5-Minute Guide to

Cognitive Search for the Life Sciences

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Forrester Research, Inc. defines cognitive search as, " The new generation of enterprise search solutions that employ AI technologies such as natural language processing and machine learning to ingest, understand, organize, and query digital content from multiple data sources."

Cognitive search has its roots in enterprise search, which goes back to at least the 1960s. Since then, enterprise search improved but only gradually and incrementally. However, once Google entered the search arena, things really got interesting. Google and other search vendors started to employ technologies from the field of AI — machine learning, text analytics, and natural language processing. Search became easier to use, faster, and the results more relevant.

Scientists and academics are still trying to agree on a definition for cognitive computing,[1] but, from the commercial perspective, there's general agreement on the basics of cognitive search. Forrester defines cognitive search as, "The new generation of enterprise search solutions that employ AI technologies such as natural language processing and machine learning to ingest, understand, organize, and query digital content from multiple data sources.[2]

Across verticals and job functions, cognitive search delivers the power and intelligence behind thousands of applications that boost employee productivity, improve customer engagement, accelerate R&D, and support data analytics that streamline operations and business processes.

THE BASICS OF A COGNITIVE SEARCH PLATFORM

Before we jump into how cognitive search would work in a customer support solution, let's take a brief look at the core capabilities of a cognitive search platform. A cognitive search platform should combine self-learning technologies such as natural language processing, machine learning, and knowledge graphing to deliver a contextualized search and discovery experience without compromising security.

1 https://en.wikipedia.org/wiki/Cognitive_computing
2 The Forrester Wave™: Cognitive Search and Knowledge Discovery Solutions, Q2 2017

The Cognitive Search Platform

- Ingest, index, and analyze virtually any data type.
- Integrate behavioral data to personalize the user experience.
- Scale to accommodate massive data volumes.
- Provide robust security that's transparent to the user.

To accomplish that, cognitive search platforms should:

- **Ingest, index, and analyze virtually any data type.** That means having native connectors to scores of structured and unstructured data types residing in traditional relational databases and modern data frameworks such as Hadoop, NoSQL databases such as MongoDB and MarkLogic, columnar databases such as Apache Parquet, and data serialization engines like Apache AVRO. The platform should also include an SDK that allows developers to build connectors to new or proprietary data types.
- **Integrate behavioral data to personalize the user experience.** Part of what makes cognitive search cognitive is its ability to learn from user behavior. Think of the Netflix recommendation engine that tailors recommendations based on what a subscriber has watched in the past.
- **Scale to accommodate massive data volumes.** From terabytes to petabytes and beyond, organizations are amassing and keeping more data than ever. Partly, it's simple economics. The cost per gigabyte of hard drive storage has declined steadily over the last 30-plus years. It's now around two cents.[3] And many companies are turning to the cloud where storage is not only cheap but also elastic. A cognitive search platform needs to feature a highly scalable distributed architecture that can support many concurrent users accessing tons of data.
- **Provide robust security that's transparent to the user.** This can be achieved with a data-centric security model that uses rich text analytics and machine learning to understand the connections between data. This allows administrators to write policies based on detected entities, advanced Boolean queries, and machine learning-based classifiers. They can create added filters to a user query, which ensures that result sets contain only information for which that user has permission.

3 http://www.statisticbrain.com/average-cost-of-hard-drive-storage/

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COGNITIVE SEARCH FOR THE LIFE SCIENCES

Life science companies engage in a variety of activities that can benefit from cognitive search. Two of these activities, which can dramatically affect the bottom line include:

- **Research to develop new therapies that cure or reduce the severity of disease.** In this endeavor, scientists want to improve their success rate while accelerating the research process. The faster they can find effective new therapies, the faster they can test and submit them for regulatory approval.
- **Increase therapeutic innovation by finding new, off-label uses for existing drugs.** Companies invest heavily in developing drugs so when scientists can find additional uses for them, more patients benefit.

And, although their use is not confined to the life sciences, Customer360 solutions powered by cognitive search can also make a significant contribution to more effective sales and marketing for pharma and biotech companies.

More than half (54%) of global information workers are interrupted from their work a few times or more per month to spend time looking for or trying to get access to information, insights, and answers. Do the math. That's a lot of inefficiency.[4]

Accelerating Research — Drug Discovery

For search to be useful to scientists in drug discovery, it needs to go far beyond what the enterprise knowledge worker typically uses search for. Of course, the search application needs to crawl file shares like SharePoint and Documentum. And it needs access to company research databases. But that's just the beginning.

Cognitive search solutions can broaden search to include electronic lab notebooks, laboratory information systems (LIMS), chemical drawing software like ChemDraw, information services such as PubMed, which connects with the MEDLINE database, and other subject matter experts within the organization. Native connectors make any relevant source of information accessible through a single interface. With cognitive search, a researcher could start with a complete or partial chemical structure or a DNA snippet and the results would return — in order of relevance — to an intranet web page.

For example, suppose a scientist could employ one term or one description of a disease and find all the internal and public information available for that term with a single search query?

4 The Forrester Wave™: Cognitive Search and Knowledge Discovery Solutions, Q2 2017

If big data and machine learning reach the level of maturity for routine application, researchers will have more time and be able to obtain answers to their research questions more quickly.[5]

Or, what if the researcher could find all the associated genes or research projects buried inside an electronic lab notebook — as well as those from public data sources like PubMed and Clinicaltrials.gov? Mapping the registration number or asset identifier from the internal system to a gene or chemical enables the researcher to see all the related information — internal and external — such as synonyms and proteins.

Cognitive search solutions also automatically observe the individual security protocols of the data sources. They incorporate a clear understanding of how organizations use access controls, including factors such as location, device, time of day, and temporary access. Access control and related security information from connectors is stored in a relational structure within the universal index and separate from the searchable information. Plus, cognitive search enables IT to centrally manage search resources without migrating data or creating project-specific data marts.

Increasing Innovation: Off-Label Drug Use

Cognitive search can bring the same speed and efficiency to identifying potential new uses for drugs. In this context, researchers often start with a hypothesis for which they need to search medical literature to confirm its value or abandon it.

Access to databases such as MEDLINE, Medi-Span, and DrugBank are critical to this effort. Medi-Span and DrugBank offer comprehensive and current information about drugs and drug targets. SAS data sets analyze how drugs are working in patients.

With this kind of access, a researcher could enter a compound name and see all the pain types associated with that compound from PubMed, clinical trial data, and event patents. The researcher could also quickly find other colleagues working on these pains and whether they think the compound might offer relief.

Moreover, since regulations constrain how pharma companies market off-label drug use, the researchers could identify the potential risks of using drugs in a way that differs from its approved use.

5 https://www.biosciencetechnology.com/article/2017/04/machine-learning-disrupting-life-science-research-good

Cognitive search & insight solutions provide increasingly relevant answers to implicit and explicit queries by combining self-learning technologies such as indexing, natural language processing, and machine-learning.

Customer 360

A 360-degree view of the customer is something every company — life science or otherwise — aspires to and few can achieve. Aggregating data from various and changing customer touch points is a little like the myth of Sisyphus. Just when you've got that rock to top of the hill, it rolls back down.

When companies grow through acquisitions it enables them to broaden their product portfolios, but integrating disparate IT systems of acquired companies often poses a barrier to realizing an acquisition's full revenue potential. For example, a company may find itself with multiple CRM instances from different vendors. Plus, not only do you have multiple customer systems to integrate, you have multiple sales and marketing organizations.

In addition, many of the firms life sciences companies acquire have themselves grown by acquisition, which further complicates efforts to identify all the entities that roll up under one company. Consolidating sales opportunity and customer satisfaction reporting for large customers can take many hours of manual processing and produce a static report that's soon obsolete.

Using cognitive search to support Customer 360 eliminates the need to migrate data from many systems — and the data normalizations that goes with it — to a single repository that requires constant maintenance. Cognitive search creates an integration layer that uses native connectors to every relevant data source.

As the search application "learns" from user interaction, it delivers:

- Global visibility into current and past sales opportunities across all company divisions,
- The ability to connect search results to visual analytics applications for interactive reports and dashboards,
- The freshest data direct from the original sources.

COGNITIVE SEARCH DRIVES LIFE SCIENCES INNOVATION

It used to take years for the improvements in search technology that emerged from academic research to filter down to commercial enterprises. Not any longer. Now it's often a matter of months, which has accelerated the pace of change in and adoption of cognitive search. Cognitive search can speed innovation in the life sciences while increasing productivity and lowering cost.

Attivio's cognitive search solution delivers insight and innovation to market leaders, with a platform that scales efficiently and operates effectively. Leading, independent analysts rank Attivio as a leading provider in search, knowledge discovery, and text analytics. Attivio exhaustively catalogs every relevant source of information, enriches every cataloged object, and offers an agile, extensible platform for building smarter search-based applications.

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Attivio is the leading cognitive search & insight company. Our Fortune 500 clients rely on us to drive innovation, operational efficiencies, and improve business outcomes. Our solutions provide industry-leading natural language processing, machine learning, analytics, and knowledge graphing capabilities at scale. Let Attivio empower you to act with certainty.

For more information, **please visit www.attivio.com.**