



CASE STUDY

Applied Materials Promotes Knowledge Sharing and Reuse with Information Architecture and Taxonomy Capabilities from Earley & Associates

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IDC OPINION

The information management challenges facing workers in most organizations today are immense. The amount and pace of information that workers have to deal with on a daily basis are increasing dramatically, in some cases more than doubling on an annual basis. At the same time, organizations are realizing that to be effective and to make the right decisions, they must improve how they empower their workers to make those decisions with the proper data and information analysis tools.

Big data – in all its forms – and associated technologies, skills, and processes promise to radically change how information is utilized to make better decisions, to interact with customers, to optimize operations, and to provide services. A big part of realizing this promise is dependent on efficient access to unstructured content and analysis of such content in addition to and in conjunction with structured data.

Although unstructured content accounts for 90% of all information according to IDC, organizations have to date overinvested significantly in technology and processes for structured data management. Yet unlocking the value hidden in unstructured content is more critical than ever. Organizations still tend to take a very fragmented approach to dealing with this type of information. IDC's latest research indicates that 61% of knowledge workers access four or more systems on a regular basis to get the information they need to do their job and 30% of knowledge workers need to access seven or more systems.

This unstructured information is locked in a variety of formats, locations, and applications made up of separate repositories that don't talk to each other. Providing unified access to varied unstructured and structured information is still not easy for many organizations, but 77% of knowledge workers surveyed indicated that a single, unified information access point to all of the information they need for work would be beneficial or very beneficial. Indeed, organizations are making strides in this area, with 78% of knowledge workers surveyed reporting that their organization has seen tangible benefits from its unstructured information access and analysis capabilities.

In this case study, we examine how Applied Materials has overcome this information challenge and harnessed the pervasive use of unified information access. As part of this case study, we look at how Applied Materials makes use of unified information access capabilities to satisfy the needs and requirements of its field service engineers.

METHODOLOGY

This case study is part of a broader research study titled *Unlocking the Hidden Value of Information*. The study identifies the challenges faced by organizations looking to leverage technology to access and analyze structured and unstructured content, and it provides recommendations for overcoming such challenges. The goal of the study is to identify methods and technology that can improve knowledge workers' productivity and unlock the value hidden in unstructured information, thereby enabling improved communications and decision making as well as optimized business processes. The methodology included a survey of over 2,000 knowledge workers from private and public sector organizations in 5 countries and in-depth interviews with 11 organizations. IDC defines knowledge workers as employees who are connected to the Internet and use a computing device to find, create, share, access, or enter information or data electronically in the course of performing their job. Skilled task workers, researchers, salespeople, analysts, managers, IT staff, executives, and professionals are all included as knowledge workers. One of the organizations interviewed was Applied Materials, a leading semiconductor equipment manufacturer. The company and its managers who were interviewed by IDC analysts were recommended to IDC by Earley & Associates, which is one of the cosponsors of the *Unlocking the Hidden Value of Information* study.

SITUATION OVERVIEW

Organization

Applied Materials is a global leader in providing innovative equipment, services, and software to enable the manufacture of advanced semiconductor, flat-panel display, and solar photovoltaic (PV) products. The company's technologies help make innovations such as smartphones, flat-screen TVs, and solar panels more affordable and accessible to consumers and businesses around the world.

Applied Materials is made up of four separate business units: Semiconductor Equipment, Display Unit Technology, Energy & Environmental Solutions, and Applied Global Services (AGS). The AGS division offers consulting, spare parts, services, automation software, upgrades, and legacy equipment solutions to semiconductor, solar, and display factories to improve factory performance and productivity. As part of its service solutions, AGS has a team of customer engineers who provide corrective, preventive, and predictive services to Applied Materials customers.

Requirements

Applied Materials has grown over the years both organically and through acquisitions. The company's businesses and solutions reach across several industries, with many different content and data repositories and applications. Each business unit has its own set of unique information and ways of doing business. The AGS group was tasked with the challenge of organizing all this information and exposing it through a single portal, through which customer engineers and other employees could systematically search and locate information they needed to perform their jobs. As part of organizing the information, the group realized a critical need to add structure to unstructured information so that it could be used to better enable findability through search and navigation.

Applied Materials field service engineers work onsite at customer factories to install, repair, and maintain customer-owned semiconductor manufacturing, solar, and display equipment. Their expertise is based not only on experience and training but also on the ability to leverage company resources, such as product documentation and best-known methods. Relevant information was scattered throughout numerous sources and locations and was presented in different formats. The information was not easily integrated and therefore was difficult and time consuming to find, often requiring separate searches in disconnected systems.

The approach and solution that AGS needed required the ability to connect to both static data sources and active repositories, including Lotus Notes databases, Livelink repositories, file shares, and Web sites, as well as several other content sources. The company also felt very strongly that it needed an approach and methodology to unify and harmonize all of this information with the use of taxonomies. As Erik Wolf, the Applied Materials architect in charge of the project stated, "The key was definitely taxonomy." The goal was to be able to access and retrieve different types of information using a unified set of organizing principles by applying rules that would always work in the same manner. This approach in turn would create a presentation layer for a unified information access system that would provide filters, navigation, and location via standard taxonomies and allow retrieval of content in the context of problem, equipment, symptom, process, or task.

Specifically, AGS needed the unified information access solution to do the following:

- Manage the content authoring processes
- Enable formal and social tagging of content
- Increase field service engineer productivity
- Protect customer and internal confidential information
- Dynamically deliver relevant content in context

AGS put out a request for proposal (RFP) to develop a strategy to increase the integration of structured and unstructured information within Applied Global Services and to develop an information architecture utilizing metadata and taxonomy to respond to overall Applied Materials needs.

Solution

Earley & Associates (Earley) responded to the AGS RFP and was chosen to develop a strategy and road map for the company, as well as assist with the implementation of that strategy. Earley is an information management consulting company specializing in content management and search strategy; taxonomy, metadata, and information architecture; indexing, auto-tagging, and migration; content modeling and publishing; Microsoft SharePoint solution design and development; master data management; and data quality and harmonization. These approaches are used in a variety of industries and functional areas – especially in knowledge-intensive processes such as customer support and field service.

Earley proposed a two-phase process. Phase 1 focused on developing a strategy and road map, and Phase 2 delivered an information architecture utilizing taxonomy and metadata as key attributes of the architecture, as well as a technical solution design and user experience design for the information access solution. Phase 1 took approximately six weeks to complete, with Earley comparing the current state to

the desired future state, performing a gap and return-on-investment (ROI) analysis, and creating an overall strategy and road map for AGS. Phase 2 took approximately four months and included the development of taxonomy and metadata frameworks, a technical solution architecture, technology selection, a user interface design, and business process analysis and workflow redesign, as well as the development of tagging and governance strategies for all of the business units contributing documents to the unified repository.

In Phase 1, Earley sent surveys to over 600 AGS field service engineers and found that 90% of those knowledge workers were unsatisfied with the amount of time it took to find a part and also felt unsatisfied with spending 9-16 hours looking for content overall. Findings from IDC's knowledge worker survey were similar, with knowledge workers spending 4.6 hours per week searching for but not necessarily finding the information they were looking for.

Logistics also affected search time because workers sometimes had to leave the customer's cleanroom environment to locate the information that they needed. Earley laid out a three-year road map to unify all of the relevant content into a single virtual repository, providing customer engineers with a single portal that they could use to locate the information needed to repair equipment quickly. For the purpose of ROI, Earley calculated that Applied Materials could save an aggregate of more than 500,000 hours per year, reducing equipment downtime and providing more time for the customer engineers to spend in the fab fixing equipment rather than researching information.

In Phase 2, Earley designed and developed a complete information architecture for Applied Materials focusing on:

- Taxonomy and metadata framework design and implementation
- Business process reengineering to create a unified authoring and publishing strategy
- An information governance and tagging approach to auto-categorize content and ensure the security of the intellectual property of the company and its customers

Earley also provided a user interface design for the portal application that was to be developed. In addition, Earley worked closely with Applied Materials and software vendors Smartlogic and BA Insight to ensure that the developed application, known as the Applied Rapid Knowledge (ARK) portal, met the criteria that Earley had developed as part of Phase 2. Finally, Earley provided industry-standard best practices around the use of information architecture, taxonomies, and the development of search-based applications to satisfy the needs of Applied Materials' end-user community.

Deployment

AGS used Microsoft FAST Search Server 2010 for SharePoint as the technology foundation for the newly designed application. The ARK portal is an innovative search-based application that enables customer engineers to find unstructured product documentation along with structured part information located across multiple data sources through a single, unified user interface. In addition to powerful search capabilities, ARK provides collaboration features that enable users to give feedback on product manuals, update part information, and engage in discussions with their peers. This two-way information flow captures high-value knowledge from the field in a way that enables continued growth of the content management solution and long-term viability as a knowledge asset.

To ensure that the quality of information remains high and that each item is easily accessible through ARK, AGS also uses Smartlogic's Semaphore for managing the taxonomy developed by Earley. As documents are added into SharePoint, Semaphore automatically classifies them using the taxonomy, with predefined rules to drive tagging. In addition, connectors for Microsoft FAST Search link structured data sources and content management repositories so that information from these disparate sources can be indexed, searched, and presented within a single user interface. BA Insight Longitude provides document previews and the ability to create dynamic workbooks from a set of search results, saving time and improving field service productivity. The overall system contains information on over 33,000 installs – including tools in the active repositories' installed base as well as thousands of tools in the company's historical archives.

The search experience integrates rich media through a visual spare parts identifier (digital asset management system), which helps identify parts by including images that are components within the tool being repaired. As a result, when customer engineers search for a part number, they also get the associated images. This presentation allows users to traverse the part hierarchy, allowing engineers to view parent, sibling, and child relationships among parts. Every document in the system that has a particular part number tagged to it will show up as part of this semantic view of information.

Outcomes and Benefits

The new unified information access application has been very well received by internal users, and it has received external industry recognition. Field service engineers have reported an average 50% reduction in time spent searching for information based on "before and after" tests. Engineers can now easily find information about a part, preview or download part schematics, check on part availability, and see related parts and products.

The benefit has been not only in the speed and ease of information access but also in the 10% improvement in the accuracy of search results. For example, it was crucial for an engineer to find and use the most up-to-date repair procedure. If an engineer found and used the wrong procedure, or an outdated version of the procedure, it could impact the customer's business and create significant issues in the customer's fab.

The new application has made the engineers more confident in the data because it helps them find the right answers to their questions more quickly, which in turn has translated into faster and lower cost resolution of customer issues. Customer satisfaction with the service provided by AGS has also improved.

New automation features such as rules-based document classification further improved the unified information access process, which accelerated worker productivity by making it easier to identify related information. The rules-based classification allowed AGS to protect its own intellectual property and the intellectual property of its customers from a security standpoint to ensure that customer engineers retrieved and used only the information that they were entitled to see when working at a particular customer site. Since Applied Materials provides many custom tools and services that include processes and intellectual property from its customers, the company needed the ability to verify that the system would return only the results that were allowed for each user. The intellectual property challenges are compounded when Applied Materials sells products to competitors or codevelops a solution for a particular customer. If, for example, a custom solution was codeveloped with one partner,

that information would need to be segregated from any teams that might support a solution developed with a competing partner. Automated security procedures based on taxonomy and classification help ensure that intellectual property is secure and protected.

Finally, AGS benefited from a common centralized user interface. Engineers no longer have to learn 17 different search applications to find information across the various repositories.

LESSONS LEARNED

- **Know your customer.** It is crucial to understand what end users want, what they value the most, and what is critical to their success. AGS worked with Earley & Associates to conduct an extensive survey and analysis of the targeted end users. Subsequent design and development efforts were based on the information collected and discovered through this process. Since preferences for information access among knowledge workers can vary widely, organizations launching unified information access projects should conduct extensive end-user requirements and usability research prior to any new technology deployment. At AGS, the analysis revealed which features were table stakes and which were nice to have. The project team identified functionality that would drive adoption. This included identification of process bottlenecks to content production and articulating the business impact in terms of ROI. Knowing the customer at a deep and detailed level ensured that the project would be successfully deployed and adopted and generate the desired ROI.
- **Develop an overall information architecture strategy.** As part of the initial analysis and design work, Earley & Associates was able to help AGS develop an overall information architecture strategy that incorporated all of the different types and locations of information that customer engineers needed to do their jobs effectively. With the information architecture strategy and road map, AGS was able to develop an implementation process that brought all of this information together in a unified fashion.
- **Use taxonomies to harmonize metadata and information across locations.** Much of the information that needed to be accessed by AGS field service engineers was related, but it was stored in many different repositories and accessed in various ways. By developing and utilizing a common taxonomy to categorize and navigate to content, the company was able to knit this information together for the end users so that all of the pertinent information was available and easily accessible.
- **Utilize semantic technologies to relate information.** AGS used taxonomy in combination with technologies such as Smartlogic's Semaphore to semantically relate content such as part information with repair procedures and inventory information. The automatic connection of related content made it easier for customer engineers to access everything they needed to solve a particular customer problem.
- **Integrate information security into the overall application design.** Earley & Associates worked with AGS to consider information security as a key organizational aspect of its data. As a result, AGS was able to design and develop its business processes to ensure information security. Using automation to create rules and procedures has allowed engineers to access and share the information that is available to them while keeping other information safe and protected.

- **Choose software and services partners that fit your organization's needs.** Since AGS had decided on using Microsoft FAST Search Server 2010 for SharePoint as its foundation for ARK, the company chose software partners whose products worked well within the SharePoint ecosystem. Organizations should ensure that software tools and solutions chosen work well together and integrate as part of the overall solution.

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