Hype Cycle for Software as a Service, 2020

Published: 30 July 2020 **ID:** G00448212

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This Hype Cycle covers several SaaS markets. It will help you evaluate the relative maturity and progression of a variety of SaaS applications and enhancement technologies, as well as the associated impacts on strategies and markets.

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Analysis

What You Need to Know

Software as a service (SaaS) has become an essential distributed software deployment model for providers. Acceptance of SaaS has grown across organizations of all sizes in multiple industries, and is spreading globally. In fact, new vendors in most application markets tend to have SaaS as their only delivery model. Traditional software providers are increasingly emphasizing their SaaS offerings. Infrastructure as a service (IaaS)-based services, such as storage and artificial intelligence (AI) services, provide a compelling foundation for a growing variety of new "as a service" offerings. They can offer capabilities that significantly exceed the scope and sophistication of traditionally deployed in-house applications. Gartner forecasts that SaaS revenue (measured in constant currency) will be $119 billion in 2020, and that it will register a 13.6% compound annual growth rate for the period ending in 2024.[1]

As SaaS gains mainstream acceptance, the applications and operational control technologies that use and underpin it are progressing at various speeds to various states of evolution. As a service-provisioning platform, the work of SaaS is not complete. It must continue to address evolving requirements by, for example, expanding its value to customers' digital businesses through complementary capabilities and improved interfaces that facilitate reliable integration with other applications. In addition, SaaS has yet to fulfill its potential for high availability, data access and backup, scalability and version management. These challenges mean that SaaS will not make on-premises software totally obsolete in the foreseeable future.

SaaS offerings with significant levels of programmability to enable extension and use as development platforms are blurring the distinction between SaaS and platform as a service (PaaS). Some service providers have surprisingly extensive partner ecosystems. Once a user organization has adopted SaaS as its primary approach, this changes its IT asset management (ITAM) and capital outlay. The increasingly complex set of externally provisioned services creates formidable challenges that do not necessarily align with traditional IT roles and responsibilities. In many ways, the IT operational challenges, risks, support service models and gaps in controls stand in the way of enterprises' ability to fully exploit the potential of SaaS.

The technologies highlighted in this Hype Cycle illustrate the pace of incremental innovation associated with the journey of SaaS toward mainstream acceptance and transformative business usage.

The Hype Cycle

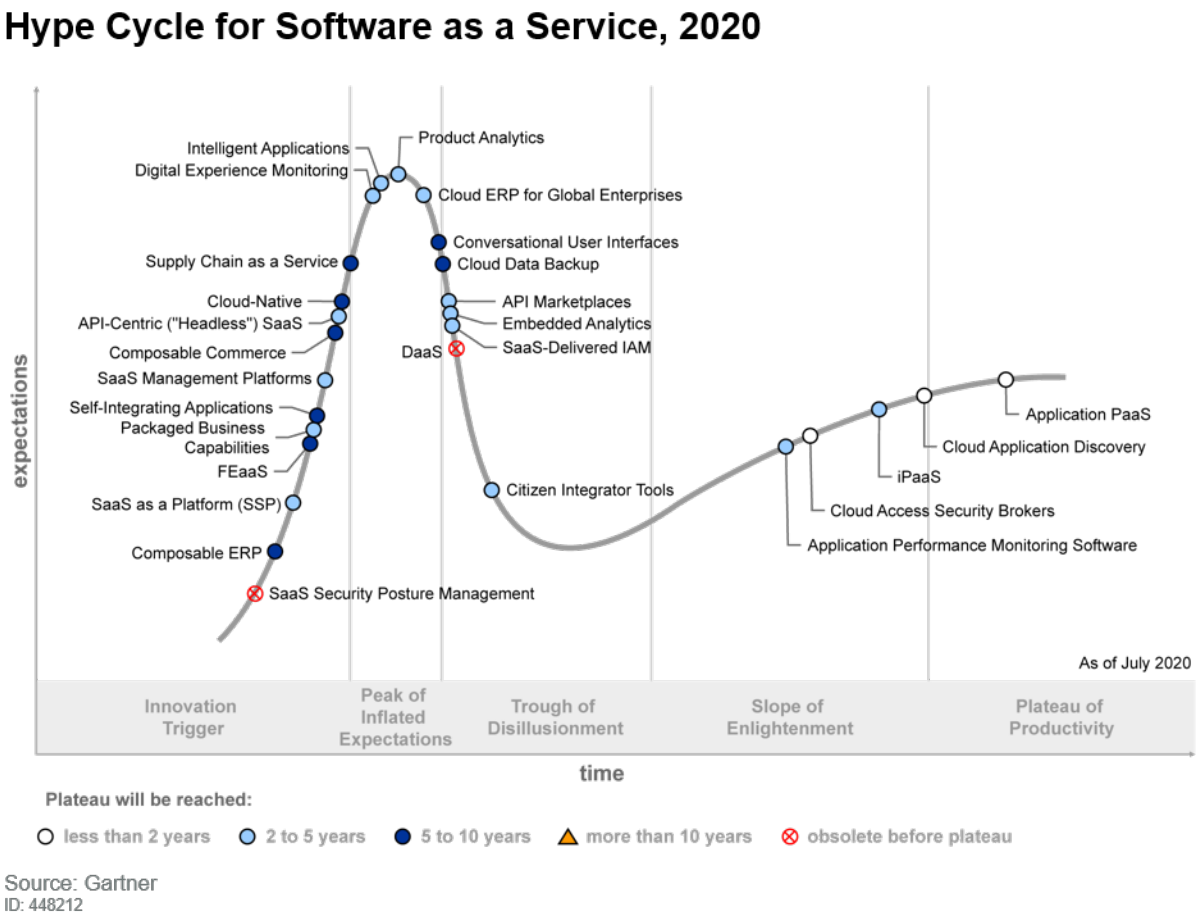
SaaS is an application service available uniformly to all qualified subscribers. The application software is owned, delivered and managed by one or more providers. A SaaS service subscriber is exposed only to application-level functionality, configuration and other application tools. SaaS is delivered and consumed as a subscription service that may be based on a per-user/per-month metric or some other metric, such as transactions processed, amount of data consumed or number of logins.

This Hype Cycle, covering 27 technologies, illustrates the dynamics of this delivery method and its associated technologies. The profiles in this Hype Cycle can be organized into three categories:

- **Core SaaS capabilities:** This category reflects the evolution of different SaaS application categories. Many SaaS markets are mature and their offerings widely deployed, and are therefore no longer represented on the Hype Cycle, while others, such as cloud ERP for global enterprises, are still in the early stages of mainstream adoption. New technologies and approaches, such as packaged business capabilities, intelligent applications, API-centric ("headless") SaaS and conversational user interfaces, give customers more flexibility to adapt applications to meet their business needs and deliver more engaging and intelligent application experiences.
- **SaaS platform capabilities:** SaaS applications are architected to allow for more rapid delivery of new releases and therefore do not enable the type of invasive customization possible with traditional on-premises applications. This is a good thing, yet customers still need to create extensions to SaaS applications to meet unique requirements and provide capabilities that deliver competitive advantage. This makes the platform that a SaaS provider delivers to extend and innovate around SaaS applications just as important as the SaaS applications themselves. Many profiles in this Hype Cycle, such as those of application PaaS, iPaaS, FEaaS, API marketplaces and embedded analytics, represent key technologies that customers need in order to create unique capabilities and connect different SaaS applications more flexibly.
- **Governing and managing SaaS:** Most Gartner clients are well into the journey of modernizing their application portfolio by adopting SaaS and rearchitecting legacy applications using cloud-native application architectures. Organizations must place much greater emphasis on the ability to effectively monitor, manage, secure and govern those investments. This third category represents key technologies like SaaS security posture management, cloud access security brokers, application performance monitoring software and cloud application discovery that organizations can use to ensure that cloud applications run efficiently and effectively in accordance with agreed service levels and that critical data is protected and secured.

This Hype Cycle provides a representative sample of the most relevant and topical technologies in which SaaS, or the enablement of SaaS, is the central value proposition, and where innovation is rapidly shaping the strategies of IT leaders and vendors.

Figure 1. Hype Cycle for Software as a Service, 2020



Source: Gartner
ID: 448212

The Priority Matrix

SaaS technologies will achieve mainstream adoption in different time frames. The Priority Matrix compares the degree of benefit attainable from a technology with its likely speed of progression along the Hype Cycle. It is intended as a general guide only, because the benefits and maturity of any technology will depend on industry conditions and organizations' capacity to exploit it effectively. Technologies in this Magic Quadrant fall into the following three benefit categories:

- **Transformational:** Technologies of transformational benefit represent fundamental changes in how people experience SaaS applications and the ability of organizations to assemble and orchestrate SaaS capabilities in new ways, enabling them to adapt applications at the pace of business change.
- **High:** Technologies of high benefit tend to deliver a tangible ROI and largely include the core SaaS capabilities that form the foundation of a modern application portfolio.

- **Moderate:** Technologies of moderate benefit represent some of the foundational capabilities necessary for enabling effective utilization of SaaS. They become increasingly important as a greater percentage of an organization's applications shifts to the cloud.

Figure 2. Priority Matrix for Software as a Service, 2020

Priority Matrix for Software as a Service, 2020

benefit	years to mainstream adoption			
	less than two years	two to five years	five to 10 years	more than 10 years
transformational		Intelligent Applications	Composable Commerce Composable ERP Conversational User Interfaces Self-Integrating Applications	
high	Cloud Access Security Brokers	API-Centric ("Headless") SaaS Application Performance Monitoring Software Cloud ERP for Global Enterprises Digital Experience Monitoring Embedded Analytics iPaaS Packaged Business Capabilities SaaS as a Platform (SSP) SaaS-Delivered IAM	Cloud-Native Supply Chain as a Service	
moderate	Application PaaS Cloud Application Discovery	API Marketplaces Citizen Integrator Tools Product Analytics SaaS Management Platforms	Cloud Data Backup FEaaS	
low				

As of July 2020

Source: Gartner
ID: 448212

Off the Hype Cycle

The focus of this year's Hype Cycle has shifted to reflect more of a balance between core SaaS applications, platforms to extend, and technologies to manage and govern. Along with other changes, several technologies, while still important, have been dropped to allow for that rebalancing:

- App tethering has been dropped to reflect the shift in the focus of this Hype Cycle.
- Cloud computing has been dropped to reflect the shift in the focus of this Hype Cycle.
- Cloud ERP for manufacturing has been replaced by cloud ERP for global enterprises.
- Cloud HCM suites is a mature category and is no longer tracked on this Hype Cycle.
- Cloud office is a mature category and is no longer tracked on this Hype Cycle.
- Cloud provider-native DLP has been dropped to reflect the shift in the focus of this Hype Cycle.
- Cloud security assessments is a mature category and is no longer tracked on this Hype Cycle.
- Cloud service brokerage has been dropped to reflect the shift in the focus of this Hype Cycle.
- Cloud-native CAD has been dropped to reflect the shift in the focus of this Hype Cycle.
- Cloud-native PLM applications has been dropped to reflect the shift in the focus of this Hype Cycle.
- Collective intelligence benchmarking tools has been dropped to reflect the shift in the focus of this Hype Cycle.
- Customer management BPaaS has been dropped to reflect the shift in the focus of this Hype Cycle.
- Digital commerce SaaS has been replaced by the next development in commerce, namely composable commerce.
- Finance and accounting BPaaS has been dropped to reflect the shift in the focus of this Hype Cycle.
- iPaaS for data integration is now included in iPaaS.
- Security rating services has been dropped to reflect the shift in the focus of this Hype Cycle.

In addition:

- Application performance monitoring suites now appears as application performance monitoring software.
- Cloud-native application architecture is now represented as cloud-native.
- Data as a service now appears as DaaS.

- Digital supply chain services now appears as supply chain as a service.
- Software usage analytics now appears as product analytics.

On the Rise

SaaS Security Posture Management

Analysis By: Steve Riley

Definition: Gartner defines SaaS security posture management (SSPM) as tools that continuously assess the security risk and manage the security posture of SaaS applications. Core capabilities include reporting the configuration of native SaaS security settings and offering suggestions for improved configuration to reduce risk. Optional capabilities include comparison against industry frameworks and automatic adjustment and reconfiguration.

Position and Adoption Speed Justification: SaaS control remains elusive even for the most conscientious of enterprises. Popular SaaS applications present useful collections of configurable security controls, but they may be difficult to discover and measure effectively. SSPM tools, a recently identified category (but not a full market), elevate the visibility of SaaS native security. Crucially, SSPM tools can provide evidence for enterprises to demonstrate they are controlling SaaS — a requirement that an increasing number of Gartner clients report their customers are demanding.

Client interest in SSPM arose rapidly, possibly coincidentally, with vendors identifying existing challenges of managing SaaS security. Somewhat curiously, the largest gap lies within the CASB market. CASBs already possess the ability to connect to SaaS applications via APIs for scanning content and user activity in SaaS applications. However, most CASB vendors haven't yet exhibited noticeable urgency to evaluate SaaS native security settings and permissions management. Gartner expects this to change in the near future. Informally, SSPM could be interpreted as a form of "CSPM for SaaS." The cloud security posture management (CSPM) market, which historically has focused on IaaS and is itself at risk of becoming a CASB and CWPP feature, could also expand into SSPM (indeed, some CSPM vendors already have, without directly describing these capabilities as SSPM). Gartner anticipates that SSPM will enjoy a brief period of awareness and success before it becomes a feature of these larger, more established markets. SSPM also somewhat overlaps the security aspects of SaaS management platforms (SMPs), excluding the ability of some SSPMs to perform automatic reconfiguration of SaaS native controls.

User Advice: We recommend:

- Evaluate the current SSPM-like capabilities of existing deployed tools, including CASB, SMP and (possibly) CSPM. If they provide sufficient visibility and management of SaaS native controls, use them. Don't buy yet another product.
- If existing tools lack required capabilities, evaluate SSPMs. Favor vendors who offer automatic remediation. Successfully controlling SaaS at scale isn't a manual process.

- Configure the SSPM to “spider” through each new release of governed SaaS applications to discover new functions and potential attack surfaces, such as exposed APIs, to maintain full visibility and compliance.
- Pressure vendors in established cloud security and management markets to broaden their capabilities, including automation, for SaaS control. Few enterprises possess the appetite to manage multiple, overlapping consoles for governing the cloud.

Business Impact: SaaS is pervasive: many business applications are transitioning to SaaS-only delivery and SaaS spending outstrips IaaS spending by a factor of two on average (see “Forecast: Public Cloud Services, Worldwide, 2018-2024, 1Q20 Update”). While most enterprises subscribe to hundreds (or perhaps thousands) of SaaS applications, most rely on the same small set of hugely popular, strategic SaaS applications for common business functions. These applications increasingly store vast amounts of intellectual property, out of the purview of central IT, and thus are at risk of inadvertent or malicious disclosure. While CASBs provide a useful mechanism for centralized policy and governance across an enterprise’s landscape of SaaS applications, they are no substitute for proper configuration of SaaS native controls. The most effective way to avoid exposure is to continuously scan for and eliminate configuration mistakes and overly scoped permissions, which represent the most common forms of cloud security failure.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Adaptive Shield; AppOmni; Cloudneeti; Obsidian Security

Recommended Reading: “Toolkit: A Checklist for SaaS Security Features”

“What to Include in Your SaaS Security Policy”

“Magic Quadrant for Cloud Access Security Brokers”

“Critical Capabilities for Cloud Access Security Brokers”

“Market Guide for SaaS Management Platforms”

Composable ERP

Analysis By: Denis Torii; Duy Nguyen

Definition: Enterprise resource planning is no longer solely focused on “resources” or “planning.” As a core part of the composable enterprise journey, ERP strategies need to evolve and embrace an increasingly complex technology environment. Composable ERP, a technology strategy (not a product), becomes a new and mandatory direction into a future where application and platform capabilities provide an enterprise business capabilities focus on end users.

Position and Adoption Speed Justification: Organizations are broadly disillusioned by ERP — costly, inflexible and inadequate are some of the qualifiers associated to it. What they need instead is a portfolio of connected, high-performance, highly usable solutions that can support and adapt to the fast pace of digital business environments. They want to adopt out-of-the-box standardized, commoditized processes. They seek opportunities to explore and deliver differentiated and innovative, value-creating processes. They want a platform to create innovative processes. But like all evolutionary processes, this will take time to reach mainstream — five to 10 years maybe. Right now, composable ERP is at the Innovation Trigger phase of the Hype Cycle, as organizations, software and service vendors are starting to understand the impacts and directions into this new future state. Even in its postmodern form, ERP is evolving from something more than just loosely coupled apps into a mesh of platforms and non-ERP vendors. Something new and aligned to the composable enterprise and future of applications.

User Advice: CIOs aiming to deliver flexibility and value to the enterprise must create a composable ERP strategy that focuses on these six hallmarks:

- AI-driven: AI will perform complex processes with little or no human intervention improving process outcomes throughput.
- Data-centric: Data is the lifeblood of composable ERP. Data will increasingly come from multiple applications, sources, services, and things.
- Consumable: Highly commoditized functionality offered as aggregator platforms, low-cost services.
- People-augmented: AI and automation assisting people to perform faster or to deliver better business outcomes.
- Enabling: Follows where you go, freeing the workforce from their desks and offering a seamless user experience on any device anywhere.
- Customer-facing: The name of the game is now what differentiates you to your customer, and how you can better support them with the best overall experience.

You must understand how these technologies are currently changing the shape of packaged business capabilities itself. Identify what new skills will be needed, the ongoing organizational change impacts created, and when and where to adopt them. There is an urgent need to get your data house in order and to plan for AI adoption in the near term.

- Establish the scope of what ERP means — and should mean — for your organization by synchronizing capabilities with business plans and desired outcomes and experiences. Reimagine ERP to align with the emerging generation of applications, architectures and technologies. The old monolithic ERP mindset and practices are a dying beast.
- Exploit the emerging technologies across all pace layers based on your organization's growth, transformation or optimization goals.
- Implement an ERP strategy that includes the hallmarks of composable ERP — or lose the ability to adapt and gain efficiencies.

- Invest in enabling technologies along the core ERP journey — AI, low-code/no-code, integration capabilities, master data management, security discussions must all be part of the ERP strategy.

Business Impact: Delivering business value remains at the heart of composable ERP. However, the ability to deliver value is beginning to change radically, thanks to the influx of new technologies, mindsets, and practices. ERP is shifting toward:

- The business outcomes of the process, rather than the process execution itself. You must shift the focus from how to do it to why to do it.
- New, more-agile approaches to implementation to meet the rapidly changing digital world, resulting in quicker time to value. The days of five-year waterfall ERP implementations are over.
- What differentiates you to your customer, and how you can better support their wants and needs.
- Accepting complexity and working to manage it is a must. Don't oversimplify the challenge toward a single vendor approach across the board.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Recommended Reading: "ERP's Emerging Fourth Era — Moving Beyond Postmodern ERP"

"Application Leaders: Master Composable Enterprise Thinking for Your Post-COVID-19 Reset"

"Future of Applications: Delivering the Composable Enterprise"

SaaS as a Platform (SSP)

Analysis By: Paul Vincent; Yefim Natis; Fabrizio Biscotti

Definition: A SaaS as a platform provides an integrated comprehensive business platform comprising a unified stack of SaaS-based packaged business capabilities, exposed as building blocks through APIs and/or event channels, and a low-code composition platform to facilitate new capabilities and experiences.

Position and Adoption Speed Justification: SaaS as a platform (SSP) provides a unified business platform equating to a combination of SaaS plus PaaS, including notable a composition capability. Vendors such as Microsoft, Oracle, Salesforce, ServiceNow and Workday provide sets of business services or packaged business capabilities (see "Innovation Insight for Packaged Business Capabilities and Their Role in the Future Composable Enterprise"). Along with a default user experience, API and/or event channel access to their services, and PaaS capabilities around application, data and user interface. These vendors overlap albeit incompletely across their SaaS services, and may participate in individual markets through their ecosystem of partners rather than

directly. Their approach to their PaaS services like data, integration and user multiexperience vary from customizable prebuilt services, to complete frameworks and toolkits competing in those markets as separate offerings. They all offer a composition tool, typically as part of a low-code application platform, to create new applications and services for users that exploit the platform capabilities of the underlying SaaS. They also enable customizations and extensions to their SaaS-based business capabilities, allow the creation of net new capabilities and services, provide integrations to other services, and provide a user experience capability including at least web and mobile experiences.

The concept of a strategic SaaS as a platform, providing customers with an integrated (typically one-vendor) solution for both standard business capabilities and new differentiating services applications, is new but profitable. More vendors will follow the lead and market success of Salesforce, which has achieved No. 1 market status in customer relationship management as well as No. 2 status in application infrastructure and middleware services. Customers are recognizing the value of a specific application ecosystem sharing data and services. Hype is low but increasing around SSPs as their adoption moves from departmental to strategic and enterprise.

User Advice: CIOs and IT leaders investigating the strategic selection of composable SaaS+PaaS platforms should:

- Understand completely the implications of a single platform versus best-of-breed approach. They need to consider the relative performance of the SaaS services offered, PaaS capabilities included, and application composition capabilities. For many the selection of a SSP will be expedient to increase automation capabilities while reducing — in theory — cross-vendor integration costs.
- Ensure the SSP vendors being considered can demonstrate all the capabilities required of a unified SaaS+PaaS platform: the SaaS services and their easy extension to new and custom applications involving other existing and new services via APIs.
- Beware of legacy vendors supporting a wide and disparate selection of underlying platforms and architectures underpinning their SaaS offerings. These are less likely to provide a unified API style or data schema that in turn will increase operational management costs and reduce interoperability and the ability to create new services, together with fragmented ecosystems.

Be wary of lock-in and technical debt associated with these platforms, and mitigate that through contract best practices. Compare the overall SSP costs versus the menu approach of separate services and platforms but consider the long-term cost and commitment that adoption implies.

Business Impact: SSP solutions are already disrupting the IT business: the success of Salesforce in attaining more than $13B in revenue faster than any other enterprise software company in history has demonstrated to other vendors the value of SSP. They and other SaaS are already considered by many organizations as a strategic platform. SSPs and their ecosystem partners are providing more packaged business capabilities and more composition capabilities every year, displacing smaller more specialized vendors in separate SaaS, PaaS and application development platform markets. This adoption curve is likely to grow as these companies invest more; the opportunity for specialists will continue to decline relatively even if that is disguised by general market growth.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Cherwell; IngageApp; Microsoft; Oracle; Pegasystems; Salesforce; SAP; ServiceNow; Workday; Zoho

Recommended Reading: "2020 Strategic Roadmap for the Future of Applications"

"Future of Applications: Delivering the Composable Enterprise"

"Innovation Insight for Packaged Business Capabilities and Their Role in the Future Composable Enterprise"

"The Applications of the Future Will Be Founded on Democratized, Self-Service Integration"

"The Future of Apps Must Include Citizen Development"

FEaaS

Analysis By: Mike Lowndes

Definition: Front end as a service (FEaaS) is the provision of presentation layers, orchestration and operations for browser-based digital experiences as a service. Vendors are cloud-based and rely on client's APIs to power digital experiences.

Position and Adoption Speed Justification: Front end as a service has emerged within the last two years. The vendors involved, unless startups, usually have a heritage in the "mobile web" space, layering a solution over traditional desktop websites using APIs and often less real-time solutions such as screen scraping/RPA. The aim was to provide simpler, much lower bandwidth websites before and during the early smartphone era (also known as m-dot sites). The mobile web has all but disappeared. It was first replaced by responsive and adaptive design for websites, and now by single-page applications (SPA), progressive web apps (PWA) and accelerated mobile pages (AMPs). FEaaS providers abstract the provision and operation of these presentation technologies to a managed cloud service.

FEaaS is most useful where complex and interactive customer journeys are required, such as digital commerce. A challenge with FEaaS can be that some aspects of presentation management that have been traditionally in the hands of the business user can return to being developer tasks, unless careful technology choices are made. Vendors of "headless" content-centric applications are addressing this need.

User Advice: The resource requirement to maintain a skilled in-house team to meet modern presentation layer demands is high, and skills are rare. Look to utilize FEaaS if you need to shift to a decoupled front end, such as an SPA or PWA, for desktop and mobile experiences but do not want the overhead of managing a front-end team or the associated DevOps and cloud-hosting

capabilities. FEaaS providers, by providing a central shared development and maintenance resource, templates and process boilerplates, are able to scale front-end operations. They also provide the cloud-hosting solutions and associated edge acceleration, usually via partnership with a content delivery network (CDN) provider.

Business Impact: Front-end design patterns (SPA, PWA and AMPs) can significantly speed up the delivery of webpages on limited bandwidths. They can also improve the experience and therefore engagement of customers regardless of viewport size (for instance, mobile device vs. laptop). PWAs also provide a much more "applike" experience, especially to mobile device browsers, taking advantage of device-side storage and native device features (biometrics, gesture navigation, camera access, push notifications). They eliminate the need to invest in native mobile apps or publish via a device vendor's app store.

Businesses should consider FEaaS if they desire to use such technologies but do not have the resources to develop, deliver and manage it. The impact is less transformational for purely content-focused websites, but more so for fronting "web apps" digital commerce, customer portals, booking engines, communications and social platforms, forums, etc., taking advantage of the mobile-first approach and integration with native device capabilities.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Frontastic; Mobify; Moovweb

Recommended Reading: "Apply the Principles Behind the Future of Applications to Digital Commerce"

"Align Your Approach to the Emerging Digital Commerce Platform Landscape to Make Buy or Buy-and-Build Decisions"

"How Progressive Web Apps Improve Digital Commerce Experience"

Packaged Business Capabilities

Analysis By: Yefim Natis

Definition: Packaged business capabilities (PBCs) are encapsulated software components that represent a well-defined business capability, recognizable as such by a business user. They inherit some characteristics from both microservices (encapsulation and domain-driven design) and monolithic applications (self-contained and deliver clear and complete business value), but are more business-oriented than former and more adaptive than latter. Complete vendor applications may be delivered as assemblies of PBCs.

Position and Adoption Speed Justification: PBCs are a foundational technology resource of the composable enterprise (see "Innovation Insight for Packaged Business Capabilities"). They act as

the building blocks for rapid composition and recomposition of application experiences. And when combined with the democratized application composition tools, empower application innovation by multi-disciplinary fusion teams, IT professionals and business technologists (see "2020 Strategic Roadmap for the Future of Applications"). Fully-expressed PBCs encapsulate a business entity (for e.g., a bank account) and are exclusive owners of the entity's data. They provide the complete set of APIs and event channels to facilitate the entity's entire life cycle (for e.g., open, close, deposit, withdrawal, lookup and all other applicable bank account actions). Basic PBCs may represent a single atomic business function (for e.g., bank account deposit), therefore having limited autonomy. Data and analytics PBCs deliver reference information and researched insights, respectively.

The full fruition of the composable enterprise model comes when both PBCs and democratized composition tools become widely available. Today, there are already multiple precursors to both PBCs and composition tools, supporting partial implementation of composable enterprise. Visionary application vendors, sensing customers' demand for greater self-expression in application experiences, are evolving through API catalogs to PBC renditions of their application services. Today's PBC precursors include API-centric ("headless") SaaS (for e.g., Twilio), API Products and marketplaces (for e.g., RapidAPI), banking services (for e.g., Solaris) or API aggregators (for e.g., Plaid), prebuilt integrations (for e.g., Cloud Elements), Business "microservices" (for e.g., Finastra APIs) and business APIs (for e.g., SAP Business API Hub). The composition platform precursors include the low-code application platforms (for e.g., Mendix), business process management suites (for e.g., Appian) and integration PaaS (for e.g., Dell Boomi).

As the COVID-19 pandemic disruption forces organizations to increase their resilience, many turn to the model of composable enterprise to drive agility, efficiency, scalability and democratization into their application environment. To progress in that direction, organizations prioritize business-modularity of vendor applications and begin to manage their API and low-code resources as strategic investments and with that are pushing the notion of the PBCs toward the Peak of Inflated Expectations.

User Advice: Application leaders, in collaboration with CIOs, responsible for strategic business change in their organizations should:

- Prioritize mastery in API management, integration, business-IT collaboration and democratized tooling to achieve preparedness for operating a composable enterprise experience.
- Reject any new monolithic solutions proposed by vendors or in-house developers, and plan to renovate or replace the old ones to begin to move to composable application experiences.
- Accelerate product-style delivery of application capabilities packaged as building blocks for application assembly, using agile and DevOps techniques over traditional methods.
- Build a technology portfolio of democratized tool capabilities in support of development, integration/assembly and governance of composed application experiences.
- Give preference to visionary application vendors that anticipate the architecture of composable enterprise and deliver applications, ready for customers' subset/superset recompositions.

- Transform the culture of the IT organization from its nearly exclusive focus on strategic software development to the role of partner and source of strategic guidance, support, service and some software development for the business-led technology innovation.

Business Impact: Adoption of PBCs enables operation of the composable enterprise, which in turn delivers resilience, efficiency, agility and democratization to business. But even alone, without the other key components of the future of applications (fusion teams and democratized technology), transition from the constraints of monolithic applications or fragmentation of technical APIs to the granularity of business-defined composable components advances the ability of organizations to innovate faster, safer and smarter.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: commercetools; Contentful; Elastic Path; finreach solutions; Finastra; Mambu; Plaid; SAP; Stripe; Twilio

Recommended Reading: "Application Leaders: Master Composable Enterprise Thinking for Your Post-COVID-19 Reset"

"2020 Strategic Roadmap for the Future of Applications"

"Innovation Insight for Packaged Business Capabilities and Their Role in the Future Composable Enterprise"

"Future of Applications: Delivering the Composable Enterprise"

"Top 10 Trends in PaaS and Platform Innovation, 2020"

"Predicts 2020: Application Leaders"

"The Applications of the Future Will Be Founded on Democratized, Self-Service Integration"

"Apply the Principles Behind the Future of Applications to Digital Commerce"

Self-Integrating Applications

Analysis By: Keith Guttridge

Definition: Self-integrating applications use a combination of automated service discovery, metadata extraction and mapping, and machine learning to enable applications to integrate themselves into an existing application portfolio with minimal human interactions.

Position and Adoption Speed Justification: The technology to enable applications to self-integrate exists across vendor-specific application suites and research and development organizations, but none has yet combined all the elements successfully. Automated service

discovery and metadata extraction can enable a reasonable understanding of an individual API. Digital integrator technology, such as SnapLogic's Iris Artificial Intelligence, Informatica's CLAIRE and Workato's Workbot, is beginning to automate the process of connecting applications together, in the shape of intelligent data mapping, next best step/action and identifying best integration recipes between endpoints. Ultimately though, self-integrating applications integrating themselves is still some way off. It is possible that some application vendors may start to restrict access to their metadata, thus impacting adoption. Although, in the longer term, this will be self-defeating for all but the largest of vendors.

User Advice: So far, application vendors have provided APIs, and increasingly events, as a way to integrate their applications into an organization's application portfolio, but this integration is not straightforward. In some cases, understanding the operations and behaviors of the API, as well as the meaning of any data elements within it, requires a considerable amount of work. Even then, API actions and data models must be aligned between applications to ensure a reliable and consistent exchange. Initially, we have started to see applications from a single vendor being able to automatically connect with each other, although this is at a pretty basic level so far. At the same time, we are seeing integration vendors delivering improvements for connecting the major applications together via the increasing utilization of digital integrator technology. Eventually, applications will be able to communicate with each other about how the information exchange will occur by dynamic data recognition identifying common data elements and complementary API calls, though this is still some way off. This will reduce and eventually remove the need for people to be involved in the development cycle though clearly people will still be involved in onboarding and offloading applications and services. It will also dramatically change the role of the published API, from the integration point today to an initiation point for the negotiation of how applications will connect with each other.

Application leaders responsible for integration should pay close attention to:

- Application interoperability within portfolios from a single vendor.
- The evolution of integration platform as a service (iPaaS) offerings with digital integrator technologies.

Application leaders should start to question application vendors about the self-integrating capabilities within their suites and, in the longer term, with other vendors' applications.

This self-integrating capability will greatly improve the rate of change within an application portfolio, but will demand even more focus on data management in order to ensure that data is well-understood, and data lineage clearly known. Without this focus, it will be all too easy to lose control of your business processes and data.

Business Impact: Integration is perceived as one of the largest obstacles in organizations that have hybrid application portfolios. With an applications' ability to discover and connect to relevant APIs within the application portfolio — with reduced or no intervention — this challenge will effectively be removed. This faster deployment of new application functionality will improve business agility, creating a more dynamic environment with improved collaboration across the partner ecosystem.

While this may be appropriate for many back-office integrations, organizations will still need to get involved in specifying how they want their portfolio to communicate, if they want to differentiate their processes from the masses.

Benefit Rating: Transformational

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Sample Vendors: Dell Boomi; Informatica; Oracle; Salesforce; SAP; SnapLogic; Workato

Recommended Reading: "Integration Personas and Their Impact on Integration Platform Strategy"

"Innovation Insight for AI in Integration Technologies"

"Reimagine How to Simplify Integration Using Artificial Intelligence"

SaaS Management Platforms

Analysis By: Chris Silva

Definition: SaaS management platforms (SMPs) provide three core functions in the management of SaaS applications: discovery of known and unknown SaaS apps in use, workflow automation of management tasks across disparate SaaS tools and the unification or augmentation of platform-specific security functions. The key benefit of SaaS management platforms is the ability to use a single tool to manage a varied set of SaaS tools in use.

Position and Adoption Speed Justification: All enterprise-class SaaS applications offer their own, native management functions, but IT administrators lack a central dashboard to view utilization and entitlements or centrally automate IT administrative workflows across multiple SaaS applications. These tools are a key ingredient to manage SaaS applications at scale and consistently apply policies for use and data security.

The continued uptake of SaaS applications, such as productivity suites (G Suite, Office 365), storage (Box, Dropbox) and function-specific tools (Salesforce, Workday) have contributed to growing management overhead for IT operations leaders. Initially this market was populated by tools focused on one, specific type of application, but Gartner has witnessed the market evolve in the past year with multiple vendors branching out and broadening the number of SaaS applications these tools can address. Gartner believes the ability to address multiple SaaS applications as an increasingly important asset for competing in this market.

Buyers and vendors face a similar challenge, finding the right mix of tools supported (for buyers) and the right mix of tools to support (for vendors.) Once top-tier broadly used SaaS applications are supported, there is a large opportunity cost for adding additional, but more niche SaaS applications; for buyers, taking on a tool that only addresses a portion of the SaaS environment undercuts the value of adopting an SMP. As such, Gartner expects vendors to continue growing their portfolio of SaaS applications, but at a slowing pace. Buyers will see grater disparity among vendors in their

support for “long tail” SaaS applications that are specific to their region, vertical market or support a diverse best-of-breed SaaS environment.

SMPs represent one of several SaaS security and control planes. Some of the capabilities overlap with tools such as cloud access security brokers and software asset management but are complementary to, not replacements for these technologies. The hallmark of these tools is the focus on SaaS applications and while they may expand to take on on-premises applications as well, Gartner sees this as a potential future development in this market, not a core element of the SMP.

Gartner has accelerated the speed at which we expect SMP to reach its next phase on the Hype Cycle for 2020. This is due to the 2020 COVID-19 pandemic’s impact on remote working which has driven more investment in SaaS tools. This investment is creating a proliferation of tool-specific management tasks for the growing SaaS portfolio while also increasing scrutiny of costs and utilization of IT assets; two areas SMPs can directly address.

User Advice: In organizations looking to bring on an SMP to help increase the visibility of the SaaS application estate, it is critical to choose a tool with discovery capabilities. Using browser plug-ins, network access information and by ingesting financial data these tools will outline which tools are being used, both those sanctioned by IT and those adopted by users without IT’s involvement. Many vendors will define “discovery” to mean better usage visibility of tools IT has formally adopted, but lack the ability to detect SaaS apps unknown to IT, providing incomplete visibility, management and risk profiling.

Ensure that the support for key SaaS tools is present in the SMP being chosen, paying particular attention to the depth of functionality for each, supported SaaS application. Due to the varying availability and complexity of the APIs used by the SMP, it is not uncommon to see disparity of SMP function between supported SaaS applications.

Understand that vendors are in varying stages of maturity in their support for functionality in securing data and apps, discovering user-adopted SaaS and breadth of application support, making direct comparisons between many SMPs difficult.

Business Impact: SMPs provide many of the efficiency, risk mitigation and TCO benefits of IT operations management tools, extended to the SaaS application estate. SaaS applications often lack sufficient IT management capabilities forcing organizations to choose between delaying adoption or accepting suboptimal management capabilities. SMPs extend management and security capabilities to bridge these gaps and minimize trade-offs between manageability and need for a given SaaS application.

Large IT organizations often rely on scripting (for example, through PowerShell) to automate bulk tasks, produce custom reports and fill gaps in the native SaaS administrative console. This can be time-consuming and detract from consistency in control (due to lack of clear ownership, regular updating and revision or peer review). SMPs can reduce or eliminate the amount of scripting administrators must use to manage their SaaS environments.

As SMPs expand to address more SaaS applications, they will emerge as a key source for analytics data, with some vendors offering analysis of collaboration patterns among workers and across

tools; acting as triggers to workflows in other systems and contributing to broader user experience measurement activities.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: AvePoint; BetterCloud; CoreView; Intello; Pointr; Productiv; Quadrotech; ShareGate; Torii; Zylo

Recommended Reading: "Market Guide for SaaS Management Platforms"

"How to Cut Software and SaaS Costs and Quickly Improve Cash Flow in Times of Crisis"

"How to Evaluate SaaS Providers and Solutions by Developing RFP Criteria"

Composable Commerce

Analysis By: Jason Daigler; Mike Lowndes; Sandy Shen

Definition: Composable commerce is an architectural approach to digital commerce where customer experiences are constructed with packaged business capabilities (PBCs). It is a modular approach that requires loosely coupled application capabilities to improve flexibility in composing new commerce functionality and experiences to be more responsive to changing business needs. This approach contrasts with a platform-centric approach in which monolithic commerce platforms are deployed to manage most aspects of the customer experience.

Position and Adoption Speed Justification: Many of the individual components that comprise full digital commerce solutions, such as personalization engines, commerce search, and content management, have been around for several years and sold independently. So the concept of using best-of-breed, individual applications to construct commerce experiences is not new. However, monolithic digital commerce platforms have long sat at the center of the commerce experience, powering many aspects of the commerce customer journey. As more modular, API-based commerce platforms and front-end capabilities are now available, companies can further decompose their commerce tech stack into modular components that will evolve into PBCs (see "Innovation Insight for Packaged Business Capabilities and Their Role in the Future Composable Enterprise"). Especially in a post-COVID-19 environment, the need for greater flexibility and agility will bring increased attention to composable commerce approaches. However, stitching together these components is not easy, especially when they come from different vendors as prebuilt integrations do not typically exist. Today the market remains platform-centric, with some commerce platform vendors offering an "app marketplace" of plug-ins for ecosystem components, while the platforms remain the primary source from which functionality is extended. As such, full-scale composable commerce is still in the early stages of evolution and adoption, and better integration between components is required. Ultimately, business user-friendly integration tools such as low-code application platforms (LCAPs) that allow business admin UIs to manage the various components, need to emerge before the approach becomes more mainstream.

Composable commerce is an evolution of API-based digital commerce, which typically focuses more on separating the presentation layer and the back-end commerce functionality, allowing the commerce platform to run in a "headless" fashion. Composable commerce focuses on modular components for the entire commerce stack — both front-end and back-end functionality. Additionally, API-based commerce can be executed with an API layer on top of a monolithic commerce platform, whereas a platform supporting composable commerce would have a much more modular architecture.

User Advice: Application leaders responsible for digital commerce technologies should:

- Evaluate their existing commerce tech stack and identify weaknesses, especially those that prevent them from moving quickly to meet ever-changing customer demands. If the flexibility and modularity provided by composable commerce is deemed to be a valuable benefit, they should create a roadmap to replace the existing commerce platform over time. This can be done by decoupling individual components from the monolith and replacing them as PBCs that are either purchased from a vendor or built internally. This often begins at the presentation layer, which is decoupled so the commerce platform is "headless" and a more composable approach is enabled.
- Acknowledge the complexity that integration will play in composable commerce. Many individual components, today, are not well-integrated. Low code or no code integration generally does not exist between commerce PBCs today, so resources to build and maintain the integrations over time will be required and should be factored into project plans.
- Consider the components they will need to develop in order to optimize experiences in multiple channels, as today's customer will frequently bounce from channel to channel during a purchase decision.

Business Impact: Composable commerce will provide significant benefits to digital commerce teams in midsize, large and enterprise companies that want a more flexible architecture that allows them to move quickly to respond to customer demand. The approach will also enable agility inside commerce organizations by allowing teams to work on and deploy individual components of the commerce tech stack without impacting other components. These commerce teams will also be less beholden to single vendors and will avoid the problems arising from large version upgrades for monolithic commerce platforms. They will also have more ability to swap out capabilities when new vendors emerge, expand to new channels more easily, and develop more innovative solutions. But they will need to have strong integration and API orchestration skills to be successful.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Algolia; Amplience; commercetools; Contentstack; Elastic Path; Kibo; Mobify; Moovweb; VTEX; Vue Storefront

Recommended Reading: "Composable Commerce Must Be Adopted for the Future of Applications"

"Apply the Principles Behind the Future of Applications to Digital Commerce"

"Innovation Insight for Packaged Business Capabilities and Their Role in the Future Composable Enterprise"

"2020 Strategic Roadmap for the Future of Applications"

API-Centric ("Headless") SaaS

Analysis By: Yefim Natis; Anne Thomas

Definition: API-centric ("headless") SaaS is a cloud application service that is offered for subscription, primarily or entirely, for programmatic access via APIs and/or event channels. Some minimal user experience may be provided as a starter set, but the strategic intent for API-centric SaaS is to be used as an accelerator for application development and integration tools. Although a business capability (SaaS), the API-centric SaaS acts as an accelerating extension feature, for a cloud platform (PaaS).

Position and Adoption Speed Justification: Most SaaS expose some of their functionality via APIs and/or event channels. But for most cases, API access is an additional or optional feature, typically enabling access to some, but not all the application's capabilities for extension and integration. User experience software or services that are provided with the SaaS are intended as the primary mode of user access to the application, although most modern SaaS provide extension and modernization tools for customization of the application experience. Some types of SaaS, however, provide API and/or event access as the primary access modality, and the number of such SaaS is increasing. Mobile back-end services (Progress Kinvey), cloud communication (Twilio), artificial intelligence (IBM Watson) and numerous e-commerce services (Stripe, Snipcart, Scalefast, BigCommerce, and more) are offered as API-centric services today. New integration vendors (such as Clever, Orderful, Plaid, PokitDok) innovate around the assembly capabilities for this emerging library of building blocks. Expect vendors to offer a growing number of headless capabilities in the near future. This trend is in line with the larger trends in application design that is shifting to continuous delivery and assembly of application experiences based on libraries and ecosystems of packaged business capabilities. Next generation serverless platforms such as AWS Lambda are designed for producing exclusively API/event-centric application services. Also, more traditional application platforms, capable of creating integrated user experience and back-end business logic (such as Microsoft Azure App Service), are often used to deliver "headless" application components. The more traditional SaaS offerings will continue to offer elaborate user experience capabilities, but the trend toward increasing innovation and diversification of user experience is forcing them to also upgrade their programmatic access. Gartner expects increasing recognition and adoption of API-centric model for SaaS delivery with the associated increase in hype. Over time, most SaaS will be used, in part or in whole, in API-centric mode, gradually moving to this model as a common mainstream practice.

User Advice: CIOs and application leaders:

- Give preference to SaaS offerings that expose more of their business capabilities as API and/or event channels.
- Plan for gradual shift of development to composition and integration of API-centric packaged business capabilities
- Give preference to application development and integration tools that provide support for assembly of application capabilities utilizing API and event interfaces.
- Ensure clean separation of the back-end business logic and the front-end user experience in all applications, to maximize future benefits of the composable application experiences
- Avoid vendor applications that lock your organization into their user experience technology.
- Give preference to low-code and pro-code PaaS offerings that are well-equipped for access to external API and Event marketplaces.

Business Impact: API-centric SaaS promote the model of composable enterprise and with that — the agility, cost-efficiency and safety of application development and business innovation.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: AYLIEN; commercetools; Contentful; Elastic Path; Impala; Strapi; Stripe; Twilio

Recommended Reading: "Top 10 Trends in PaaS and Platform Innovation, 2020"

"2020 Strategic Roadmap for the Future of Applications"

Cloud-Native

Analysis By: David Smith

Definition: Something is cloud-native if it is created to leverage cloud characteristics. Those cloud characteristics are part of the original definition of cloud computing and include capabilities delivered as a service that are scalable and elastic, metered by use, service-based, ubiquitous by means of internet technologies, and shared. The term cloud-native is used primarily as an adjective. You can have cloud-native architecture, infrastructure, applications or operations, for example.

Position and Adoption Speed Justification: Cloud-native is particularly challenging with respect to hype because confusion amplifies hype. There are very different meanings for the cloud-native term in use already. The original cloud computing definition helps provide something very simple to define this. Something is cloud-native if it is created to leverage cloud characteristics. Gartner's definition of cloud-native is based on the original definition of cloud computing. It's all about capabilities delivered as a service that are scalable and elastic, metered by use, service-based, ubiquitous by means of internet technologies, and shared.

Cloud-native is a concept that is not binary, meaning that something either is or isn't cloud-native. Rather, cloud-native can be expressed in degrees. The more something aligns with core cloud characteristics, the more we consider it to be cloud-native and the more cloud-native outcomes the thing will produce.

Cloud-native is a popular and hyped concept today because many organizations using cloud have not fully realized the benefits they expected from cloud. For example, if a traditional, noncloud application is migrated to cloud using a lift-and-shift approach, the application is unlikely to leverage cloud characteristics and deliver the full benefits of cloud. This is an example of an application that is not cloud-native. In contrast, if the application is rewritten to take advantage of the cloud capabilities using cloud interfaces, services and operating processes, then the application is more likely to deliver the expected cloud outcomes.

User Advice: Rather than focusing purely on the definition of cloud-native, focus on the outcomes you want from using cloud. The more your use cases align with the core cloud attributes, the more likely you are to recognize the full benefits of using cloud.

Assess vendor claims about their cloud-native capabilities with skepticism. Vendors use the term "cloud-native" to promote their offerings regardless of how cloud-native their offerings may be.

When building or acquiring cloud-native applications or services, ensure that the supporting tools, processes and operations support the cloud characteristics. The value of cloud-native applications can be subverted when supporting elements are not cloud-native in their approach.

Embrace services design to bring you closer to cloud-native outcomes. This can include the use of containers, microservices architecture, serverless design, functions and many PaaS services. Use of these technologies should, however, be a means, not a goal.

Business Impact: Cloud-native, to deliver cloud characteristics, has potential to enable maximum leverage of the cloud technologies and benefits. Note that the most common meanings in use are quite contradictory. One is all about using native features and, therefore, locking yourself into the provider. The other is all about containers, which don't guarantee portability but are directionally consistent with the goal.

When using the term cloud-native, it is, therefore, imperative that there is clarification of which meaning is being used. It is not uncommon to find both multicloud and cloud-native as goals in a cloud strategy. Further explanation is required in that case.

Sorting out the definitions and being clear about goals are key to leveraging cloud-native.

Three contradictory definitions are in common use:

1. The first meaning is the most common. It is basically interpreting cloud-native to mean the use of the native cloud platform features. So, it could be platform as a service, availability zones or serverless, for example. So, if you're using Amazon, you're using the native features of Amazon Web Services (AWS) such as Relational Database Service (Amazon RDS), Lambda and Elastic Beanstalk. A better term to use to describe this is CSP-native (CSP means cloud service provider), or a vendor-specific term such as AWS-native.

2. The second meaning is a focus on particular technologies such as containers and Kubernetes. This is driven by an organization called the Cloud Native Computing Foundation (CNCF), which promotes these technologies. A better term to describe this would be container-native, or Kubernetes-native.
3. The third meaning is one that is very architectural in nature. One source for this is Gartner GTP's LIFESPAR acronym. Another example is 12-factor applications. This approach is popular with those who are very deep into architectural approaches but is in no way the most common use of the term.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amazon; Google; IBM; Microsoft

Recommended Reading: "The Cloud Strategy Cookbook, 2019"

"Define and Understand New Cloud Terms to Succeed in the New Cloud Era"

Supply Chain as a Service

Analysis By: Michael Dominy

Definition: Supply chain as a service (SCaaS) is an externally focused commercial digital service that delivers ongoing management of one or more supply chain functions to other enterprises. These business process services leverage technologies and supply chain professionals. Processes are standardized, configurable and exploit cloud technologies.

We have combined supply chain (SC) business process as a service (BPaaS), business process outsourcing (BPO) and digital SC services into SCaaS to better align with how the market describes the innovation.

Position and Adoption Speed Justification: Cost-effective availability of cloud computing infrastructure services, multitenant SaaS applications, open-source software and analytics tools have enabled service providers and some enterprises to create, launch and sustain SCaaS offerings. Adoption will vary by maturity and current application portfolio. Organizations with limited or outdated supply chain applications will be more open to using SCaaS. Access to master data and transaction systems, such as ERP, will be critical enablers for the service.

Adoption varies by process area:

- Transportation management, customs clearance process and tracking are mature examples. In the area of tracking, basic tracking is not charged separately.
- Postsale or postdelivery services are less mature.

- Supply chain planning and analytics as a service are less mature, but are being offered and hyped by many providers.
- Sourcing and procurement, like logistics, is mature overall with differences between direct and indirect categories. Indirect sourcing and procurement is very mature, while direct materials or parts is immature.

User Advice: If you are considering launching your own SCaaS, evaluate your ability to compete. Use, "Take Four Steps to Develop Your Supply-Chain-as-a-Service Strategy" to help assess your capabilities, the competitive landscape and solution requirements.

If you are considering using SCaaS, prioritize processes and functions with lagging capabilities or those spanning multiple organizations. For example, if you have poor supply chain planning capabilities and constrained budgets or insufficient planning professionals, you should consider a SCaaS offering for supply chain planning. An example SCaaS targeting processes spanning multiple organizations would be those enabling a digital business model for a product company that requires integration and coordination of forward fulfillment and aftermarket or delivery services.

Continually monitor the market for new SCaaS offerings. As software functionality becomes more advanced, and as integration capabilities utilizing cloud services improve and expand, service providers will bring new and broader services to the market. Digital tools, such as artificial intelligence, robotic process automation and machine learning, are enabling providers to create, deploy and scale services faster than traditional license, design and implementation approaches using packaged applications.

Business Impact: SCaaS will continue to impact the logistics function, especially as logistics service providers look to leverage technology to offer more differentiated services to shippers. Aftermarket services, such as returns and reverse logistics, will be impacted as companies expand digital offerings or embrace circular business models. SCaaS will also impact planning and optimization, including demand forecasting, supply planning and inventory optimization. Manufacturing operations processes that involve regulatory and compliance activities, such as environmental, health and safety (EH&S) reporting, material safety data sheet (MSDS) processing and reporting, will be impacted. The demand-sensing and demand-shaping functions within supply chain management (SCM) will also be impacted as existing and new service providers capture and analyze consumer data from social networks and combine it with other sources of demand data, such as POS scan data.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Arrow Electronics; Celestica; DHL; Entercoms; Genpact; Jabil; KPMG; Mayo Clinic; Tata Consultancy Services; UPS Supply Chain Solutions

Recommended Reading: "Take Four Steps to Develop Your Supply-Chain-as-a-Service Strategy"

"Market Guide for Supply Chain Strategy and Operations Consulting"

“Market Guide for Supply Chain Planning BPO or BPaaS”

“Magic Quadrant for Third-Party Logistics, North America”

“Market Guide for Electronics Manufacturing Services”

At the Peak

Digital Experience Monitoring

Analysis By: Federico De Silva; Charley Rich

Definition: Digital experience monitoring (DEM) technologies monitor the availability, performance and quality of experience an end user or digital agent receives as they interact with an application and the supporting infrastructure. Users can be external consumers of a service, internal employees accessing corporate tools or a combination of both. DEM technologies seek to observe and model the behavior of users as a continuous flow of interactions in the form of “user journeys.”

Position and Adoption Speed Justification: Digital experience monitoring continues to evolve from a reliance on independent tools and technologies, which traditionally focused on metrics of single applications, toward a more holistic approach that measures the effectiveness of the interactions users have in relation to business outcomes such as retention, risk and revenue. DEM solutions are evolving from focusing purely on availability and performance toward helping organizations optimize and improve digital business outcomes by addressing three key topics:

- What they monitor: Availability, performance, security and quality of the application, and all of the components that may impact the end-user experience
- Who they monitor: External customers and partners who drive revenue for the organization, internal employees (particularly in a rapidly changing workplace), and digital agents as key actors in distributed application ecosystems
- Why they monitor — To enable the proactive monitoring of business outcomes and to connect technology with business KPIs

While DEM is a critical component of a comprehensive IT monitoring strategy, it can be implemented and connected in parallel to other IT monitoring technologies. End-user customers can leverage the maturing capabilities of the components of DEM:

- Synthetic transaction monitoring
- Real user monitoring, including session replay
- Endpoint monitoring

Integrating the technologies can help to create a more comprehensive analysis of the customer experience and, ultimately, of the impact on the organization or business. This becomes critically

important as more applications and workloads move to the cloud and IT organizations lose control of the components of the applications and services.

DEM plays a similar but complementary role to web and digital experience platforms. Web analytics and other IT monitoring technologies (APM, ITIM, NPMD, AIOPs) are part of the broader monitoring strategy. Organizations are able to have a more complete view of how users — internal, external, partners and more — are affected and impacted by the performance of their applications, and to troubleshoot accordingly. DEM is increasingly being integrated earlier in the software development life cycle as part of testing (via synthetic transaction monitoring, real user monitoring [RUM], etc.) within DevOps environments.

Improving and ensuring employee productivity is another important objective of DEM. And though there is considerable uncertainty surrounding COVID-19's impact on the future of work, Gartner expects that the "new normal" will require significant changes to I&O's monitoring strategy for employees (see "Use DEM to Understand and Enhance Your Employees' Work-From-Home Experience"). In this respect, DEM can be achieved through endpoint monitoring with the deployment of a local agent installed on a device (whether physical or virtual). Endpoint monitoring solutions also help monitor COTS and VDI platforms, such as SAP and Citrix environments.

User Advice: Organizations should deploy DEM technologies to create holistic views of a user's digital experience. To do so, organizations should use a combination of data sources:

- Endpoints: Agent-based instrumentation to understand the performance of applications from the perspective of the end user on a mobile device or PC.
- Real user monitoring: JavaScript that is injected into web applications to collect data such as response time, latency and errors or alternatively via plug-ins when HTML is not accessible in the case of SaaS applications. Session recording and replay shows what the user experienced during an application session, which the IT monitoring teams can correlate with other application performance metrics for RCA.
- Networks/internet: Analysis of packet and flow data to understand the impact of the network's performance on user experience. This includes monitoring voice over IP (VoIP) network traffic.
- Synthetic transaction monitoring (STM): Synthetic transaction execution records to simulate user interactions with applications leveraging RUM data to create most natural conditions.

Organizations should also complement the above data sources with social media analytics, NPS scores, ITSM data to correlate user-derived tickets to system performance and user experience, as well as the analysis of API performance as applications interact with each other.

Business Impact: Organizations that implement DEM tools can not only benefit from better application performance and improved user experience, but also ultimately improve business outcomes in support of digital transformation. This will require IT organizations to consider nonhuman agents in their analysis of interactions among customers, suppliers, partners and observers; they may exhibit different behaviors and operate on different time scales. With an expanded remote workforce, organizations will need to tie DEM to employee productivity and digital workplace initiatives to achieve the rapidly changing business objectives as a result of COVID-19

(see “Getting Value From Employee Productivity Monitoring Technologies for Remote and Office-Based Workers”).

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Apica; Aternity; Catchpoint; GSX; ITRS Group; Lakeside Software; Nexthink; Quantum Metric; Rigor; ThousandEyes

Recommended Reading: “Magic Quadrant for Application Performance Monitoring”

“Market Guide for Network Performance Monitoring and Diagnostics”

“Market Guide for Digital Experience Monitoring”

“Broaden Application Performance Monitoring to Support Digital Business Transformation”

Intelligent Applications

Analysis By: Alys Woodward; Helen Poitevin; Jim Hare

Definition: Intelligent applications are enterprise applications with embedded or integrated AI technologies such as intelligent automation, data-driven insights, and guided recommendations in order to deliver a more personalized interface, improve productivity and decision making.

Position and Adoption Speed Justification: AI is the near-term next major battleground for enterprise application providers with every tech provider now incorporating some type of AI capability into their product or service offering. Enterprise application vendors are embedding AI technologies within their offerings as well as introducing AI platform capabilities — from ERP to CRM to HCM to workforce productivity applications. This drives greater customer loyalty and dependence on the applications rather than driving specific additional revenue lines for vendors — the AI enhances the usefulness of the whole application.

Intelligent applications will use AI in the following ways:

- Data capture and response: AI technologies such as NLP, text analytics, deep neural networks (DNNs) and image recognition can be used for intelligent invoice matching, extracting terms and conditions or clauses from contracts, or analysis of images for photographic recognition.
- Process augmentation: AI technologies like machine learning, decision intelligence, knowledge graphs and explainable AI can provide more intelligent actions for an application. In the future, this can be extended further to identify patterns of work, from which process models can be built and executed. When processes or recommendations change due to AI, the business user responsible for the process and decision being taken needs to understand the reason for the changes, hence the use of explainable AI.

- User experience: Conversational UI platforms are used to develop language-based interfaces that use text or speech to interact with the user. Natural language processing used to create virtual assistants is one application of AI to the user experience. Further examples include facial recognition and other AI applications for understanding user emotions, context or intent, and predicting user needs.
- Analytics: AI technologies like augmented analytics can be used to create more predictive and prescriptive analytics that can then be presented to users for further evaluation, or plugged into a process to drive autonomous action.

Although intelligent applications will have a widespread transformational effect, the hype around them has not particularly advanced since 2019. It may be that the message has been obscured by the move to the composable enterprise, or that application leaders tend to consider intelligent components in the same way as other components. It is important to recognize the different nature of smart components that require updating from machine learning models, because the need to update models causes deployment challenges.

User Advice: Enterprise application leaders should:

- Explore how AI can improve your organization's processes and operations by adding more diverse ways to capture a variety of information, more intelligent automation, conversational user interfaces and better decision making.
- Challenge your packaged software providers to outline in their product roadmaps how they are incorporating AI to add business value in the form of a range of AI technologies.
- Be aware of "AI washing" as more and more startups, and even aging solutions, claim AI as part of their solution. Ask them how they use AI to deliver improvements on the original promise of the application. Some technologies under the AI banner are fairly mature and well-established.
- Prioritize investments in highly specialized and domain-specific intelligent applications delivered as individual point solutions which help solve problem areas such as customer engagement and service, talent acquisition, collaboration, engagement and more.
- Understand how the vendor is mitigating bias in the models used in its application. Verify that the vendor is safeguarding your data if used as part of a benchmarking service.
- Bring AI components into your composable enterprise thinking to innovate faster and safer, to reduce costs, and to lay the foundation for business-IT partnerships. Remain aware of what makes AI different, particularly how to refresh and rebuild machine learning models, as this can cause implementation and usage challenges.

Business Impact: Intelligent enterprise applications that leverage AI can offer the following benefits:

- Reduce or eliminate human-based manual tasks allowing workers to focus on more value-adding activities through the use of intelligent automation and insights — via bots, sensors and machine learning.

- Improve business efficiency via packaged AI technologies embedded in enterprise business processes.
- Make business operations more agile with business processes that adapt and reshape themselves as they run.
- Enhance the user interface with conversational capabilities that can ingest and interact through text or speech.

For example, in the area of human capital management (HCM), AI is increasingly being added to HCM applications to match talent supply and demand, predict recruitment success, or optimize recruitment marketing. Candidate-facing chatbots are becoming increasingly common in enabling further automation of this process, such as recommending which jobs to apply for and answering questions or conducting initial candidate screening.

In procurement, applications can ingest contract terms and conditions, and provide analytics on the level of risk introduced by contracts from a newly merged or acquired organization.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Google Docs; Microsoft Office 365; Oracle Applications; Salesforce Einstein; SAP Leonardo; ServiceNow; Sievo; Workday

Recommended Reading: "Application Leaders: Master Composable Enterprise Thinking for Your Post-COVID-19 Reset"

"Technology Options for Talent Analytics"

"Drive Better Digital Workplace Employee Collaboration Using AI, Chatbots and Advanced Analytics"

"Predicts 2020: AI for CRM Sales Technology Must Be Balanced With Analytics, Training and Change Management Considerations"

"Artificial Intelligence Maturity Model"

"How to Apply 'Intelligent' to Your ERP Strategy"

Product Analytics

Analysis By: Melissa Davis; Jason Wong; Aapo Markkanen

Definition: Product analytics (formerly software usage analytics) are tools to analyze digital products used by product managers and product teams to better understand and improve end-user outcomes. These tools typically apply web and mobile app analytics, along with other feedback

mechanisms, to generate specific insights on usage and performance KPIs for product enhancements.

Position and Adoption Speed Justification: Interest in product analytics is driven by the high priority placed on improving customer experience, the trend toward data-driven decision making for product investment prioritization, and the increasing availability of purpose-built tools for product managers and product teams. In addition, the COVID-19 crisis has elevated the need for optimized digital user experience as organizations respond to changing priorities from physical to digital experiences. Product analytics have been around for many years and are employed largely by digital-native product companies. The tools are typically used to analyze data from mobile and web apps, but they are also increasingly applied to connected (IoT) devices and applications. Every-day consumer brands like Uber, Resy, DoorDash, Peloton and OpenTable use product analytics to refine the user experience and optimize engagement. Now, as enterprises shift from project delivery to product delivery as part of digital transformation, traditional companies are also adopting product analytics. Consumer brands like Capital One, Shutterfly, and adidas, along with B2B companies like Autodesk, DocuSign and PagerDuty, now also implement product analytics for their digital products. Product analytics is still primarily applied for customer-facing scenarios, but companies should also think about their critical employee-facing applications (particularly the custom-developed ones) as digital products with a life cycle to be maintained and optimized. Product analytics can also be used to display context-relevant messaging to ease user onboarding, prompt the use of selected features and provide real-time user help. As presently defined, product analytics is related to, but distinct from, application monitoring, customer journey analytics, web analytics, digital experience analytics and A/B testing tools. As these technologies mature and evolve, the lines may increasingly blur between the categories.

User Advice: Product managers responsible for digital products, consisting of web and mobile apps and sometimes connected devices, should make it a priority to improve the user experience, increase engagement, prioritize feature enhancement, measure adoption and track licensing compliance. Quantitative data provided from product analytics supports data-driven decision making and goes beyond the insights available from qualitative techniques such as interviews and surveys. Existing applications should be retrofitted if future development investment is planned.

Product managers of digital products that employ a freemium or free trial strategy should incorporate product analytics capabilities to better understand the behavior of users that convert into paying customers. Usage insights about segments with high conversion rates compared with segments with low conversion rates can be used to drive changes to feature tiers, in-app messaging and sales outreach.

Business Impact: Product analytics enables digital product managers to improve feature adoption, customer experience, trial conversion, retention and revenue by:

- Tracking how often and when the app (including specific modules) is being used, to support billing, allow identification of upsell or cross-sell opportunities and highlight any licensing compliance gaps.
- Providing efficient, personalized intervention to guide individual users through real-time, in-app messaging, driven by an understanding of the user's interaction pattern.

- Improving the customer experience by identifying trouble spots in user workflows.
- Prioritizing enhancements that are most relevant to users, based on feature usage data.
- Exposing detailed, trusted and available usage metrics to support continuous customer health measurement.
- Refining software packaging and pricing through segmentation of customers based on their actual usage.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amplitude; Countly; Flexera; FullStory; Heap; Mixpanel; Pendo; Pyze; Quantum Metric

Recommended Reading: "Market Guide for Web, Product and Digital Experience Analytics"

"How to Drive Value From Customer Experience Analytics"

"Market Guide for Customer Journey Analytics"

"Worlds Collide as Augmented Analytics Draws Analytics, BI and Data Science Together"

"Critical Steps for Tech Product Managers: Invest in the Right Tools"

Cloud ERP for Global Enterprises

Analysis By: Denis Torii

Definition: Cloud ERP for global enterprises is defined as the SaaS ERP suite adoption by companies that operate across multiple regions with total annual revenue above $5 billion. Those types of companies usually search for an ERP application suite that can cover multiple country localization features — including language support and embedded tax calculation engines. There must also be an offering that allows them to provide a flexible application platform that takes into consideration different geographical and local business execution constraints.

Position and Adoption Speed Justification: Interest in cloud ERP for global enterprises continues to grow due to legacy applications reaching end of life. At the same time, it represents opportunity to adopt modern technology with lower initial investment for subsidiaries. That interest is also variable across different business domains. For example: most organizations are highly interested in cloud human capital management (HCM) adoption, while only a few are pursuing cloud ERP adoption for complex manufacturing environments.

Mature localized cloud ERP offerings are not available in all countries in which these enterprises operate, which leads to a slower adoption rate in certain regions. Governmental policies and

regulatory compliances created additional constraints on data protection and sovereignty status where ERP vendors do not have access or qualify to operate. The lack of dependable telecom infrastructure can still be strong inhibitors in certain geographies. These barriers to adoption are a reality check for global enterprises aspiring to upgrade their core systems, and their resulting disappointment pushes this technology toward the trough.

User Advice: Application leaders should:

- Adopt cloud ERP as part of a global ERP strategy approach, when appropriate. Leverage cloud ERP point solutions for specific business domains (e.g., HCM or CRM) as part of the overall ERP strategy enablement.
- Consider potential issues that may arise from technological and legal constraints in certain regions (including internet access quality and reliability, and rules about data residency within the country). Evaluate the architecture capabilities of this application to overcome those challenges.
- Map global ERP requirements that consider the regional complexities (local legal and business requirements), and understand how they fit into a global application strategy.
- Validate that your implementation timelines align with the roadmap of these global cloud ERP applications, including localization features enablement. Plan for the fact that ERP vendors don't guarantee fulfillment of future release roadmaps.
- Evaluate whether a two-tier ERP strategy is the best fit to promote regional coverage, as opposed to adopting a single solution that may be too complex to deploy globally.

Business Impact: Some of the advantages of cloud ERP potentially include lower cost of implementation, faster time to benefit, reduced cost of upgrades, and lower capital expenditure. Thus, there is currently no clear indication that cost is lower as compared with an on-premises deployment, when measured over the useful life of the solution.

Global enterprises that are able to adopt this can benefit from quicker global rollout (when compared with the traditional on-premises model) when the functional scope defined is adherent to standard capabilities. Global ERP support structure enablement may be another one.

Achieving business outcomes is easier when enterprises accept and commit to a global culture of change and adaptability to standard business execution. And this continues to be a big challenge in many cases. Evidence exists that enterprises that don't properly prepare to adopt such architecture struggle with the frequent updates.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: IFS; Infor; Microsoft; Oracle; SAP

Recommended Reading: "What CIOs Need to Know About ERP Consolidation"

“2-Tier ERP: Modernizing the Hidden Jewels of the Enterprise”

“Toolkit: Evaluate the Applicability of 2-Tier ERP to Your Enterprise”

“Market Guide for Service-Centric Cloud ERP Solutions”

“IT Market Clock for ERP 2020 — Preparing for the 4th Generation of EBC”

Conversational User Interfaces

Analysis By: Magnus Revang; Van Baker

Definition: Conversational user interface (CUI) is a high-level design model in which the user and machine interactions primarily occur in the user’s spoken or written natural language. Sophistication of the CUI can vary from understanding just simple verbal utterances to handling complex multiturn interactions.

Position and Adoption Speed Justification: CUIs can exist as a front end to application or business process, but also as a description of the interface employed by chatbots and virtual assistants. It’s being popularized through products like the Amazon Echo that uses the Amazon Alexa Virtual Personal Assistant (VPA) and Google Home that uses Google Assistant VPA. Enterprises are coming on board, with chatbots and virtual agents being the primary use case for AI technology in enterprises.

The promise of CUIs is a shift in responsibility between the user and the interface. In traditional user interfaces (UIs), the user is an operator of the technology and is largely responsible for the effects of using the technology. In a CUI, this responsibility shifts as the CUI is responsible for taking the user input and determining the intention of the user. Conceptually, the CUI has taken over some of the responsibility that was once reserved for the user. This makes CUIs the first widespread adoption of agent user interfaces.

CUIs will evolve their conversational capabilities through advances in natural language understanding (NLU) and in more advanced dialogue management. Additionally, we will see the introduction of multimodal interactions, where speech, text, video and point-and-click interactions are all part of the input used to determine the intention of the user.

User Advice: The conceptual shift away from the user as the operator toward the user as conversing with an agent that will execute on a determined intention — has greater impact on the enterprise than most realize. Training, onboarding, escalations, productivity, empowerment and responsibility all change with this new model and need to be embraced as part of CUI projects. Treat CUIs as transformative and plan on it, and by evolution AUIs becoming the dominant interaction model in the future.

Underlying technology supporting CUIs, either front ends delivered as part of software or custom developed CUIs like chatbots and virtual agents built on top of conversational platforms, still needs to evolve until they reach their potential. Vendor and technology choice is tactical for the

foreseeable future. Voice will also arrive as a strong modality, but trail text in capabilities for some time.

Prepare for CUIs to communicate with each other. Larger architectures connecting different use cases for CUIs, like virtual agents for customer service, HR, IT to front ends for enterprise software, business intelligence tools, etc., will be a central challenge for organizations in the next three to five years. This will lead to a variety of architectural models like CUI-to-CUI communication and specialist tooling entering the market.

Prepare for new roles in the enterprise. Dialogue designer, AI trainer, digital coach, humanizer and AI interaction designer are all titles Gartner is seeing in the market to support the creation of conversational experiences.

Business Impact: CUIs are the interaction pattern of many chatbots and virtual assistants — both will be significant contributors to the impact of CUIs, especially in high-touch communicative fields of customer service and Q&A-type interactions with significant volume.

Outside of this, CUIs will appear primarily in new applications. Enterprise IT leaders should be on the lookout for (and biased toward) CUIs to improve employee (and customer) effectiveness, as well as to cut operating expenses and time spent learning arcane computer semantics.

There will also be some retrofitting. Over the next three to five years, we do not expect large enterprises to invest heavily in retrofitting existing systems of record where the employee base is experienced and stable, and the feature set is well-known to the user base. Where there is high employee turnover or rapid changes in features, or enterprises face a burden of providing computer literacy training, IT leaders need to consider creating people-literate front ends to make it easier for employees to adapt and excel.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Amazon; Baidu; Facebook; Google; IBM; IPsoft; Microsoft; Oracle; Salesforce; SAP

Recommended Reading: “Architecture of Conversational Platforms”

“Designing Conversational Experiences for Chatbots and Virtual Assistants”

“Market Insight: How to Collaborate and Compete in the Emerging VPA, VCA, VEA and Chatbot Ecosystems”

Cloud Data Backup

Analysis By: Jerry Rozeman; Chandra Mukhyala; Michael Hoeck

Definition: Policy-based, cloud data backup tools back up and restore production data generated natively in the cloud. The data can be generated by SaaS applications (e.g., Microsoft Office 365 or Salesforce) or by infrastructure as a service (IaaS) compute services (e.g., Amazon Elastic Compute Cloud [Amazon EC2] instances). Backup copies can be stored in the same or a different cloud location, or on-premises in the data center, where restore/recovery options should be offered in terms of restore granularity and recovery location.

Position and Adoption Speed Justification: Backup of data generated natively in public cloud is an emerging requirement, because cloud providers focus on infrastructure high availability and disaster recovery, but are not responsible for application or user data loss. Most SaaS applications' natively included data protection capabilities are not true backup, and they lack secure access control and consistent recovery points to recover from internal and external threats.

As Microsoft Office 365 (O365) gains more momentum, O365 backup capabilities have begun to emerge from mainstream backup vendors and small vendors. IaaS data backup, on the other hand, is a more nascent area that caters to organizations' need to back up production data generated in the IaaS cloud. Native backup of IaaS usually resorted to snapshots and scripting, which may lack application consistency, restore options, data mobility, storage efficiency and policy-based automation. However, more data center backup vendors now offer improved cloud storage backup capabilities that automate snapshot management and address some cloud-native limitations.

User Advice: Before migrating critical on-premises applications to SaaS or IaaS, organizations need a thorough understanding of cloud-native backup and recovery capabilities and should compare them to their situations today. If the native capabilities seem to fall short (e.g., in application consistency, security requirements and recovery point objective [RPO]), factor additional backup costs into the total cost of ownership (TCO) calculation before migrating to the cloud. Organizations planning to use cloud-native recovery mechanisms should ensure that their contracts with cloud providers clearly specify the capabilities and costs associated with the following items in terms of native data protection:

- **Backup/restore methods —** This describes how user data backup and restore are done, including any methods to prevent users from purging their own "backup copies" and to speed up recovery after a propagated attack, such as ransomware.
- **Backup/restore performance —** Some users have observed poor recovery time objectives (RTOs) when restoring or recovering data from cloud object storage.
- **Retention period —** This measures how long cloud providers can retain native backups free of charge or with additional cost.
- **Clear expectations in writing, if not service-level agreement (SLA) guarantees, regarding recovery time objectives —** RTO measures how long it takes to restore at different granular levels, such as a file, a mailbox or an entire application.
- **Additional storage cost due to backup —** Insist on concrete guidelines on how much storage IaaS's native snapshots will consume, so that organizations can predict backup storage cost.

For third-party backup tools, focus on ease of cloud deployment, policy automation for easy management, data mobility, storage efficiency and flexible options in terms of backup/recovery granularity and location.

Business Impact: As more production workloads migrate to the cloud (in the form of SaaS or IaaS), it has become critical to protect data generated natively in the cloud. Deploying data protection for cloud-based workloads is an additional investment; however, this is often an afterthought, because it was not part of the business case. Without additional protection of cloud-based data, customers face additional risks, due to the impact of data loss, data corruption or ransomware attacks on their data.

SaaS and IaaS providers typically offer infrastructure resiliency and availability to protect their systems from site failures. However, when data is lost due to their infrastructure failure, the providers are not financially responsible for the value of lost data, and provide only limited credit for the period of downtime. When data is lost to user errors, software corruption or malicious attacks, user organizations are fully responsible themselves. The more critical cloud-generated data is, the more critical it is for users to provide recoverability of such data.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: Actifio; Cohesity; Commvault; Dell EMC; Druva; Rubrik; Spanning Cloud Apps; Veeam; Veritas Technologies

Recommended Reading: "Adopt Microsoft Office 365 Backup for Damage Control and Fast Recovery After Malicious Attacks"

"Debunking the Myth of Using EFSS for Backup"

Sliding Into the Trough

API Marketplaces

Analysis By: Mark O'Neill

Definition: An API marketplace is a platform for API providers to publish and market APIs. Consumers, mainly developers, use API marketplaces to discover APIs and (in some cases) purchase access to APIs. API marketplaces differ from API portals since they are more likely to include APIs from multiple providers, and may showcase applications (e.g., mobile apps) using the APIs. Although public API marketplaces are more well-known, a growing number of organizations, particularly banks, now have deployed internal or private API marketplaces.

Position and Adoption Speed Justification: Public API marketplaces have not gained significant industry traction due to many factors including lack of industry-vertical API standards, lack of clearly articulated business models from API marketplace providers, and lack of dedicated marketing

which impacts on developer awareness. Because of this, API providers have reported more success in marketing their APIs directly, e.g., via Google Ads search advertising, compared to registering their APIs in third-party API marketplaces. However, a number of API marketplaces have been developed by API providers themselves, and these demonstrate initial success. For example, Twilio provides a marketplace for partners to sell API access in the form of complementary add-ons to Twilio's core telephony offering, such as AI-based sentiment analysis APIs. ADP and Temenos also provide similar add-on marketplaces, showcasing add-ons which use their APIs. These API marketplaces add to the vendor's overall customer offerings, leveraging partners by marketplaces. Governments, including those of Singapore and Canada, have also begun to deliver API marketplaces that combine APIs from across their governments, both for internal and external consumption. Internal API marketplaces have traditionally found usage in larger organizations, mainly as enterprisewide API catalogs.

User Advice: Following are some recommendations for:

API providers: Recognize that your choice of API marketplace(s) in which to offer APIs will depend on the industry focus and profiles of its developers/users. Be sure to manage expectations. Gartner clients report that general, all-encompassing API marketplaces, which list APIs that can also be found through other channels (like web search), have brought API providers few new users. API marketplaces that include an integration capability, or target a particular vertical or multiparty community or ecosystem, have brought more success. But when considering commercial API marketplaces in which to register your APIs, examine billing terms carefully to understand what proportion goes to the API marketplace provider. Find out if a revenue-sharing model is available. Because your APIs may be side-by-side with competing ones, think carefully about differentiation.

If you plan to build your own API marketplace, ensure that you establish a commercial model upfront (e.g., through registration fees charged to API and app providers and/or revenue share provided to API and app providers) as well as a clear governance process for onboarding third-party APIs or apps. Understand that although it is developers who will leverage APIs through your marketplace, you must also consider incentives to ensure that businesses or end-users engage. In addition, consider delivering an internal API marketplace first, to promote internal discovery and sharing of APIs. Vendors such as Constellant, RapidAPI and Pronovix provide API marketplace capability based on API portals. General-purpose API management products can also be used as the basis of an API marketplace.

API consumers: As API marketplaces gradually develop, ensure that you use APIs from trusted marketplaces and trusted API providers, and that you examine usage agreements, licensing and billing terms carefully. If an API is available in an API marketplace, also investigate if the API is available through a direct business relationship with the API provider itself, possibly under better conditions.

Business Impact: For API providers, the presence of their APIs in API marketplaces can increase developer visibility and consumer mind share, which may lead to more API usage, and business scale benefits. For public API marketplaces, these consumers may include not only individual independent developers, but also new business partners. The API marketplace provider may take a

share of the revenue for API access purchased through the marketplace, but this can be considered a cost of sale by the API provider.

For prospective API marketplace providers, there is an opportunity to create marketplaces for particular industries, like BBVA's API marketplace for the financial services sector. The marketplace itself can be monetized, through a registration fee or revenue sharing model. Partner solutions in the marketplace provide capabilities that are additive to the API provider's own APIs.

Internal API marketplaces also promote API discovery, sharing, and reuse.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: Constellant; Lucybot (AnyAPI); Pronovix; RapidAPI

Recommended Reading: "How to Derive Value From APIs Using API Marketplaces"

"Choose the Right API Monetization and Pricing Model"

"To Create a Successful API-Based Ecosystem, Look Before You Leap"

Embedded Analytics

Analysis By: Kevin Quinn

Definition: Embedded analytics is a digital workplace capability where data analysis occurs within a user's natural workflow, without the need to toggle to another application (or change context). More recent use cases are embedding prediction and even adding rule-based logic to deliver prescriptions at the "decision point" in operational applications (e.g., churn risk offers a 15% discount to renew early).

Position and Adoption Speed Justification: The current market climate has end-user organizations focused on cost optimization. This will accelerate the adoption of embedded analytics to measurably improve frontline decision making. The seamless availability of analytics as an inbuilt decision-making capability can mean that nontechnical business users may not even recognize that they are "doing analytics," particularly when this capability is deployed in support of operational decision making.

During the next two years, embedded analytics built into business applications will move from a differentiating capability to a standard feature. Differentiation will not only come from the sophistication of advanced analytics and machine learning capabilities that will be embedded, but also from how streamlined embedded analytics will become within a user's natural workflow. The extreme is when the meaning of analytics is so clear that a decision can be automatic and not require human interaction. This is the tipping point between embedded analytics and business process automation.

User Advice: Consider embedded analytics as a way to drive usage by removing barriers to adoption. Also, consider embedded analytics as a way to increase business value by making analytics closer to the business process and therefore more actionable.

Embedded analytics will also be a part of strategies to help employees understand and improve their personal and team performance. Workplace metrics, measures and targets are a vital part of shaping expectations around individual employee and team behaviors. Select workplace analytics scenarios that are relevant to current business or organizational challenges and ensure that workplace metrics encourage the desired employee behaviors that are in alignment with organizational strategy and values. When the right behaviors are encouraged — and when employees can see the benefit to themselves, the team and the organization — the overall business performance improves.

Business Impact: Embedded analytics contribute to create an organizational culture where analytics are broadly used and trusted for decision support and personal growth within the digital workplace. As more analytics and business intelligence shift their focus toward augmented analytics, the possibility to embed more advanced insights (i.e., predictive and prescriptive) becomes increasingly available. When these advanced analytics are embedded in business applications that also track user decisions and actions, ROI is more easily measured. Accordingly, embedded analytics will help accelerate the adoption of analytics and support data-driven decision making for specific business roles (such as finance management, sales, HR, customer service, and operations etc.) as well as for personal performance.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: GoodData; Infor (Birst); Logi Analytics; Microsoft; MicroStrategy; Oracle; Salesforce; Sisense, Syncfusion

Recommended Reading: “Tech CEOs: Increase Your Competitive Advantage With the Right Embedded Analytics Platform Provider”

“Augmented Analytics Is the Future of Analytics”

“5 Best Practices for Choosing an Embedded Analytics Platform Provider”

SaaS-Delivered IAM

Analysis By: Michael Kelley; Abhyuday Data

Definition: SaaS-delivered IAM has been trending up in the market as clients seek an alternative to software-delivered tools as well as the related infrastructure and people costs that accompany that approach. Up until recently, IAM SaaS offerings have seen the strongest growth in adoption in access management (AM), and authentication functionality. But now many other elements of IAM,

like identity governance and administration (IGA) and privileged access management (PAM), are increasingly being offered through SaaS delivery models.

Position and Adoption Speed Justification: Driven by digital transformation initiatives, SaaS adoption for IAM services continues to grow. There are many organizations who require a hybrid approach due to a large portfolio of legacy applications, and these environments will require more effort to migrate entirely to SaaS, which will delay universal adoption. However, the majority of customers worldwide appear to be prioritizing SaaS approaches over software.

SaaS-delivered AM and authentication capabilities are very mature, with many organizations comfortable consuming multifactor authentication (MFA) as a SaaS offering. SaaS-delivered IGA is not yet mainstream, and not every IGA vendor offers it, however, Gartner has noticed a marked acceleration in client purchasing. PAM capabilities are still primarily being delivered via software, and in some instances are still bound to purpose-built appliances. However, several PAM vendors have started to offer SaaS-delivered options, and the ratio of SaaS-based PAM solutions is growing quickly for new purchases.

User Advice:

- Identify the key business drivers for your IAM vision, which benefit from SaaS-delivered IAM: faster time to value, more reliable and available services, mitigation of staffing concerns for software deployments, and lower cost of ownership.
- Evaluate the ability to use a SaaS-based IAM solution to resolve conflicts over duplicate IAM implementations. A SaaS-based platform augments these solutions by providing standardization and consolidation for all apps and users.
- For organizations that manage frequent acquisition and divestiture activities, leverage the agility of SaaS-based IAM solutions and quicker time to completion compared to software-delivered solutions.
- When considering new IAM purchases, use a responsibility and cost comparison framework to ensure appropriate comparisons between software and SaaS-delivered IAM implementations.
- Capture a more complete picture of the costs for software delivered tools by; auditing and documenting people and IT asset costs for owning and managing IT infrastructure, documenting project related costs for software upgrades, and audit and document ongoing support costs and planned obsolescence, which drives investment in new IT infrastructure. These costs can be used when evaluating transition and subscription fees for SaaS-delivered IAM platforms.
- For hybrid approaches, organizations required to maintain both software and SaaS tools based on application requirements, take a cloud first approach and consider software solutions as exceptions.
- If not already consuming MFA from SaaS, begin there, followed by access management, both of which are mature in adoption. Consider migrating PAM next, and consider IGA migrations last, due to the complexity of software implementations.

Business Impact: Organizations are using SaaS to fill gaps in enterprise IAM portfolios, IAM staffing functions and to achieve faster time to value. IAM staff can potentially be redirected to other areas. SaaS provides standard, consistent IAM functions to support both internal and cloud-based applications and users for multiple lines of business with disparate IAM infrastructures inside an enterprise.

SaaS is proven in authentication with SaaS representing the default choice in over 90% of the cases, as well as in AM and customer IAM (CIAM) use cases, in addition to growing PAM and IGA offerings. Popular SaaS offerings from a single vendor may not be able to replace functionally deep and broadly implemented IAM solutions in all organizations, but SaaS may be used to supplement those implementations, and to provide a bridge for digital transformation initiatives, some convergence between AM, IGA, and PAM in SaaS tools has been observed in the market.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Cisco-Duo Security; Entrust Datacard; Microsoft; Okta; OneLogin; Oracle; Ping Identity; SailPoint; Saviynt

Recommended Reading: "How to Choose Between Software and SaaS Delivery Models for Identity and Access Management"

"Predicts 2020: Identity and Access Management"

DaaS

Analysis By: Mark Beyer; Ehtisham Zaidi

Definition: Data as a service (DaaS) is an architectural and design approach that delivers data on demand via consistent, prebuilt access with the aid of standard processing and connectivity protocols (e.g., APIs), and is one possible mode of delivery in the evolving data fabric. Originating data remains to its current storage platform and, following various steps to access, transform and contextualize it across any deployment option, is presented as output for use in a subsequent process or delivery endpoint.

Position and Adoption Speed Justification: There are two "flavors" of this solution that are often confused in the market:

- DaaS. Organizations have begun to independently develop their data access and management processing solutions into a service-enabled approach that can access disparate data from various sources and combine it for delivery to a new use case. The term is used only by solution architects and designers in this regard. Even experienced organizations' providers are encountering demands to increase their capabilities to create a sustainable, consistent and repeatable data delivery mechanism.

- Data brokers (mistakenly referred to as DaaS). Data aggregation companies (such as Dun & Bradstreet, Nielsen and others best referred to as “data brokers”) have existed as third-party data providers for decades. They consistently utilize data-as-a-service infrastructure to deliver data to clients. Data brokers are becoming increasingly popular due to the growing demand for collaborative, curated and enriched data. New aggregation services are also emerging, and many government agencies are now providing data assets accessed via DaaS.

Market confusion has increased regarding DaaS during the last two years. Most of this owing to the two definitions.

Assertions that mechanical steps in data integration could be automated and repeated by leveraging machine learning over metadata carried DaaS over the peak and it is now heading into the Trough of Disillusionment. The difficulty of building DaaS in-house (the solution) has increased interest in data from more mature marketplaces. Through 2022, DaaS will continue to be a confused term, and this will lead to it ultimately splitting into the two components. The DaaS architecture will become obsolete before plateau and be absorbed by “data fabric.” Data brokers — which are primarily a business delivery model — will eventually use the data fabric approach.

DaaS offers an approach for overcoming binding or “tight coupling” of data to specific applications. All data is available at different levels of access and different speeds of acquisition and refresh. Data is often sourced from disparate governance frameworks that need to be resolved, with varying levels of detail and in various integrated and nonintegrated models. The ingest and output sides of DaaS will be as complex as the result of a combination of *all* these issues. The DaaS architectural approach will not reach the Plateau of Productivity but will be replaced by the more advanced data fabric, which will use this approach as one option. Further, most of the example vendors already involved in this approach will expand to the broader data fabric.

User Advice: Well-designed DaaS environments provision data that is integrated, accurate, enriched, described and available for access. DaaS contrasts with self-service data integration. Users can acquire additional data using DaaS, and then integrate it themselves — with more data or not — as their needs require.

While data and analytics leaders might incorrectly equate DaaS with a technology implementation, it is essential they ensure the data sources made available in this way are well-described and well-documented, are locatable, and that security, privacy and quality controls are well-embedded. D&A leaders looking for DaaS delivery should investigate and prioritize those vendors that offer tools for simplifying and unifying database and content data store access.

Data and analytics leaders such as data architects should consider DaaS-style architecture as one option to temporarily expand and complement the existing data management strategy and infrastructure as they progress toward the wider data fabric.

Business Impact: Some benefits associated with DaaS architectures include:

- DaaS architectures offer benefits to developers who may otherwise have to learn specialized database calls and protocols (proprietary or not). This can enable faster time to value for new business applications and enable new developers or consultants to deploy applications more quickly.

- DaaS architectures can be used to complement complex hub-and-spoke data warehouses to eliminate data silos by federating existing structures. This obscures the underlying complexity with a simplified interface.
- In general, DaaS enables more users to have access to more data, faster.
- DaaS architectures also make coordination between business units and between business partners seamless, enabling more investment in business functionality rather than multiple data integration efforts.
- In addition, DaaS is a "high confidence" approach for monetizing or sharing data via online marketplaces or open data hosting sites.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Acxiom; CluedIn; Denodo; IBM; Informatica; Orion Governance; Sesame Software

Recommended Reading: "Data Fabrics Add Augmented Intelligence to Modernize Your Data Integration"

"Cool Vendors in Data Management"

Citizen Integrator Tools

Analysis By: Massimo Pezzini; Tim Faith

Definition: Citizen integrator tools are typically cloud-hosted services meant to enable expert business users with minimal IT skills to handle relatively simple application, data and process integration tasks (or "automations") by themselves through very intuitive, no-code development environments. In addition, citizen integrator tools also provide a rich set of prepackaged integration flows ("recipes") that business users can rapidly configure and run with no assistance from integration specialists.

Position and Adoption Speed Justification: Tools that support citizen integrators come in many forms:

- Recipes — These are prepackaged and configurable sets of integration flows, available stand-alone (at times for free), as embedded capabilities in SaaS or as add-ons to integration platforms.
- Integration software as a service (iSaaS) — Cloud services that enable users to implement brand new recipes and to deploy, run and customize existing ones. Typically sold to business users, they partially overlap with iPaaS and at times with digital workplace tools.

- Integration platform as a service (iPaaS) — These are targeted to professional integrators, but a growing number of iPaaS provide an iSaaS-like development environment on top of their offering and/or make available collections of configurable recipes atop their platform.

Pure-play iSaaS providers have achieved notable traction in the consumer and SMB markets, but not in other segments. Instead, recipes (often embedded in SaaS applications like ERP, CRM, HCM) and iPaaS providing citizen-integrator-oriented capabilities are becoming popular in midsize, large and global organizations. These are under pressure to reduce costs and increase business agility, therefore they strive for integration approaches that lead to fast time to value and don't demand expensive and hard to find skills. The growing use of AI, ML, NLP and chatbots in iPaaS offerings will further contribute to augmenting their appeal for citizen integrators.

However, excessive expectations for ultra-easy, super-fast integration and the simplistic nature of some citizen integrator tools may still lead to disappointment, thus hindering the widespread adoption of these offerings.

User Advice: Business users are increasingly technology savvy and often driven by velocity and time-to-market pressures, especially in the post-COVID-19 era, which requires fast reaction to sudden changes in the business environment. This will increasingly urge them to adopt cloud citizen integrator tools, rather than wait for their IT colleagues to methodically perform integration work. This will inevitably lead to security, compliance, management and governance issues, which central IT will eventually have to resolve.

Therefore, as application leaders responsible for integration architecture and platforms you should:

- Engage with your business users to understand their automation challenges and identify to what extent citizen integrator tools can improve their responsiveness and productivity.
- Adopt an approved, certified and supported set of citizen integrator tools and make them available to internal users in a self-service way. This will help to prevent the uncontrolled proliferation of similar tools and maintain a degree of centralized governance and monitoring. However, beware of the unsophisticated and lowest-common-denominator nature of several tools (especially, recipes) available in the market.
- When selecting an iPaaS, give preference to providers that can support both "professional" and citizen integrator requirements.
- Frame citizen integrator tools, including those embedded in SaaS applications, in your hybrid integration platform (HIP) strategies.

Business Impact: The insatiable need for integration as well as the mounting pressure for business change and greater efficiency caused by the post-COVID-19 global recession will fuel adoption of citizen integrator tools.

These tools enable business users to automate tasks that are currently integrated via slow and error-prone manual methods. When framed in an HIP, they can improve organizations' efficiency, productivity, agility and innovation, while keeping technical debt, security and compliance risks under control.

Citizen integrator tools can also be leveraged as high-productivity environments for integration specialists or less-skilled IT staff (ad hoc integrators), to quickly and cheaply sort out simple tasks instead of using more sophisticated, but expensive and time-consuming tools. This can increase productivity, reduce cost of integration and free up integration specialists' time to focus on the more challenging requirements.

Consequently, citizen integrator capabilities may help reduce integration and business operations costs and enable tactical or strategic digital initiatives by supporting fast, pervasive integration by a wide range of employees within (and potentially also outside) the organization.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adeptia; APIANT; Formstack; IFTTT; OneSaas; Oracle; Quick Base; Tray.io; Workato; Zapier

Recommended Reading: "The Applications of the Future Will Be Founded on Democratized, Self-Service Integration"

"Boost Development Team Capacity at MSEs Using Citizen Developers and Integrators"

"Market Guide for Application Integration Platforms"

Climbing the Slope

Application Performance Monitoring Software

Analysis By: Charley Rich; Federico De Silva

Definition: APM software is composed of:

- Front-end monitoring to observe and analyze the performance and behavior of end-user interactions with applications.
- Application discovery, tracing and diagnostics (ADTD), used to discover and detect the relationships between web/application servers, microservices and infrastructure using bytecode instrumentation and/or distributed tracing.
- Analytics uses domain-centric artificial intelligence for IT operations (AIOps) to detect patterns, anomalies and causality.

Position and Adoption Speed Justification: Gartner continues to see increasing growth in the market size (over 15.3% growth rate on revenue of $4.3B, see "Market Share: All Software Markets, Worldwide, 2019") driven by the continued acceleration of the digitalization of business processes

and the realization that greater observability is needed to monitor the applications that are essential to digital business transformation.

APM vendors have expanded with integrated monitoring and analysis of infrastructure, including network, servers, databases, logs, containers, orchestration, service mesh, microservices, cloud services, the relation of performance metrics with business KPIs and business processes.

Increased emphasis on customer experience is stimulating the need for greater insight into the customer journey as users interact with digitalized business processes. This need goes beyond traditional front-end monitoring, as part of APM measuring latency and encompasses a broader set of capabilities including measuring end-user sentiment, as well as accomplishment of business objectives such as orders, claims and trades (see “Market Guide for Digital Experience Monitoring”).

APM is playing a critical role in providing rapid feedback to developers about the impact of the most recent production deployments. They display performance analysis within the context of a release with some solutions providing bidirectional deployment tool integration and the sharing of tags between IT ops and DevOps.

APM vendors’ adoption of open standards continues to expand. A number of APM vendors have become active in the group defining a future standard for distributed tracing, collection of metrics and logs, OpenTelemetry. (See “Magic Quadrant for Application Performance Monitoring.”) This approach is developer-intensive but, with automation it may replace or expand the standard model of application monitoring, the agent. The proprietary nature of APM agents are also evolving, pushing more of the APM value proposition into the analytics realm, reducing vendor “stickiness.” The mainstream adoption of OpenTelemetry could disrupt vendors that are slow to adopt these new technologies and could impact the rate of adoption of microservices. This is part of an ongoing trend toward self-reporting infrastructure.

APM solutions are increasingly adding machine learning (ML), a technology used in AIOps solutions, into their products. ML is being used to reduce the noise operators deal with, predicting and detecting anomalies and determining causality.

User Advice: As organizations continue to embrace digital transformation, their need for agility in order to deliver on these transformation initiatives increases. Therefore, APM solutions must support that need for agility, aid in its acceleration and effectiveness, and avoid being perceived as just another performance monitoring tool.

Choose vendors that assist in relating application performance to business objectives and serve not only IT operations, but also DevOps, application owners and lines of business, providing value throughout the life cycle of an application. Select a vendor that provides actionable answers and not just endless drill-downs to more data.

Choose APM vendors based on their abilities to support, the following:

- The mapping and monitoring of customer and business journeys
- Bidirectional integration with the DevOps tool chain
- New emerging standards in instrumentation such as OpenTelemetry

- Cloud-native monitoring with an API-first approach

Bidirectional integration with ITSM tools to bridge the gap between APM and ITSM tools (see “Avoid the Unexpected Consequences of IT Change Management With AIOps and CMDB”).

Business Impact: APM is critical for isolating problems, shortening MTTR, improving service availability and customer experience. Advanced capabilities can be used to better understand business processes by mapping instrumentation data to a business process, broadening APM’s value in performance monitoring to delivering insights into business operations. improving business relevance, communicating insight to business personas and in resolving the most important problems first. As a result, APM continues to be of use to a growing set of stakeholders including IT Ops, development/DevOps, CloudOps and application owners or line of business (see “Critical Capabilities for Application Performance Monitoring”).

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Sample Vendors: Aternity; Broadcom (CA Technologies); Cisco (AppDynamics); Datadog; Dynatrace; IBM; Instana; New Relic; SolarWinds; Splunk

Recommended Reading: “Magic Quadrant for Application Performance Monitoring”

“Critical Capabilities for Application Performance Monitoring”

“Market Guide for Digital Experience Monitoring”

“Broaden Application Performance Monitoring to Support Digital Business Transformation”

“Advance Your Application Performance Monitoring Strategy to Support Microservices”

“2019 Strategic Roadmap for IT Operations Monitoring”

“I&O Leaders Must Use Monitoring Metrics to Optimize Customer Experience”

Cloud Access Security Brokers

Analysis By: Steve Riley

Definition: Cloud access security brokers (CASBs) provide crucial cloud governance controls for visibility, data security, threat protection, and compliance assessment in SaaS and IaaS. CASBs consolidate multiple types of security policy enforcement into one place. Examples include authentication, single sign-on, authorization, device profiling, data security, logging, alerting, and malware removal. Most CASB deployments are cloud-based; on-premises deployments are rare.

Position and Adoption Speed Justification: Vendors offer feature-rich products to increase cloud visibility and apply consistent policy across multiple providers. Execution across all vendors is variable: while some have incrementally improved and added new capabilities, the leading vendors continue to make significant investments that have contributed to the rapid maturation of the market. The acquisition phase of the market has ceased. Major incumbent security vendors now offer a CASB, either stand-alone or as part of a product portfolio; integration with other products in portfolios is inconsistent but improving. While the number of independent vendors has stabilized, the most relevant independent vendors demonstrate sustained innovation and broad market reach. Differentiation among vendors is becoming difficult, and several have branched beyond SaaS governance and protection to include custom application support in IaaS clouds, cloud security posture management (CSPM) capabilities, and user and entity behavior analysis (UEBA) features. The most relevant independent vendors continue to receive venture capital funding, while funding for the less well-known private vendors remains uncertain. The pace of client inquiry indicates that CASB is a popular choice for cloud-using organizations. Gartner's 4Q19 security spend forecast predicts a significant but slowing growth rate for CASB: 45.3% in 2020, 40.7% in 2021, 36.7% in 2022, and 33.2% in 2023. While the forecast predicts slowing spend for all security markets, CASB's growth remains higher than any other information security market (see "Forecast: Information Security and Risk Management, Worldwide, 2017-2023, 4Q19 Update").

User Advice: Examine vendor capabilities in four functionality areas: visibility, data protection, threat detection and compliance. All relevant CASB vendors interact with SaaS applications via APIs and can be positioned in-line for real-time traffic visibility. CASB proxies may or may not require endpoint agents for traffic steering outside proxied networks; factor this into your evaluation. Increasingly, CASB vendors offer remote browser isolation as an adjunct to in-line deployments.

Common deployment scenarios that deserve special scrutiny include:

- **Cloud discovery and risk assessment.** Evaluate the thoroughness of the CASB's analysis of an organization's cloud security posture. The CASB should discover every cloud service in use and assign each one a risk score (ask vendors for information about how often this is updated), gleaned from attributes whose weights can be modified by customers. Evaluate the CASB's CSPM capabilities for assessing risk in IaaS storage, compute, and virtual network configurations.
- **DLP.** Evaluate whether CASB capabilities are sufficient or require augmentation with deployed enterprise DLP product, either via ICAP or RESTful API integration. In-line CASB DLP capabilities should provide a mechanism to control the movement of sensitive information into and out of cloud services in real time. Examine CASB support for data classification features that can link to existing enterprise classification tools.
- **Adaptive access control (AAC).** Examine techniques vendors provide for altering the behavior of governed applications based on signals observed during and after login. AAC allows for shades of access (e.g., read-only access to content on unmanaged devices) that are more useful to the business than blocking access completely.
- **UEBA.** Evaluate how CASBs detect and isolate risky users and devices. Insider threats and compromised accounts are common attack vectors. Seek mechanisms that build baseline behavior profiles (such as typical upload/download amounts and user locations) and alert and

mitigate when behavior deviates from baselines. Step-up authentication is an important capability to test with whatever IAM vendor is already deployed.

- **Third-party app discovery and control.** Ensure that the CASB can detect all third-party apps that have been granted access to SaaS applications (almost always via OAuth). Look for more than single yes/no controls for each app and instead favor the ability to group third-party apps into categories based on OAuth scopes.
- **Regulatory compliance.** Determine whether the CASB offers sufficient visibility and control for aspects such as user privacy and data residency. Carefully scrutinize encryption mechanisms. Encrypting data before sending it to a cloud service might negatively affect certain functionality in the service. Evaluate the CASB's CSPM capabilities for comparing IaaS workload configurations to common regulatory baselines.

Business Impact: CASBs are uniquely positioned to enable organizations to achieve consistent security policies and governance across many cloud services. Unlike traditional security products, CASBs are designed to protect data that's stored in someone else's systems. CASBs are suitable for organizations of all sizes in all industries and are uniquely positioned to help demonstrate that cloud use is well-governed. Given the expected continued feature expansion and relative ease of switching, favor one-year contract terms over lengthier ones.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Bitglass; Censornet; CipherCloud; Forcepoint; McAfee; Microsoft; Netskope; Proofpoint; Symantec; Zscaler

Recommended Reading: "Magic Quadrant for Cloud Access Security Brokers"

"Critical Capabilities for Cloud Access Security Brokers"

"Peer Lessons Learned: Implementing Cloud Access Security Brokers"

"How to Secure Cloud Applications Using Cloud Access Security Brokers"

"Best Practices for Planning, Selecting, Deploying and Operating a CASB"

iPaaS

Analysis By: Massimo Pezzini

Definition: An integration platform as a service (iPaaS) is a vendor-managed cloud service that delivers a mix of application, data and B2B integration capabilities, coupled with API management functionality. iPaaS offerings target a variety of central IT and line of business integration personas, including integration specialists, application developers and business users. iPaaS are typically

adopted to complement or, increasingly, replace classic integration software in the context of hybrid integration platform and self-service integration strategies.

Position and Adoption Speed Justification: Although tens of thousands of organizations have adopted iPaaS offerings already, the market continues to grow rapidly (about 47% in 2019). iPaaS offerings are typically sold as:

- "Enterprise" suites of capabilities or as offerings targeting specific domains (verticals or ecosystems).
- Stand-alone services or "embedded" in other cloud services, especially SaaS applications and megaPaaS suites.

Even during the COVID-19 global recession, iPaaS adoption will continue to grow, although it will likely be at a slower pace. Factors driving this growth include organizations' pressing needs to automate processes, accelerate digital transformation, quickly react to dramatic business changes and speed up plans to adopt the cloud to contain costs and increase agility. To respond to these requirements, providers will strive to further improve iPaaS developers' productivity, reduce time to value and shorten the learning curve in order to reduce barriers to entry and expand the potential audience. This implies providers' R&D budgets will focus on use of AI/ML and NLP to assist development and operation, enrich packaged integration processes portfolios, enable CI/CD and DevOps and extend the range of supported use cases, including in hybrid, multicloud scenarios.

However, obstacles to faster adoption will include:

- The excessive fragmentation of the market (140+ providers).
- Confusion between the complementary roles of iPaaS and API management platform.
- The dubious viability of some pure-play providers in the light of the looming global recession.
- Limited geographic coverage of most of the smaller providers.

User Advice: iPaaS offerings are used to support a growing set of cloud-centric integration requirements via differentiated developer experiences supporting various personas, including integration specialists, agile application developers (ad hoc integrators) and business users (citizen integrators). Therefore, compelling reasons for organizations of any size to consider iPaaS include:

- Short learning curve and ease of use even for junior integration developers and personnel with minimal IT skills (i.e., citizen integrators)
- Fitness with cloud-centric integration requirements
- Fast time to value and self-service via prepackaged integrations
- Lower entry and IT operation costs
- Rich and expanding range of functionality and supported use cases

Application leaders responsible for integration architecture and platform should position iPaaS as:

- The integration platform of choice for midsize organizations moving to the cloud and for "greenfield" integration initiatives.
- Quick-win for well-defined use cases, typically via the tactical adoption of domain-specific iPaaS offerings.
- An opportunity to enable ad hoc integrators (application developers, SaaS administrators, etc.) or citizen integrators to occasionally perform integration tasks in a self-service way.
- A viable option for a variety of tactical integration projects with low budgets, severe time constraints, and informally defined and incrementally formulated requirements.
- A strategic complement to traditional integration platforms — increasingly in the context of HIP strategies — to empower a collaborative, democratized approach to integration.

Application leaders should, however, think strategically, but act tactically in their iPaaS purchases. Many of the current providers will be acquired; retrench into narrow, more defensible niches; reposition; or simply go out of business as the market conditions get harder and market growth slows down.

Business Impact: By enabling to rapidly and cost-effectively address integration requirements, adoption of iPaaS helps organizations improve efficiency, provide real-time business insights, increase business agility and innovate products, services and business models. However as opposed to classic integration software products, the use of iPaaS offerings will help application leaders deliver these goals more effectively by:

- Reducing cost via prepackaged process automation
- Shortening time to value for new applications via more agile and faster integration
- On boarding more quickly and more easily business partners, customers and employees
- Supporting any-to-any, pervasive integration challenges, typically as a component of a broader HIP
- Enabling accelerated digital transformation through API publishing, mobile apps, IoT integration, RPA, digital integration hubs, event processing and other emerging use cases

Through iPaaS, those benefits are now accessible and affordable also to midsize organizations that could not take advantage of the classic integration software due to its cost and demanding requirement in terms of skills.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Dell Boomi; Informatica; Jitterbit; Microsoft; MuleSoft; Oracle; SAP; SnapLogic; Tray.io; Workato

Recommended Reading: "Magic Quadrant for Enterprise Integration Platform as a Service"

"Technology Insight for Enterprise Integration PaaS"

"Market Share Analysis: Integration Platform as a Service, Worldwide, 2019"

Cloud Application Discovery

Analysis By: Jay Heiser

Definition: Cloud application discovery (CAD) refers to mechanisms for security, licensing, compliance and I&O professionals, providing visibility into enterprise activity associated with the use of public cloud applications. CAD provides information on application name and type, and usage by individual and department. Ideally, an application discovery tool also provides information about the cloud service provider, including a risk rating.

Position and Adoption Speed Justification: IT professionals are increasingly recognizing that the identification and analysis of unsanctioned IT are critical elements of data governance, cybersecurity and IT spend management, encouraging the utilization of CAD functionality. Regulations, especially the EU GDPR and CCPA, are providing additional incentive to determine what SaaS applications are being used in what way. Dozens of multifunction products offer different levels of CAD functionality, supporting different corporate IT roles. CAD is not a stand-alone market, but rather a feature of several categories of multifunction management tools. It is a primary capability of cloud access security broker tools and SaaS management platforms, and a secondary capability of software asset management, DNS solutions, firewalls and secure web gateway products. The proliferation of CAD across so many different functions represents a confusing market, but it means that most IT departments already have some capability to identify "shadow IT," although many have not yet tried to apply this capability.

User Advice: All organizations that are heavily regulated or have large amounts of critical data should be either controlling access to SaaS or monitoring SaaS usage through CAD mechanisms. As more enterprises put policies in place that require explicit risk acceptance decisions for the use of SaaS, they require mechanisms to identify unauthorized SaaS use and monitor authorized SaaS use to ensure it is meeting policies. The decision about when and where to place additional controls over the "virtual enterprise" represented by SaaS starts with tools that can report on the extent to which external applications are being utilized. This provides information in support of defensible decisions about the organizational use of SaaS, and will ensure that "unsanctioned IT" can be identified, helping organizations prioritize their SaaS risk assessment and control efforts.

CAD products differ in the sources used for collecting the data, which can come directly from the endpoints or, more conveniently, from firewalls or secure web gateways. They also differ in the level and form of information they report. The most useful CAD products provide some information that can help IT security, privacy, compliance and other IT governance functions to focus attention on the applications that are most likely to represent higher levels of risk.

Business Impact: Most organizations have hundreds, even over 1,000, SaaS applications in regular use, many of which the IT department is unaware of, and most of which are not IT's direct

responsibility. Cloud discovery tools are useful in identifying this "unsanctioned IT," facilitating security, compliance, SaaS license management and even control over usage fees. Most organizations have some form of tool that includes a CAD function, but the majority of organizations still fail to fully apply this capability, thus complicating the estimate of market penetration. Gartner anticipates that visibility into cloud application usage will eventually be considered a mandatory function by auditors and regulators, but the level of urgency continues to be relatively low.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Censornet; Eracent; Flexera; McAfee; Microsoft; Netskope; Scalable Software; Snow Software; Symantec; Torii

Recommended Reading: "Magic Quadrant for Cloud Access Security Brokers"

"How to Develop a SaaS Governance Framework"

"Solution Path for a SaaS Adoption Framework"

Entering the Plateau

Application PaaS

Analysis By: Paul Vincent; Yefim Natis; Fabrizio Biscotti

Definition: An application platform as a service (aPaaS) is a cloud platform service that offers an environment and tools for general-purpose application development and deployment. The major aPaaS types include low-code/no-code (targeting high-productivity and reduced skill sets), and pro-code (providing high-control of underlying design patterns and resources).

Position and Adoption Speed Justification: The aPaaS market is served by all the cloud megavendors and over a hundred independents (see "Platform as a Service: Definition, Taxonomy and Vendor Landscape, 2019"). Cloud megavendors such as Amazon Web Services (AWS) and Google are pursuing cloud integrated platform service strategies that offer pro-code (3GL) aPaaS alongside other PaaS such as database, API/integration, as well as container services. SaaS+PaaS vendors such as Salesforce and ServiceNow focus more on multifunction low-code/no-code aPaaS (rapid application development using model-driven capabilities and optional scripting). Few vendors like Microsoft, Oracle and Salesforce stand in both low-code and pro-code camps but these aPaaS are usually distinct platforms. Some aPaaS, increasingly from megavendors like IBM-Red Hat and Google but also from independents like Betty Blocks, Mendix and OutSystems, support hybrid (cloud and software) versions which also provide a multicloud capability.

Salesforce, the largest aPaaS vendor, dominates the low-code aPaaS market. Most other megavendors were late to low-code/no-code aPaaS which is where independents are thriving due

to increasing demand for lower-cost business automation. The low-code aPaaS segment overlaps with cloud business process management and automation systems (bpmPaaS) such as Appian, Pegasystems and AgilePoint, as well as citizen development focused aPaaS like Quick Base. The total aPaaS market achieved an annual growth rate of over 27% over the past year, versus the traditional platform middleware market's decline of 3.9%.

The maturation of aPaaS technologies indicates mainstream acceptance and strategic use of cloud platform services by enterprise and departmental IT teams. Enterprise adoption of aPaaS offerings is approaching the Plateau of Productivity, with their cloud-native capabilities replacing traditional on-premises monolithic application technology. The pro-code aPaaS competes with self-assembly Kubernetes-based container platforms as well as the productized versions from Red Hat OpenShift, SUSE and VMware, and with the serverless function PaaS (fPaaS) like AWS Lambda and Microsoft Azure Functions. The combination of pro-code, low-code and no-code aPaaS fulfils most requirements for new and modernization business application initiatives.

User Advice: Application leaders, CIOs, CTOs, IT leaders and planners should:

- Use aPaaS, as the strategic platforms for most new and modernized applications. Although aPaaS is still evolving, avoiding it risks limiting agility and innovation since the familiar "legacy" platforms of past decades are inelastic. aPaaS offerings provide cloud-first, cloud-native best practices, and should be the primary components of any application platform portfolio unless there are specific specialist requirements for on-premises, edge, or multi-cloud applications.
- Consider the pro-code and low-code/no-code aPaaS for appropriate use cases. Pro-code aPaaS is suitable for direct design of high-performance miniservices and microservices, exploitation of event-driven architectures, and extreme performance requirements in packaged business capabilities. Low-code/no-code aPaaS is suitable for more standard enterprise use case patterns, and where 2-8 week application delivery schedules are more important and the task is user experience combined with composition of services. Blend usage of both types for maximum flexibility in terms of technologies, development skills, and speed and sophistication of application delivery.
- Consider cloud-native application platforms or PaaS frameworks, such as container-based Cloud Foundry and OpenShift, as alternatives to aPaaS where high-control hybrid, multicloud or edge application services are desired.
- Augment or replace pro-code aPaaS with fPaaS when you require fine-grained control of costs or variability in compute resources and are not concerned with infrastructure for pro-code applications. Note fPaaS is still evolving developer support and is dedicated to only the application back-end logic.
- When planning aPaaS-centered initiatives, give special consideration to integration and composition needs. Web-scale IT will demand continuous change, extension and integration. Vendor reliability in terms of backward-release compatibility should also be assessed.

Business Impact: Public aPaaS changes the model of IT software engineering from do-it-yourself full-stack responsibility to a focus on the business content of applications. This, in turn, encourages a shift in IT organization, processes, skills and culture from infrastructure-centric to business-

centric. The benefit of adopting aPaaS to replace traditional on-premises development and production management of applications is at least moderate. It may be high or even transformational when used in conjunction with, or in support of, agile and associated methodologies such as DevOps. In these cases, aPaaS gives IT teams access to continuous platform innovation, new time-to-market advantages and ready access to cloud-native technologies.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Sample Vendors: Appian; Betty Blocks; Google; Mendix; Microsoft; Oracle; OutSystems; Quick Base; Salesforce; ServiceNow

Recommended Reading: "Top 10 Trends in PaaS and Platform Innovation, 2020"

"Platform as a Service: Definition, Taxonomy and Vendor Landscape, 2019"

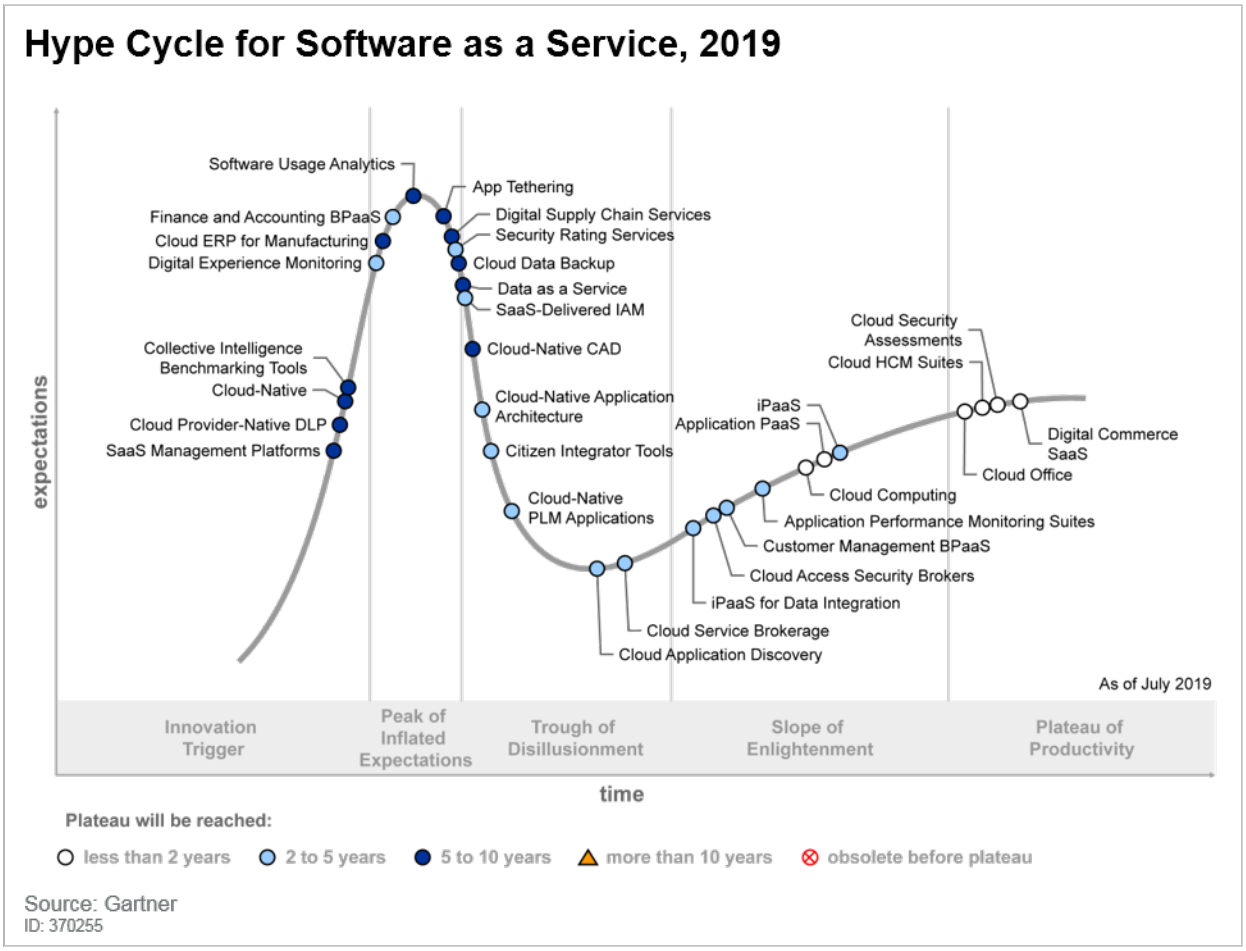
"Top 3 Trends in Application Architecture That Enable Digital Business"

"Magic Quadrant for Enterprise Low-Code Application Platforms"

"Market Guide for Container Management"

Appendixes

Figure 3. Hype Cycle for Software as a Service, 2019



Source: Gartner
ID: 370255

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
Innovation Trigger	A breakthrough public demonstration, product launch or other event generates significant press and industry interest.
Peak of Inflated Expectations	During this phase of overenthusiasm and unrealistic projections, a flurry of well-publicized activity by technology leaders results in some successes, but more failures, as the technology is pushed to its limits. The only enterprises making money are conference organizers and magazine publishers.
Trough of Disillusionment	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
Slope of Enlightenment	Focused experimentation and solid hard work by an increasingly diverse range of organizations lead to a true understanding of the technology's applicability, risks and benefits. Commercial off-the-shelf methodologies and tools ease the development process.
Plateau of Productivity	The real-world benefits of the technology are demonstrated and accepted. Tools and methodologies are increasingly stable as they enter their second and third generations. Growing numbers of organizations feel comfortable with the reduced level of risk; the rapid growth phase of adoption begins. Approximately 20% of the technology's target audience has adopted or is adopting the technology as it enters this phase.
Years to Mainstream Adoption	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (July 2020)

Table 2. Benefit Ratings

Benefit Rating	Definition
Transformational	Enables new ways of doing business across industries that will result in major shifts in industry dynamics
High	Enables new ways of performing horizontal or vertical processes that will result in significantly increased revenue or cost savings for an enterprise
Moderate	Provides incremental improvements to established processes that will result in increased revenue or cost savings for an enterprise
Low	Slightly improves processes (for example, improved user experience) that will be difficult to translate into increased revenue or cost savings

Source: Gartner (July 2020)

Table 3. Maturity Levels

Maturity Level	Status	Products/Vendors
Embryonic	■ In labs	■ None
Emerging	■ Commercialization by vendors ■ Pilots and deployments by industry leaders	■ First generation ■ High price ■ Much customization
Adolescent	■ Maturing technology capabilities and process understanding ■ Uptake beyond early adopters	■ Second generation ■ Less customization
Early mainstream	■ Proven technology ■ Vendors, technology and adoption rapidly evolving	■ Third generation ■ More out-of-the-box methodologies
Mature mainstream	■ Robust technology ■ Not much evolution in vendors or technology	■ Several dominant vendors
Legacy	■ Not appropriate for new developments ■ Cost of migration constrains replacement	■ Maintenance revenue focus
Obsolete	■ Rarely used	■ Used/resale market only

Source: Gartner (July 2020)

Gartner Recommended Reading

Some documents may not be available as part of your current Gartner subscription.

Understanding Gartner's Hype Cycles

How to Develop a SaaS Governance Framework

What to Include in Your SaaS Security Policy

Forecast: Public Cloud Services, Worldwide, 2018-2024, 1Q20 Update

Solution Path for a SaaS Adoption Framework

SaaS SLAs: Reduce Risk and Improve Service by Negotiating These Key Terms

Consumption-Based Pricing Is Emerging From Leading SaaS Providers, but Beware

Toolkit: Prudently Accelerate Cloud Acquisitions for SaaS Using Gartner's Triage Methodology

Eight-Step Playbook to Optimize Software and SaaS Negotiations

How to Cut Software and SaaS Costs and Quickly Improve Cash Flow in Times of Crisis

Evidence

[1] "Forecast: Public Cloud Services, Worldwide, 2018-2024, 2Q20 Update"

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