

InformationToday

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R&D Workflows: What's in the Pipeline

by BARBARA BRYNKO

Researchers today are working with a new set of digital tools in their quest for innovation. R&D is no longer just an abbreviation for research and development; R&D also stands for the process of “reach and discovery” in an information-rich environment, where volume and mass describe Big Data and where successful product rollouts involve more integration, implementation, and collaboration than ever before.

Many of today's R&D labs are cloud-based platforms with web access to drive users to highly relevant content that serves a global scientific community. Streamlining these R&D workflows not only promotes faster access to that critical content but to encourage more collaboration among researchers worldwide. It means researchers can spend more time, energy, and resources actually working instead of wasting time looking for information.

“There was one 2011 study of the scientific community I remember,” says Ryan Sasaki, director of global strategy at Advanced Chemistry Development (ACD/Labs). “It noted that despite the emergence of the electronic lab notebook (ELN) and laboratory information systems in the late 1980s, which had a pretty widespread adoption in the pharma industry, 88% of R&D organizations reported that they still lacked adequate systems to automatically collect data for decision making.” Such statistics point to the dire need to build better solutions for researchers in all disciplines.

Sasaki sees the pain points of the research community in his work at

ACD/Labs, a global chemistry software company that develops and commercializes enterprise and desktop solutions. "Many organizations spend millions of dollars looking for data but not finding it," he says. "Scientists are spending way too much time looking for data. And if they can't find what they need within the first couple of minutes, they often run the experiment again at a very high cost to these organizations."

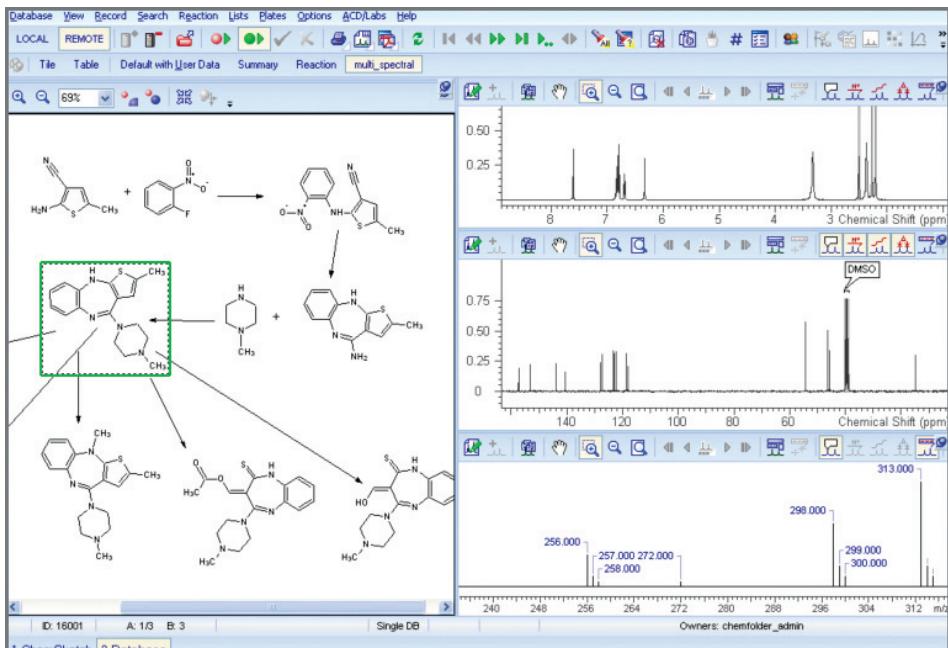
One Interface for Easy Access

Time and cost are two reasons why major R&D integration providers have turned their attention to creating work-

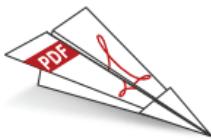
flows with a rich set of capabilities and flexibilities, says Sasaki. Researchers want to work with one interface that has easy access to software services, web applications, and web services, without toggling back and forth between disparate software applications.

The research landscape has definitely changed, says Ryan Jones, co-founder of Pubget, now a subsidiary of Copyright Clearance Center. Three major trends have emerged in research workflows that he sees as having a big impact on what users want and what vendors are ultimately creating in response.

First, the increased distribution of diverse sources has opened the floodgates of



ACDSpectrusDB, from ACD/Labs, offers researchers a single, homogeneous environment for chemical and analytical data. It instantly collects information from an array of analytical instruments, creating a management tool for the needs of today's chemical enterprises.



content options, says Jones; second, users are looking for one-stop rights for that content; and third, there's a greater need for flexibility in accessing that content on whatever format or device the researcher is using. "It's not only making research easier in general, but it's making it easy for a researcher to find the right thing quickly," he says, adding that Pubget now offers its scientific PDF content to 6 million users and 600 academic institutions.

"We like to think we're really different from anyone else in this space," says Jones. "We consider ourselves the glue that holds several pieces of the workflow together behind the scenes, where we tie access to the database to the rights to the collaboration."

Integrating software and applications that users employ in their daily work is often essential in building a workflow that responds to specific user needs. Many companies that design solutions are responding efficiently to these user needs with customized workflows that vary from discipline to discipline in the scientific research environment.

"Smart vendors are the ones who realize they can't just sell us a bunch of boxes anymore," says Sasaki. "They need to sell us something that we can integrate directly into our workflows." He's seen many vendors sit down with researchers at conferences recently to talk candidly about the best ways to improve integration for better workflows and better results.

Catering to the Researchers

These one-to-one conversations are all part of the growing openness of the scientific community. "We're getting more open," says Sasaki, citing discussions from several recent pharma conferences he has attended. "This doesn't mean sharing trade secrets or formulas, but it means sharing best practices in what makes us more productive, what makes us get a drug to market safer or faster." It's a concerted effort to spend less time spinning our wheels and more time driving products to market faster and more efficiently.

Sharing siloed information is still among the toughest challenges that scientists in the research community face. "It's hard enough at times for a biologist to talk

to a chemist let alone have them share their work," says Sasaki. But part of the beauty of creating effective workflows includes ways to share siloed information, especially across multidisciplinary fields. He compares data silos to a community in the suburbs: The suburb has several different neighborhoods that are made up of individual houses, which, in turn, have people living in them. The challenge is getting the people in those houses and in

that let researchers use content the way they want to use it. Elsevier's dual capabilities as a technology company and a publisher have a big impact on building a better platform for tapping into information for research discovery.

"Researchers need answers," says Sidi. "They are looking for insights and specific pieces of information, but they still rely on articles almost exclusively." But that reliance isn't usually on finding the full text;

The screenshot shows the Pubget search interface. At the top, there is a search bar with the query 'pharmacoproteomics 2010' and a search icon. Below the search bar, there are tabs for 'Papers', 'Journals', 'Bookmarks', 'Tags', and 'MeSH'. Under the 'Papers' tab, there are two search results:

- DrugBank 3.0: a comprehensive resource for 'omics' research on drugs.**
C Knox, V Law, ... D S Wishart
Nucleic Acids Res 39(Database):D1035-41 (2011), PMID 21059682
DrugBank (<http://www.drugbank.ca>) is a richly annotated database of drug and drug target information. It contains extensive data on the nomenclature, ontology, chemistry, structure, function, action, pharmacology, pharmacokinetics, metabolism and pharmaceutical properties of both sma...
- Proteomic Protease Substrate Profiling of tPA Treatment in Acute Ischemic Stroke Patients: A Step Toward Individualizing Thrombolytic Therapy at the Bedside.**
Mingming Ning, David A Sarracino, ... Eng H Lo
Transl Stroke Res 1(4):268-275 (2010), PMID 22140417
We describe an initial attempt in proteomic substrate profiling, i.e., degradomics in human plasma within the context of acute stroke. Plasma from acute stroke patients were analyzed pre- and post-intravenous tPA using tandem mass spectrometry and protein array profiling to identify substrates and p...

For iPad users, Pubget, a Copyright Clearance Center business, offers access to 30 million papers, which can be read then and there or can be saved for reading later.

those neighborhoods to communicate with each other so everyone knows what is going on and has access to the same data.

"Listening to users is the key to understanding what they need," says Rafael Sidi,

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vice president of product management for ScienceDirect at Elsevier B.V. Sidi is intent on designing new productivity tools

researchers focus in on what appeals to them at the time or for their specific needs, which may be an abstract or specific methodology, he says. "We serve researchers in the best way by creating more value through tools and enriching the content we provide." The proof is in Elsevier's range of products and initiatives such as Geofacets, illumin8, and Article of the Future.

Sidi says he collaborates with researchers by formulating concepts and building solutions that improve their lives and productivity. "We want to engage users in the workflow experience," he says. "It gives the product development team better information to use in the design phase, and ultimately, it gives the researcher easier access to the information they are looking for in the product itself."



Sustaining Efficiency

Two big drivers in workflow innovation are efficiency and sustainability, says Christopher McKenna, vice president of professional services at Thomson Reuters. "The focus is on not only how the work is being done but in creating a sustainable workflow to make that a more efficient process," he says.

For the past 3 years, Thomson Reuters has worked with Deloitte Development, LLC on financial analysis to calculate the ROI of R&D. McKenna says the decreased ROI that pharmaceutical companies have reported in R&D is something that's been happening for the past 15 years. But he says it's finally reaching a point where it is bottoming out, and the pressure from pharma executives to be more efficient and to get more value from their R&D spend are still factors driving the different parts of the pharmaceutical value chain. And for platforms such as Cortellis, the pharmaceutical value chain includes a wide spectrum of options, from early discovery to preclinical and clinical development to regulatory compliance to market access and commercialization.

The interplay of factors on the pharma value chain can pave the way for future development as well. One of the trends McKenna is seeing involves next-generation sequencing (a revolution in genetic research) and its role in becoming a usable element in terms of decision making. "We're working on workflows that are bringing the next-generation sequencing into our pathway analysis systems to determine what targets are likely to yield efficacy," he

says. "And on the discovery side, we're dealing with the volume and velocity of that data for next-generation sequencing."

The Cortellis platform has two key features that enhance workflow: a dashboard visualization and APIs. The dashboard visualization lets users see data more easily as the tools collect data in context and keep it live as it flows in from different sources, he says. The investment in APIs has also resulted in greater efficiencies. Content about drug pipeline data, patent information, deals and partnerships, literature, clinical studies, and regulatory documentation strategies have all

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been consolidated onto one platform. With the APIs as part of Cortellis, more content sets can be added to the platform along with more APIs to push data through the system to users. "Users don't have to log in multiple times on multiple programs to export their data," says McKenna. "With the APIs, the content flows into the systems they are using."

One of the reasons Cortellis has succeeded in gaining quick acceptance is that users helped develop the platform, another big plus for workflow adoption. McKenna explains that users didn't want advanced search; they requested a simple, Google-

like search experience for the platform, where they could enter a drug, target name, or company they were interested in and then pull up the results. But the product developers turned the control back to the users. Since no one likes to scroll through thousands of results, says McKenna, users can select tabular results to export into Excel for analysis.

Going Mobile

Mobile is playing more of a role in R&D, but actual usage varies from discipline to discipline. "We're seeing mobile devices proliferating in the pharma space," says McKenna. When members of a project team are in a meeting, it's easy to grab a tablet and check on the available clinical intelligence right in the meeting, he says. Having access to a mobile device serves as a real-time decision-support tool.

But in chemical R&D labs, mobile isn't living up to all the hype at this point, says Sasaki. "In labs where data visualization is key, researchers may have two or three monitors hooked up to their computers, all using different applications," he says. "A tablet is great for a single app, but not all the apps have been specifically designed for the tablet, and this shortcut can limit the value that a scientist sees for using the application."

The Value of Shared Data

Collaboration is at the core of ProQuest's mission for its internal product development teams and for its users. "Much of the primary research we conduct to develop our products and services is helpful for our

Importing Skilled Workers

The U.S. is facing a unique challenge: The nation has long reached a point where it can absorb more high-tech professionals than its educational system can produce. As a result, the door for talent is open to those outside U.S. borders, especially in the STEM field where 26.1% of workers who have Ph.D.s. and 17.7% with master's degrees are foreign-born, according to the Immigration Policy Center. Those rates could be even higher if immigration restrictions on H-1B visas and green cards were lifted.

But this doesn't mean that the influx of foreign-born workers is taking jobs away from U.S. citizens. Instead, new jobs are being created.

- Every foreign-born student who graduates with an advanced degree from a U.S. university and works in STEM creates on average 2.62 jobs for U.S. workers through R&D and innovation, according to a 2012 report from the Information Technology Industry Council, the Partnership for a New American Economy, and the U.S. Chamber of Commerce. The report also noted that many STEM jobs "have markedly low unemployment, and that foreign-born STEM workers currently in the workforce are complementing, not displacing their U.S. counterparts." In addition, the report explained that STEM workers with advanced degrees who are U.S. citizens have full employment rates.
- Foreign-born entrepreneurs launched 18% of all Fortune 500 companies, many of which are high-tech companies (e.g., Google, Yahoo!, Intel, eBay), according to a 2011 report from the Partnership for a New American Economy.

customers in honing their services, so we make a point of sharing it with them," says Pam Cory, vice president of global field and enterprise marketing at ProQuest. Products such as ProQuest My Research and RefWorks Flow are all about helping researchers store, manage, and share their data.

And Rich Belanger, CIO at ProQuest, takes it a step further: "I feel that greater collaboration and transparency is more important for us than compartmentalized security," he says. "We actually share R&D activities more broadly within the company to get input from a wide variety of teams."

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