



Picking a Winner in the Race to Deliver AI-Powered Global File Search

FEATURING RESEARCH FROM FORRESTER

Intelligent Content Services Will Energize Your Content Management Road Map: ECM In 2022

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FORRESTER RESEARCH NAMES CONTENT SPRAWL AS A TOP CHALLENGE

With enterprises and OEMs looking to integrate search tools into their own products, Enterprise File Search (EFS) has emerged as one of the today's hottest technology trends – with several recent high-profile IPOs and multimillion-dollar venture capital investments in the space. This market-shifting trend is fueled by the rise of Global File Search (GFS), a seamless search across multiple file repositories.

Forrester classifies enterprise search under the category [cognitive search](#). The leaders in this space deliver next-generation enterprise search solutions employing AI technologies such as natural language processing and machine learning to ingest, understand, organize, and query digital content from multiple data sources.

Forrester analyst Cheryl McKinnon cites content sprawl as a *top challenge facing ECM programs in 2018*.

GFS is the next generation of enterprise search designed to solve the file sprawl problem. It provides a single search query across multiple independent file repositories including on-premises storage, cloud storage, and popular SaaS applications like Slack and Salesforce. In contrast, previous generations of search were designed to search within a single repository. Indexing data from disparate data sources and normalizing wildly-varying file permissions paradigms is a non-trivial challenge. Few vendors have successfully achieved this GFS standard to date.

Cloutenna, is one of the few that has delivered a GFS solution to market. DirectSearch, was designed from the ground up to deliver the full suite of GFS services: cross-silo search, recommendations, audit and governance. It introduces a novel search architecture that is able to deliver sub-second search queries while enforcing accurate file permissions – no matter where data is stored.

PICKING THE RIGHT SEARCH ARCHITECTURE

When picking a search architecture, enterprises and vendors evaluating GFS solutions should look closely at these three important criteria:

- The Search Latency vs ACL-accuracy Tradeoff
- Enterprise Security Requirements
- Scalability

The Search Latency vs ACL-accuracy Tradeoff

How fast are search results returned after submitting a query? Seconds? Minutes? A good experience requires search results in under one second. And how quickly are file permissions updates reflected in search results? It is critical that users only see search results for files they have access permission to view.

A comprehensive GFS engine must deliver a fast user experience and enforce file permissions accurately. For an Enterprise use-case, a trade-off is unacceptable. Choosing an efficient architecture is critical for vendors seeking to integrate GFS into their products.

Search built on previous generation technologies had to choose between fast query response times or accurate file permission enforcement. To reconcile file permissions for each user, old search solutions relied on either “query-time binding” or “early binding.” Query-time binding accurately reflects file permissions, but requires heavy join operations which make search queries painfully slow. Early-binding, on the other hand, trades off security to deliver a fast user experience. Cloudfenna has introduced a new “real-time binding” approach which uses machine learning to achieve the best of both worlds: sub-second search responses and up-to-date ACL enforcement.

Enterprise Security Requirements

GFS software tools need to approach security and access control differently than general search tools in order to return a list of files the specific searcher is authorized to view. After files are scanned and indexed, the GFS tool understands the organization’s access control structures. Users must never see files they do not have permissions to view.

Failure to correctly enforce file permissions is unacceptable for enterprise applications. Solutions that rely on early-binding may have file permissions that are out of date by as much as a week. This means users can find and access files they are not allowed to view – something that is generally intolerable for enterprises. This is why some vendors choose to use query-time binding instead. Query-time binding, while inefficient and cumbersome, maintains ACLs and permissions for security because it performs lengthy system-intensive join operations to apply the file permission at the time of query. Returns simply take too long, forcing users to wait. The more they wait the less productive and satisfied they become.

Real-time binding achieves similar ACL enforcement to that of query-time binding, but does so without the system-intensive query-time join operation. Real-time binding uses machine learning to match the speeds necessary to run continuously and ensure an always up-to-date permissions map.

Scalability

Several GFS options break down at scale based on how they are built. They attempt to mask that architectural limitation by capping the number of files that they can accommodate per software instance. This can be acceptable to midsized organizations or departments with fewer than 200,000 files. It may also be passable for those using GFS as a point solution for a single repository such as a custom-built search function on a website. Enterprise organizations with considerably more files will find the costs untenable. More licenses, management, compute hardware, supporting infrastructure, and/or virtual compute instances adds up rapidly.

Aside from user and file limitations, many GFS systems are subject to repository limits. Most accommodate local machines and on-premise network shares in filers and NAS; fewer work across file sync-and-share services and clouds (Google Drive, Box, Dropbox, and Microsoft OneDrive). GFS should also search files in email applications (Outlook and Gmail) and SaaS applications (including Salesforce, Slack, Jira, or Confluence).

In a modern enterprise with thousands of employees and millions of files across dozens of repositories, data management and security are complex challenges that GFS solutions can alleviate or aggravate depending on their architectures.

GLOBAL FILE SEARCH REQUIRES NEXT-GENERATION ARCHITECTURE

Cloudtenna's DirectSearch real-time binding works universally across on-premise repositories, cloud file storage services, and hosted/online applications. The universal search tool can find files by name, sender, date, file type, keyword, content, and other attributes regardless of where it is stored. DirectSearch uses machine learning intelligence, natural language processing, and automation to deliver relevant results and rankings fast – in 400-600 milliseconds.

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Intelligent Content Services Will Energize Your Content Management Road Map: ECM In 2022

Vision: The Enterprise Content Management Playbook

by Cheryl McKinnon

March 19, 2018

Why Read This Report

Enterprise content management (ECM) continues to transition. Veteran vendors are on the defensive — consolidating, merging, and divesting. New competitors are winning deals with cloud-native content platforms or modern architectures that support the delivery of flexible, granular, purposeful applications. Enterprise architecture (EA) professionals must look at cloud, artificial intelligence, and cross-repository content services as they envision their future content apps.

This is an update of a previously published report; Forrester reviews and revises it periodically for continued relevance and accuracy.

Key Takeaways

Cloud Providers Wield Disruptive Power Over Content And Collaboration Markets

Cloud-native and cloud-friendly content platforms will continue to disrupt traditional vendors with new business and pricing models.

Look For Intelligent Content Services To Elevate The Value Of Enterprise Content

Cognitive capabilities will bring new life to ECM. Enterprises with multiple content repositories will adopt technologies to harvest and enhance content across systems. Watch for algorithms and analytics to enrich and automate content at scale.

Hybrid, Hosted, And Heterogeneous Deployments Will Persist Into 2022

ECM is still mostly deployed on-premises. Hosted content applications are gaining traction as veteran vendors strive for cloud relevance. Hybrid architectures will be the norm. And software-as-a-service (SaaS) for content services will accelerate in 2018.

Intelligent Content Services Will Energize Your Content Management Road Map: ECM In 2022

Vision: The Enterprise Content Management Playbook



by [Cheryl McKinnon](#)
with [Daniel Hong](#), Madeline King, and Peter Harrison
March 19, 2018

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Related Research Documents

[The Five Key Trends For 2017 That Shape How We Manage Enterprise Content](#)

[The Forrester Tech Tide™: Enterprise Collaboration, Q1 2018](#)

[Solve Your Top Content Challenges With Flexible, Modern Platforms](#)



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One Repository To Rule Them All: A Vision That Didn't Materialize

Year over year, ECM decision makers report that their strategy is to standardize on a single ECM solution. Yet, multiple systems — from multiple vendors — are the norm. Point solutions deliver specific business value; cloud services provide flexible scale and easier external engagement; and ubiquitous content management systems, such as Microsoft's SharePoint, serve a number of document management and collaboration use cases. Traditional ECM repositories continue to preserve business records. Yet, sprawl of ungoverned file shares persists.¹ EA pros can expect more fragmentation of content stores.

CONTENT IN THE CLOUD PICKS UP STEAM, YET A HYBRID WORLD IS THE NEAR-TERM REALITY

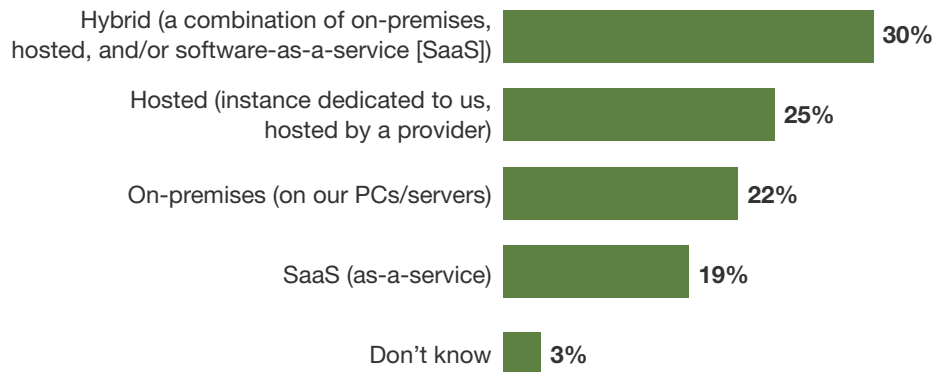
An approximately \$8 billion market is up for grabs — and nearly 90% of current ECM decision makers plan to expand their deployments in 2018.² The tipping point for cloud-based ECM hasn't happened yet, but the momentum accelerates. Long-leading vendors are investing in hosting services and alternative licensing models to hold market share. New vendors, with platforms architected specifically for cloud scale, have found their way onto buyers' shortlists. EA pros envisioning cloud in their ECM strategy must consider that:

- › **2018 to 2019 will be a tipping point for content in the cloud.** Hybrid and hosted models are helping to shift a critical mass of content to cloud services. Microsoft is a force in compelling customers to move to cloud services, such as Office 365 (with OneDrive for Business and SharePoint Online). Cloud-native entrants, such as Box, Dropbox Business, and Google Drive, now address content-centric use cases. Established vendors offer their own private cloud options or forge alliances with public cloud providers, such as Amazon.
- › **Adoption patterns reflect “embrace and extend,” rather than “rip and replace.”** In 2017, 22% of software decision makers said that they primarily deploy ECM on-premises or have plans to do so, down from 30% in 2016 (see Figure 1).³ Thirty percent used hybrid in 2017, up from 26% in 2016; in each year, 25% reported using a hosted model; and in 2017, 19% said they primarily use SaaS, up from 16% the previous year. In 2017, 31% of these decision makers said that they use some SaaS to complement or replace ECM; a further 35% have replaced either most or all of their ECM with SaaS versions or plan to do so in the next two years (see Figure 2).
- › **Secure B2B content co-creation and sharing drive cloud interest.** Enterprise-focused file-sharing services — many of which are cloud based — exploited a key gap in traditional ECM offerings: the ability to extend collaboration, content creation, and basic task management to external participants. Easy-to-use, mobile-friendly, secure tools to engage customers, partners, suppliers, and other members of this “extended enterprise” fill a need that on-premises, rigidly licensed ECM systems cannot. More than half of ECM decision makers want some level of external participation in their content applications.⁴

- › **Cloud-native business applications will have content management requirements.** Business applications, such as CRM, supply chain management, and human resource management, will be the largest category of SaaS through 2019.⁵ EA pros must consider integration approaches to these new cloud applications, extending document management capabilities, such as version and access controls, metadata, audit trails, or retention policies, to critical files generated by line-of-business users.⁶

FIGURE 1 ECM In The Cloud Is Increasingly Hosted And Hybrid

“How does your firm primarily deploy enterprise content management or plan to do so?”



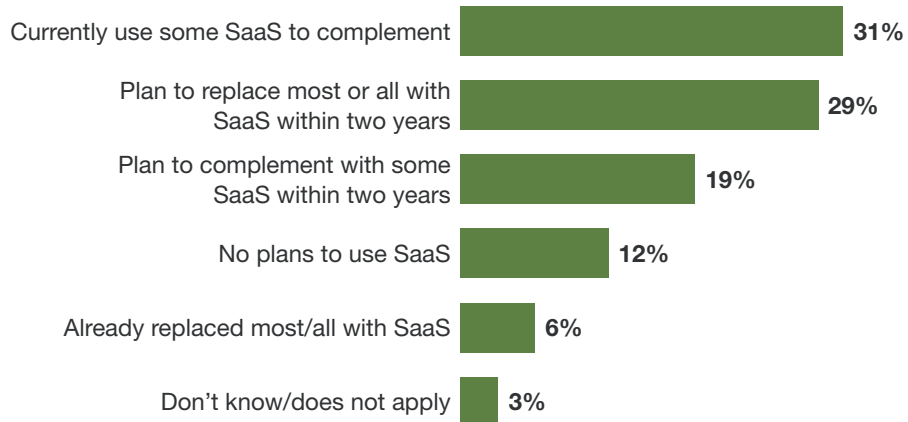
Base: 1,902 software technology decision makers whose firms have implemented enterprise content management or plan to

Note: Percentages do not total 100 due to rounding.

Source: Forrester Data Global Business Technographics® Software Survey, 2017

FIGURE 2 2018 To 2019 Will Be A Tipping Point For Software-As-A-Service Content Platforms

“What are your firm’s plans to use software-as-a-service (SaaS) to complement or replace your ECM deployment?”



Base: 1,474 software technology decision makers whose firms deploy enterprise content management in an on-premises, hosted, or hybrid model or plan to do so

Source: Forrester Data Global Business Technographics® Software Survey, 2017

Adjacent Markets Offer A Continuum Of Content Management Options

EA professionals are tasked with modernization and digitization efforts — and content is no exception. Technologies with roots in adjacent markets have evolved to serve a bigger set of content-centric use cases — and are becoming competitors to traditional ECM vendors. The heavy-footprint, assembled-via-acquisition, architected-for-on-premises suites are giving way to newer architectures, flexible content platforms, and cloud-native alternatives.

ASSESS ALTERNATE APPROACHES FOR SYSTEM-OF-ENGAGEMENT OR SYSTEM-OF-RECORD NEEDS

Mature ECM systems have a broad set of capabilities and can be configured to meet use cases for both systems of engagement and systems of record.⁷ EA pros can map the flow of content across teams, lines of business, and out to external stakeholders, identifying the tools that are necessary to help with content creation, revision, and distribution. Look beyond traditional ECM to include:

- › **Enterprise file sync and share/document collaboration vendors.** Many file-sharing tools — particularly from cloud vendors — have enhanced core foundational services for content management. Products such as Box, Citrix ShareFile, Dropbox, and Google Drive have evolved to offer enhanced document management, collaboration, and task management capabilities for 2018 and beyond.

- › **Public cloud providers.** Cloud providers such as Amazon, Google, IBM, and Microsoft not only provide storage for documents and data but are also evolving to expose intelligent content services, such as image and photo recognition, speech-to-text/text-to-speech, or natural language processing. Enterprises with strong developer teams can use these platforms to develop their own customized content applications or use these services in their existing systems.
- › **Document stores (document-oriented databases).** Document stores offer the ability to store, process, and access documents in industry-standard formats such as XML or JSON. Platforms such as Couchbase, IBM Cloudant, MarkLogic, and MongoDB can be used as core repository services for a range of content-intensive use cases, such as digital publishing, insurance documents, or other use cases that are rich in data and need to scale.⁸
- › **Archiving platforms.** Investments in mobile apps and user-friendly email and web interfaces have put archiving tools into the hands of information workers. Users are now searching, navigating, and using archived information to understand how decisions were made. No longer designed solely for technical or legal roles, archiving platforms are evolving into corporate systems of record accessible to all. Vendors are enhancing life-cycle management capabilities as well as search, content, and analytics to meet investigative and legal discovery requirements.⁹

COGNITIVE CONTENT SERVICES, ANALYTICS, AND MACHINE LEARNING WILL RESHAPE TRADITIONAL ECM

ECM will hit its own cognitive tipping point by 2021 — if not sooner.¹⁰ Customer support teams, sales desks, or researchers can get content proactively delivered by asking questions with natural language — not clunky search interfaces. Cognitive and other forms of intelligent analytics are being embedded into modern content platforms (see Figure 3). Cloud providers, such as Amazon, Google, IBM, and Microsoft, provide recognition, translation, and text-to-speech services. EA professionals can map the content systems that can feed into intelligent systems, providing the information that chatbots can mine and deliver. There are opportunities to extract insights from content:

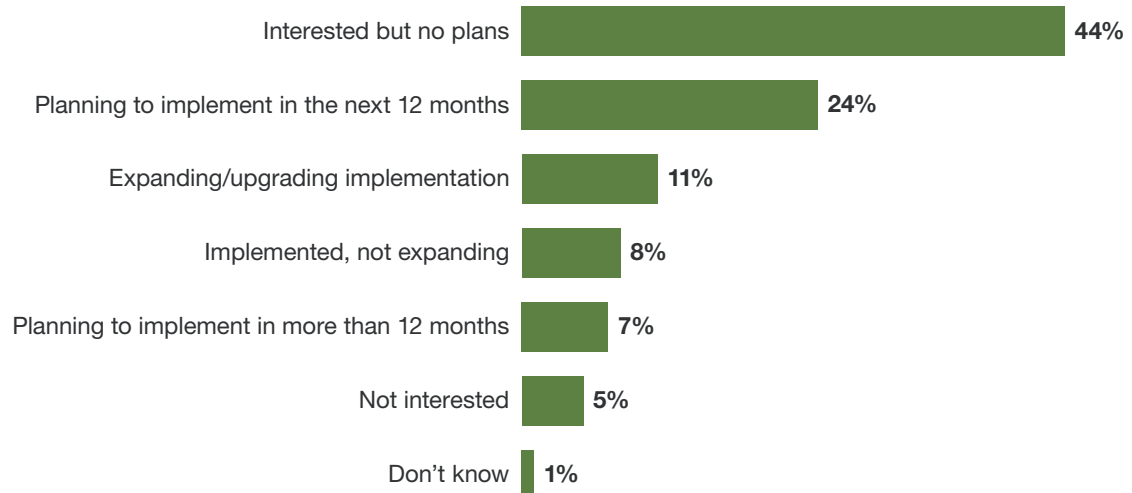
- › **Analytics assist in seeding content into content applications.** Migrating to modern ECM platforms can be a budget and timeline killer — large-scale content movement rarely contributes to business productivity. File analytics technologies can complement ECM by revealing documents safe for disposal — duplicates, expired information, or items past their retention period — and allow EA pros to focus on higher-value content migration efforts. These tools can flag items containing sensitive data, such as personally identifiable information, prior to migration, securing or tagging documents prior to ingestion.
- › **Bots offer a new way to request, create, or consume content.** EA pros can envision scenarios where frustrating search capabilities can be replaced with intelligent agents that can consume, process, and return content based on simple human language — rather than complex Boolean operators. Chatbots can find content for customer service teams, help with research and content aggregation, or find useful materials from teams or projects relevant to your own.¹¹ Robotic process

automation (RPA) tools can quickly augment or replace repetitive desktop activities, accelerating content creation or re-keying processes.¹²

- › **Machine learning mines patterns of behavior for more intelligent results — at scale.** Road-tested in the eDiscovery market for years, machine learning in the context of ECM brings the potential of automated categorization, security classification, and assisted collaboration to information workers.¹³ Content that is tagged or analyzed can serve as a model to train systems, letting technology do the heavy lifting across the rest of the content store. Logs, search indexes, and other sources of work patterns can surface smarter recommendations or tune users' preferences.
- › **Disposal rules driven by “business value” collide with the thirst for insights.** Customer-obsessed organizations have terabytes of untapped customer communication, contracts, and correspondence that can feed systems of insight (see Figure 4).¹⁴ Analytics can extract data and entities locked up in documents and deliver this underused information into broader insights platforms. Companies with disposal or deletion policies based on “business value” will need to rethink how they define this term. Expect that value will now be assessed in the aggregate — a cluster of documents — instead of by individual item.

FIGURE 3 Interest In Analytics For ECM Is Strong, But We're Still In The Early Days

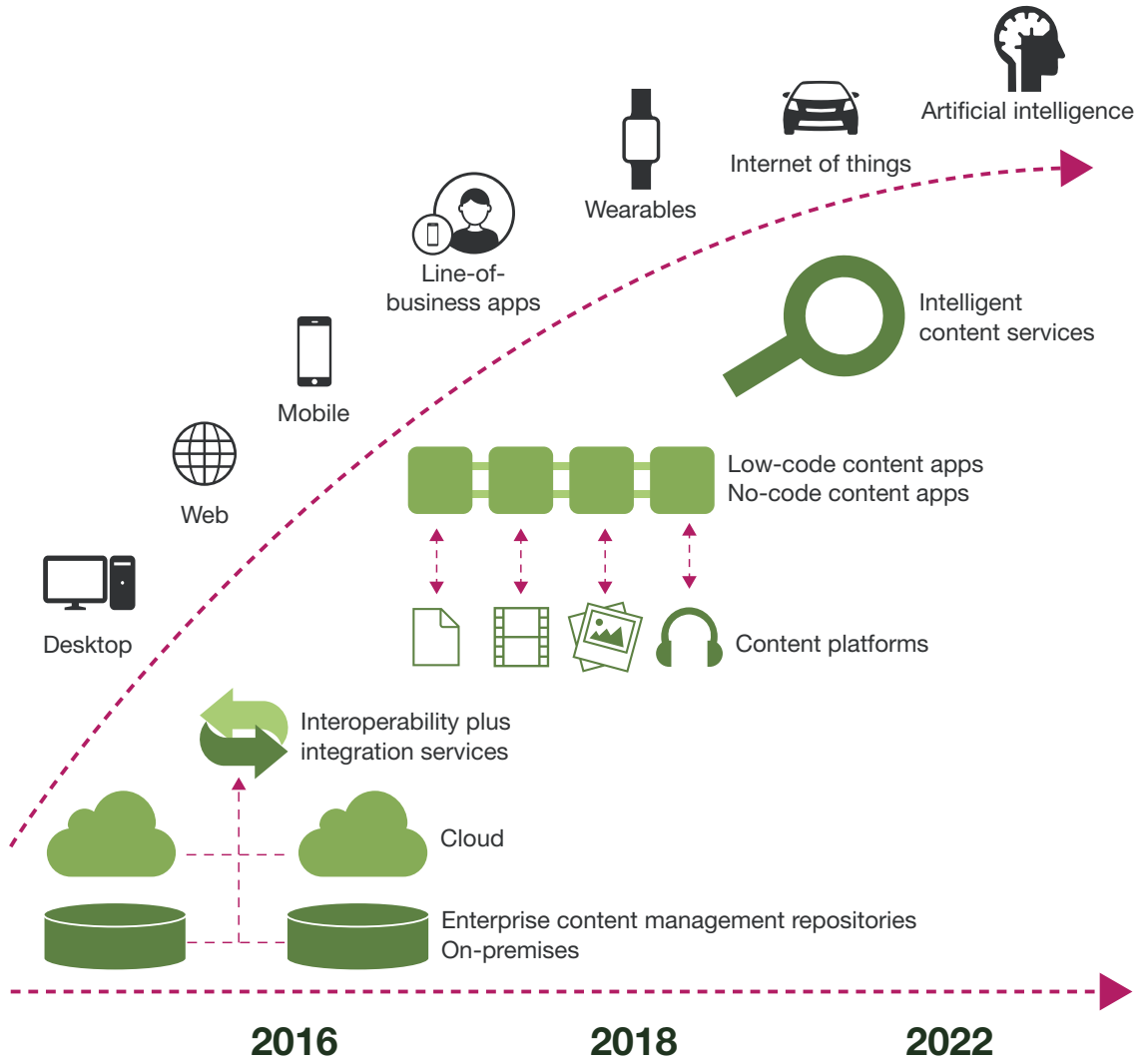
“What best describes your firm’s current usage of or plans to adopt content analytic, autoclassification, or autocategorization tools as part of an ECM initiative?”



Base: 75 enterprise content management professionals

Source: Forrester's August 2017 Global Enterprise Content Management Online Survey

FIGURE 4 Cognitive Content Services Will Reshape ECM By 2022



Rethink ECM: From Repositories To Intelligent, Transparent Services

EA pros are challenged to streamline and simplify the content services demanded by business peers. The value proposition of ECM is in transition. Technology managers recognize the complexity in the hybrid, heterogeneous content landscapes in their enterprises. The emergence of modern, often cloud-based, content platforms is eroding the dominance of the monolithic, 1990s-architected ECM suites. Platforms allow architects, developers, and designers to compose and deliver content-rich applications to business stakeholders. Intelligent content services allow applications to use, share, and control content from a mix of repository and collaborative systems, both on-premises and cloud.

The emergence of modern, often cloud-based, content platforms is eroding the dominance of the monolithic, 1990s-architected ECM suites.

CONTENT PLATFORMS ENABLE THE DECOUPLING OF APPLICATION AND REPOSITORY LAYERS

Forrester defines a software platform as:

A set of integrated software components and modular services assembled to support other parties as they design, build, and run specific types of custom business logic.¹⁵

A content platform is a software platform architected specifically for document-, content-, or process-rich applications. Modern content platforms offer a four-tier approach, with layers for the clients (presentation across devices), content delivery, aggregation, and services (data and content from other sources).¹⁶ This loosely coupled approach allows technology managers to design, deploy, or upgrade their user interfaces or content applications independent of the repository — a major challenge with older, monolithic architectures. Key attributes that will appeal to EA pros include:

- › **Support for integration and interoperability.** While the Content Management Interoperability Services (CMIS) standard has had inconsistent adoption among ECM vendors, it continues to appeal to architects tasked with supporting multiple content systems.¹⁷ Vendors providing content platforms will support modern, RESTful APIs and expose core content management capabilities as services for use by developers.
- › **Pricing and licensing models that adapt to the unit of value.** The shift to subscription-based pricing allows vendors to test monetization models beyond the traditional per-user license. Both new and established ECM vendors are offering flexible models, with subscriptions tied to variables such as storage, number of API calls, and number of documents or cases. Flexible models are designed to attract a range of solution providers and ISVs to these platforms, so they don't need to reinvent core content management capabilities from scratch.

- › **Modularity and support for low-code or no-code application design.** Proprietary scripts and APIs are ceding ground to more design-driven templates and GUIs to deliver granular, purposeful applications to busy information workers. Designers and business analysts play roles alongside developers. By decomposing core content management features into reusable services, designers and developers can offer specific apps to specific groups — for example, a contracts management application for corporate legal teams or employee file management for a talent management team.

INTELLIGENT CONTENT SERVICES ANTICIPATE THE POST-REPOSITORY WORLD OF ECM

While content repositories will not disappear, these foundational library services are no longer the top value proposition for an ECM investment. Cloud providers are offering “good enough” content storage services, file shares continue to hang on in corporate data centers, and ECM systems continue to proliferate to serve both enterprise and departmental use cases. Sprawl is a top challenge facing ECM programs in 2018.¹⁸ Migration projects are often costly and onerous. EA professionals extending their vision for ECM into 2022 must consider the following:

- › **Information workers are suffering from content FOMO (fear of missing out).** Productivity drops when users need to stop, think, and search disparate systems. Content contains a plethora of corporate knowledge, but it is often poorly organized or resides in multiple systems. In conversations with customers, Forrester hears that employees know content exists but are unsure where to find it. Expect to see content services that aggregate information from documents and related metadata from multiple on-premises or cloud systems, surfacing information where the work needs to be done.
- › **Policies and information architecture transcend individual content systems.** Enforcement of security, retention, and other policies is a hallmark of ECM systems. Forrester clients are increasingly asking if they are alone in desiring consistency and a one-stop approach to applying these policies to disparate on-premises and cloud content systems. Expect to see content services that allow information governance policies to be created centrally and applied to content stores (including public cloud).¹⁹ Metadata will play a central role in establishing consistency across systems.
- › **Contextual capture and use of content will accelerate with mobile.** Mobile is still woefully underused in the context of ECM — just over a third of ECM decision makers report mobile adoption.²⁰ Mobile capture is an on-ramp to modern content applications. EA pros can take advantage of optical character recognition, image identification, and text extraction capabilities built into mobile apps. Explore the sensors on phones or tablets to rethink processes for mobile.²¹ For example, geographic information can enrich the content with contextual data. Smart content can intelligently kick off workflows, with machine learning providing continuous improvement capabilities.

Recommendations

Enterprise Architects Must Plan For 2022's Content Challenges Now

Business and tech organization leaders recognize that they will operate in a hybrid, heterogeneous world of content over the next few years. The fundamental need to manage enterprise content, however, persists. Corporate priorities continue to drive investments in technologies that serve objectives such as revenue growth and customer experience improvements. Yet, compliance and governance requirements must still underpin a content management strategy — but unobtrusively and transparently to end users. As an EA pro, when looking at your five-year vision for ECM, you must:

- › **Prioritize employee experience when delivering content apps.** Improved knowledge sharing is among the top drivers for firms revisiting their business case for content management. Yet, user adoption is a dark cloud that hangs over many deployments. ECM teams that value their employees' time and expect them to deliver quality goods and services to their clients will invest in designers and user experience experts.²²
- › **Understand your road map for cloud content services.** Most ECM vendors offer their products as vendor-managed services or in a private cloud instance. While useful to lessen the burden of infrastructure maintenance, these approaches rarely take full advantage of the modern, elastic services of true cloud architectures. EA pros must push vendors on their road maps for cloud-native, next-generation content platforms. Explore emerging vendors, particularly those with origins in cloud-based file-sharing services. Understand where major public cloud providers are investing in content services.
- › **Demand interoperability and modern APIs for ease of integration.** The dream of having one repository to rule them all has not been fulfilled. Assume that multiple content systems will continue to be the norm — but now, with the added complexity of both on-premises and cloud systems. Pick your migration battles carefully: These are expensive and time-consuming endeavors. Look for opportunities to harvest from existing ECM systems, and use this content on demand in newer applications.
- › **Understand your vendors' road maps for cognitive services or machine learning.** ECM systems are loaded with rich content and metadata that are ripe for analytics. You must reveal patterns of work, communication, and expertise to make information workers more productive and serve customers more effectively. Content must take its place in emerging systems of insight. Machine learning, an established service in the eDiscovery market, presents a rich set of opportunities for automated categorization, security classification, better recommendations, and proactive delivery of content in a moment of need.

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Supplemental Material

SURVEY METHODOLOGY

Forrester's August 2017 Global Enterprise Content Management Online Survey was fielded to 170 tech organization professionals. Forrester fielded this survey during August 2017. Respondent incentives included a summary of the survey results. Exact sample sizes are provided in this report on a question-by-question basis. This survey used a self-selected group of respondents, Forrester contacts interested in enterprise architecture and content management, and is therefore not random. This data is not guaranteed to be representative of the population, and, unless otherwise noted, statistical data is intended to be used for descriptive and not inferential purposes. While nonrandom, the survey is still a valuable tool for understanding where users are today and where the industry is headed.

The Forrester Data Global Business Technographics® Software Survey, 2017, was fielded between August and October 2017. This online survey included 3,653 respondents in Australia, Brazil, Canada, China, France, Germany, India, New Zealand, the UK, and the US from companies with two or more employees.

Forrester's Business Technographics ensures that the final survey population contains only those with significant involvement in the planning, funding, and purchasing of business and technology products and services. Research Now fielded this survey on behalf of Forrester. Survey respondent incentives include points redeemable for gift certificates.

Please note that the brand questions included in this survey should not be used to measure market share. The purpose of Forrester's Business Technographics brand questions is to show usage of a brand by a specific target audience at one point in time.

Endnotes

- ¹ The proliferation of file shares and ungoverned SharePoint sites was named as one of the top challenges for ECM programs. Source: Forrester's August 2017 Global Enterprise Content Management Online Survey.
- ² ECM is part of the broader information management market segment. Forrester sees ECM as an \$8 billion to \$9 billion market globally for 2018 to 2019. To learn more about tech spend trends, see the Forrester report "[The Global Tech Market Outlook For 2018 To 2019.](#)"

Twenty-nine percent of ECM decision makers expect to significantly increase their deployment or usage, with a further 58% expecting to increase it somewhat. Source: Forrester's August 2017 Global Enterprise Content Management Online Survey.
- ³ Source: Forrester Data Global Business Technographics Software Survey, 2016 and 2017.
- ⁴ Fifty-one percent of respondents allow some form of external user access. Source: Forrester's August 2017 Global Enterprise Content Management Online Survey.
- ⁵ SaaS revenue for business applications is expected to reach \$80.3 billion in 2018, jumping to \$102.3 billion in 2019. To learn more about tech spend trends for 2018 to 2019, see the Forrester report "[The Global Tech Market Outlook For 2018 To 2019.](#)"
- ⁶ To learn more about integrating ECM and cloud applications, such as CRM systems, see the Forrester report "[Manage Your Customer Content In The Salesforce Context.](#)"
- ⁷ To learn more about systems of record, systems of engagement, and other core business systems, see the Forrester report "[Brief: The 'Systems Of X' Concept Drives Architecture Zoning.](#)"
- ⁸ To learn more about document stores and the leading vendors in this space, see the Forrester report "[The Forrester Wave™: Document Stores, Q3 2016.](#)"
- ⁹ To learn more about the archiving market, see the Forrester report "[The Forrester Wave™: Information Archiving Cloud Providers, Q4 2016.](#)"
- ¹⁰ To learn more about cognitive systems and Forrester's forecasts for human and robotic collaborative work, see the Forrester report "[The Future Of White-Collar Work: Sharing Your Cubicle With Robots.](#)"
- ¹¹ To learn more about the emerging market for chatbots, bots, and other types of intelligent agents, see the Forrester report "[Executive Q&A: Boost Your Chatbot IQ.](#)"

- ¹² To learn more about RPA, see the Forrester report [“Digitization Leaders Share Robotic Process Automation Best Practices.”](#)
- ¹³ To learn more about the power of machine learning in content-heavy use cases, such as eDiscovery, see the Forrester report [“Protect Your Customers With Technology-Assisted Review.”](#)
- ¹⁴ To learn more about systems of insight, see the Forrester report [“Digital Insights Are The New Currency Of Business.”](#)
- ¹⁵ To learn more about the role of platforms and application services, see the Forrester report [“The Platform Explosion: Harness It Or Lose Agility.”](#)
- ¹⁶ To learn more about modern architectures and the four-tier approach, see the Forrester report [“Mobile Needs A Four-Tier Engagement Platform.”](#)
- ¹⁷ In 2017, fewer than 10% of ECM decision makers put CMIS at the heart of their content management strategy.
Source: Forrester’s August 2017 Global Enterprise Content Management Online Survey.
- ¹⁸ The “proliferation of file shares and SharePoint sites” is among the top challenges named by ECM decision makers.
Source: Forrester’s August 2017 Global Enterprise Content Management Online Survey.
- ¹⁹ File sharing and content storage are among the top use cases for public cloud. To learn more, see the Forrester report [“Data Brief: Public Cloud – The Momentum Continues.”](#)
- ²⁰ Thirty-six percent of ECM decision makers report using mobile for content access. Source: Forrester’s August 2017 Global Enterprise Content Management Online Survey.
- ²¹ To learn more about building a case for mobile, see the Forrester report [“Building A Mobile Business Case: It’s A Steep Climb.”](#)
- ²² To learn more about how ECM programs are investing in new roles, see the Forrester report [“Prepare To Adjust The Skills You Need For ECM Success.”](#)

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