerings. Titles selected for inclusion in the Knovel Journal Modules are those which have industry-relevance as part of their aims and scope, maintain high-quality levels, and come highly requested and recommended by practicing engineers.

Topics included in the Knovel Journal Module for Chemical Engineering include:

- Catalysis & Reaction Engineering
- Environment, Health, and Safety
- Extractive Metallurgy
- General Chemical Engineering
- Heat & Mass Transfer
- Manufacture of Specialty Chemicals
- Process Design, Control, & Optimization
- Separation
- Solid & Particle Technology

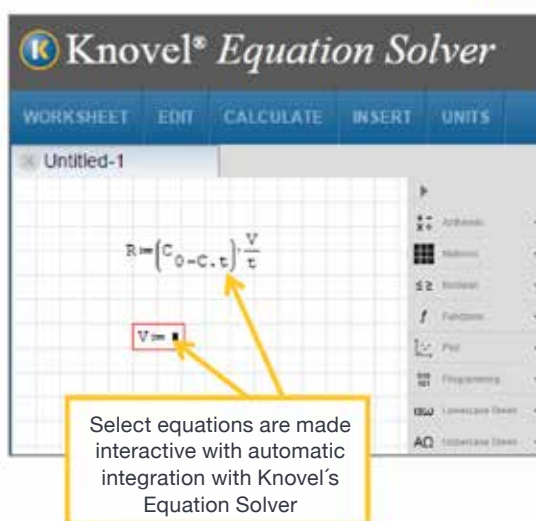
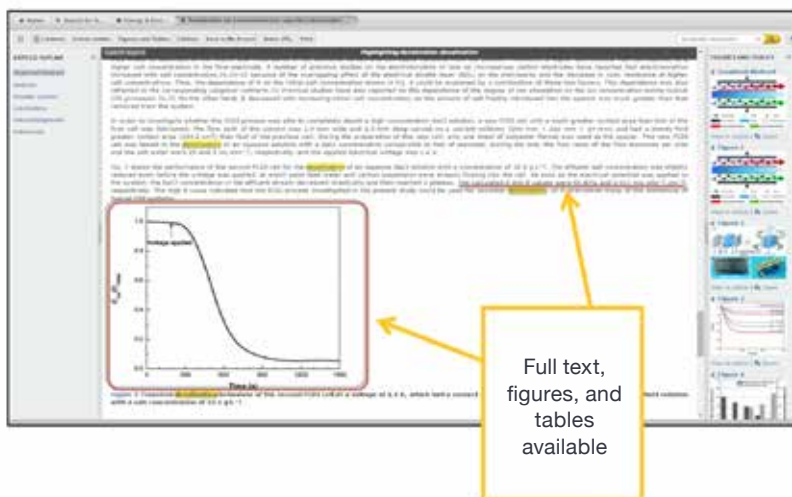
With this content coverage, the solution is relevant to those in the Chemicals, Downstream Oil and Gas, Engineering Design & Construction, Consumer Packaged Goods and Food and Beverage, Pharmaceutical industries, particularly for engineering teams that design and upgrade major chemical or processing plants.

The following product screenshots summarize how Knovel Journal Modules currently work:



“I really like the interactive graph and calculation features. They are helpful for modeling. If a model is close to a work condition, we can apply it.”

—Senior Engineer, Energy Industry



Knovel Journal Module for Chemical Engineering, was in ‘beta’ testing from February-July 2015 through the Knovel Design Partner Program. Based on insights on customer needs and gaps, the Knovel team assessed the Knovel Journal Module concept. Key findings are as follows:

- **Curation and aggregation of relevant content across multiple publishers is a must-have:** Customers need solutions that ‘guide users on what else to read’ for a focus area or problem, regardless of publisher. In addition, for customers that may already subscribe to full-text journal platforms for large publishers like Elsevier, it was critical for the Knovel Journal Module to also deliver on other, hard-to-find and specialized content coverage from a mix of reliable publishers.
- **Engineers highly value the curation of ‘applied’ engineering content:** Users have a clear preference to making distinctions between purely scholarly and theoretical research and more applied engineering research articles.
- **Users want the simplicity of a single, unified experience that helps them derive insights from both journal and technical reference content sources:** They highly value being able to enter one search query and easily toggle between content types, as well as not having to go back and forth between multiple platforms.
- **Alerts on new available content need to be enabled:** Given the dynamic nature of technology developments, enabling users to be alerted whenever new information about their topic of interest is available via Knovel is more critical for journal content, than technical reference content.

“Now you have the ability to actually look at journals and get articles and do pretty much the same thing [as you are doing with other content sources] like share the content with individuals.”

—Information Manager,
Pharmaceutical Industry

- **Users readily understood how journal content was integrated into the standard Knovel search results page, and the on-screen journal article page layout:** The delineation between the two content types –Journals and Technical Reference – was easy for users to understand when searching and reviewing results. However, in some cases, users needed to be informed of journal content being accessible as a separate filter on the search results page. On the journal article page view, users readily understood how to use the page, responding positively to having the article outline on the left pane, image thumbnails on the right pane, and DOI reference linking.
- **Some users wanted the ability to also click through to broader research databases to understand related research areas.** As part of an engineer’s investigation of a new approach or technology, they will read a number of articles written on the topic, using the references and citations included in articles as roadmaps to guide them.
- **Some users expressed interest in learning more about interactive equations and content or being able to access it.** Being able to explore multiple scenarios with experimental data, for innovation purposes was seen as an interesting feature.
- **Users believe Knovel Journal Modules will be easy to adopt for individuals and organizations who already use Knovel:** Customers responded positively to being able to leverage Knovel’s familiar and intuitive platform to cull insights from journals, in addition to the existing resources. This helps avoid having to coordinate extensive training and adding yet another ‘tool’ that users have to learn.

CONCLUSION AND NEXT STEPS

Knovel Design Partner feedback suggests that the Knovel Journal Modules can help address two challenges that engineers face when using individual title subscriptions or publisher-specific journal platforms for design and development purposes: (1) the burden of having to go to multiple platforms to achieve a fuller picture that includes proven approaches as well as emerging technology developments and (2) the lack of a solution in the market that provides engineers with the latest, most relevant ‘applied’ engineering insights from journals, regardless of journal title or publisher. In particular, Knovel Journal Modules can benefit customers in the following ways:

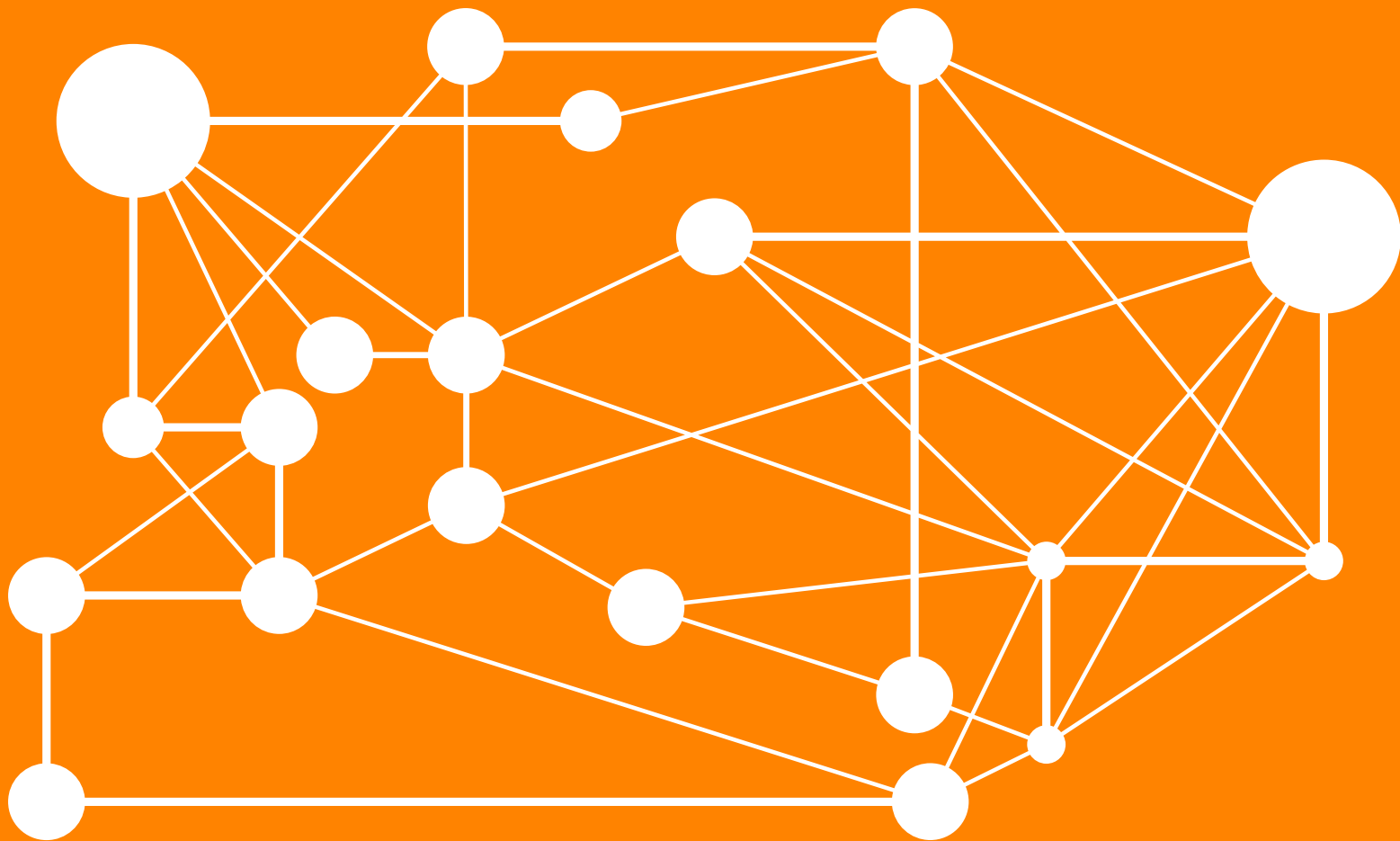
- 1. Get a fuller view on possible approaches to design and development:** Knovel Journal Modules can help users find more and recent answers to technical questions and problems by complementing existing information on best practices and proven approaches, with cutting edge-thinking and experimental data
- 2. More efficiently drive innovative, competitive thinking in changing markets:** Knovel Journal Modules can help ensure that engineers are always able to access the latest ‘applied’ engineering insights by offering a comprehensive, curated and regularly updated content base of emerging technical literature from which engineers can easily and regularly draw insight, directional thinking and ideas
- 3. Get additional valuable insights without complexity:** Knovel Journal Modules can offer users additional valuable insights without the information overload and the need to learn a new platform

As a next step, the Knovel Product team will leverage the insights gathered to-date in order to solidify and extend the current solution. Many of the tactical suggestions garnered from customers are already underway, including the aggregation of content from key publishers and extension of interactivity.

To conclude, both initial customer requests and subsequent Product team research findings consistently point to Knovel Journal Modules as a viable way to solve the gaps for engineers and expand the value Knovel already provides to engineers working in design and development. The Knovel Product team recently announced an initial offering to the market this year. Given the newness of the Knovel Journal Modules as a resource, customer feedback and suggestions will continue to be actively gathered through various channels of customer interaction.

GET STARTED

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