# Hype Cycle for the Future of Applications, 2020

**Published:** 27 July 2020 **ID:** G00450384

**Analyst(s):** Saniye Alaybeyi, Yefim Natis, Stefan Van Der Zijden

This Hype Cycle will help application leaders gain an understanding of the future of applications, assess the maturity and potential impact of emerging innovations, plan for their adoption and separate the hype from reality.

## Table of Contents

## List of Tables



## List of Figures



# Analysis

## What You Need to Know

Organizations are undergoing digital transformation for many reasons. They may be looking to exploit new market opportunities or deliver better experiences, or they may be reacting to the increasing pace of innovation or responding to competitive disruption. Due to an accelerated pace

of business change and in order to better deliver on new business opportunities, organizations need to be agile and adapt and respond faster than ever.

Most organizations today are limited in their ability to adapt. This is primarily due to the state of their application portfolio which is often bloated, difficult to change and aligned to outdated strategies.

To deliver on the future strategy of the organization, application leaders must modernize the application portfolio, and it must operate at the pace of business change. To deliver on digital transformation, organizations need applications that can be assembled, reassembled and extended. This will allow the application portfolio to innovate and adapt to the changing needs of the business. Moreover, application leaders need to begin to enable the composable enterprise, and they need to start now.

## The Hype Cycle

This Hype Cycle contains the main components for the design, architecture and delivery of future application experiences.

In the "future of applications," application leaders and CIOs will be continuously forming and improving business application experiences. To accomplish this, they will be assembling component business capabilities (see "Future of Applications: Delivering the Composable Enterprise"). Some of these building blocks will be delivered in the form of API-centric software as a service (SaaS) or other specialized applications. Some will be semiautonomous components of larger packaged applications. Others, will still be created by organizations for themselves. Not all applications will be delivered via headless SaaS, many people will still consume applications via a vendor provided user experience (UX).

These multisourced business capabilities will be assembled into business experiences by collaborative business-IT teams using the next-generation business integration technologies. Application leaders must transform their applications organization, methods, skills and knowledge in order to deliver new experiences, embrace change, and optimize hybrid teams and architectures. Organizations' leadership will be challenged to refresh their organizational structures, in seeking to provide the best work experiences possible for their employees. They will also need to strive to direct the new company culture toward business unit-IT collaboration and active flexible innovation.

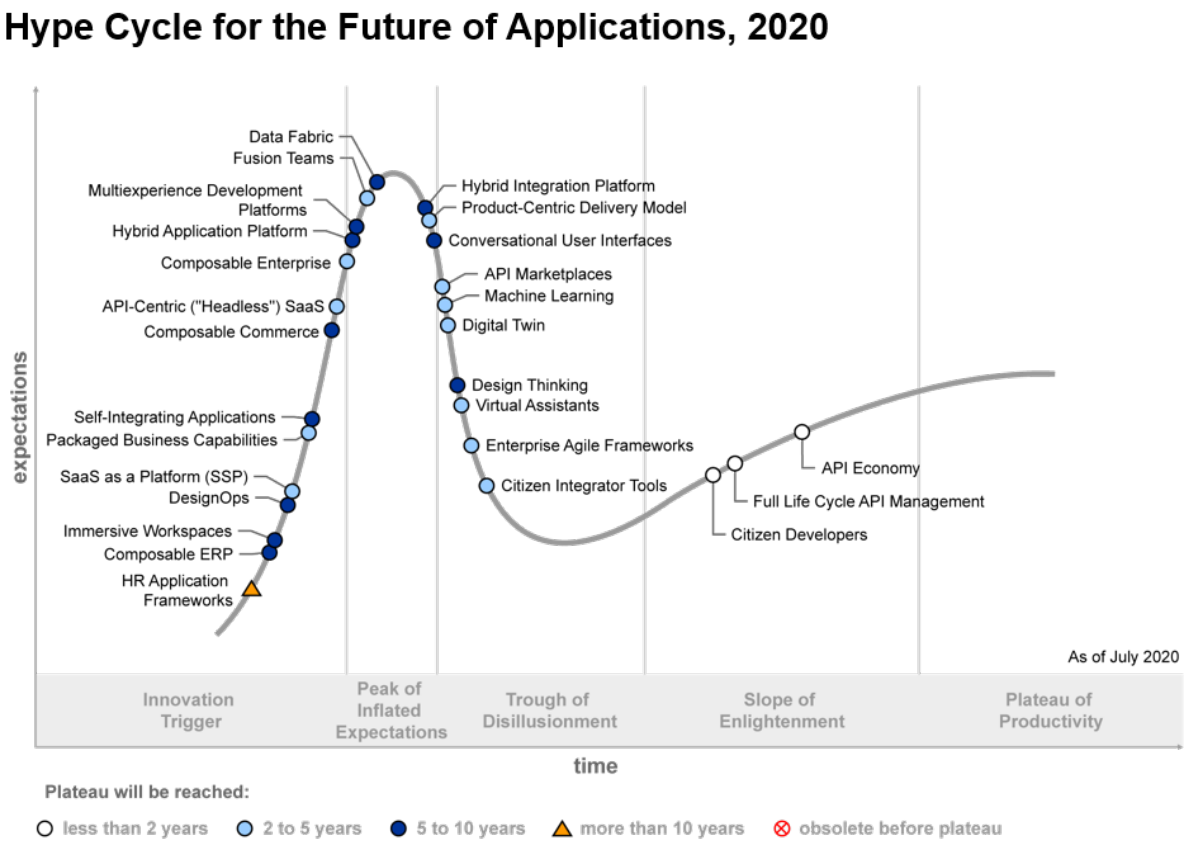
This Hype Cycle encompasses the broad variety of technologies and innovations. These enable application leaders to be agile, and adapt and respond faster than ever to deliver on new business opportunities. The core foundation of a composable enterprise relies on experiences, continuous change and hybrid teams/architecture:

- **Deliver experiences.** Innovations such as multiexperience development platforms and composable commerce. These enable application leaders to know more about their customers, employees and partners; to focus on business outcomes and to iterate, measure and improve.
- **Embrace change.** Innovations such as API-centric-headless SaaS and data fabric, which help application leaders to co-create with customers and partners, and to leverage communities.

- **Optimize for hybrid teams and architectures.** Innovations such as event-driven architecture and packaged business capabilities. These enable application leaders to deliver better business outcomes via highly autonomous fusion teams and to support pervasive integration strategies.

Technologies in support of the future of applications are partly in place today, but are largely still emerging. Application leaders should use this Hype Cycle to understand the future of applications landscape, and assess the maturity and potential impact of emerging innovations. They should also use the Hype Cycle to plan for innovation adoption and separate the hype from reality.

Figure 1. Hype Cycle for the Future of Applications, 2020




Source: Gartner
ID: 450384

## The Priority Matrix

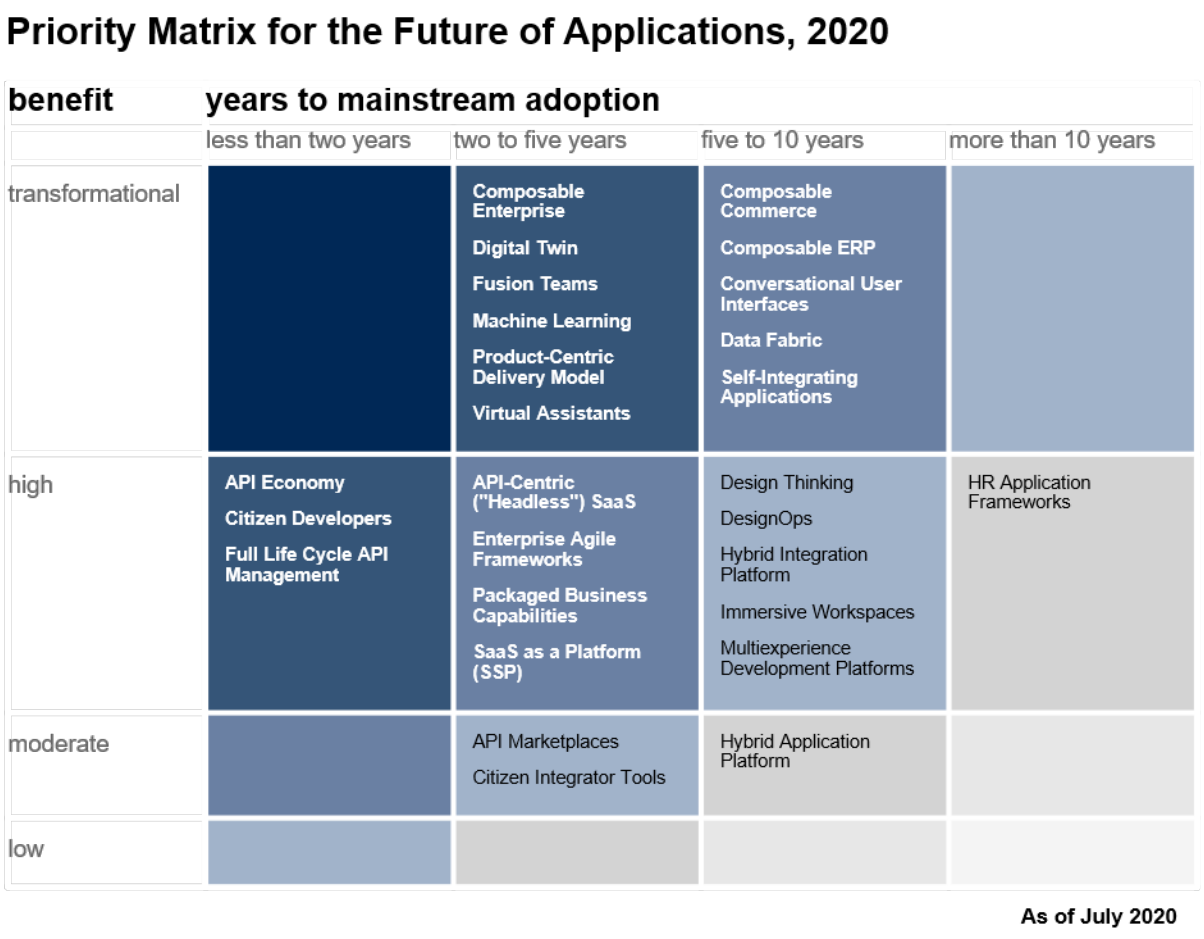
The Priority Matrix shows the relative impact of innovation profiles for the future of applications. It combines the potential benefit of the innovation on the vertical axis and the years-to-plateau rating on the horizontal axis. Application leaders can use this information for internal planning and the prioritization of emerging innovation profiles.

Most innovations for the future of applications have great potential with a transformational or high benefit. There are no transformational innovations that are expected to become mainstream within

two years; most are expected to be mainstream within two to five years. This means that there is still time to develop strategic plans and to evaluate the impacts of these technologies on your organization. However, the number of innovations and their combined impact on the application organization will be high.

The innovations with a high benefit are more evenly spread across the years-to-plateau categories, including three innovations that will become mainstream within two years. These require consideration and transformation planning today, especially if the application organization has not already started to exploit them.

Figure 2. Priority Matrix for the Future of Applications, 2020




Source: Gartner
ID: 450384

## Off the Hype Cycle

**Mediated APIs.** API marketplace, API economy and full life cycle API management innovations are more applicable to future of *applications*. A mediation layer is not necessary to support composable enterprise.

**Microservices.** Microservices innovation profile is not very specific to future of applications. They are not necessary to implement a composable enterprise.

**Decentralized Web.** Decentralized web technologies are not enablers of composable enterprise.

**Digital Business Technology Platform.** There are many other platforms technologies and innovations included in this Hype Cycle that are more relevant to future of applications than digital business technology platforms.

**Blockchain.** Blockchain innovations are not enablers of composable enterprise.

**Microapps.** Similar to microservices, microapps is not very specific to future of applications. They are not necessary to implement a composable enterprise.

**Intelligent Applications.** Machine learning (ML) and conversational platform innovations are more applicable to future of applications compared to Intelligent Applications.

**Business Ecosystems.** API ecosystems are more applicable to future of applications compared to Business Ecosystems.

**Enterprise-Class Agile Development.** There are many other platforms technologies and innovations included in this Hype Cycle that are more relevant to future of applications than enterprise-class agile development tools.

**Application PaaS.** There are many other platforms technologies and innovations included in this Hype Cycle that are more relevant to future of applications than applications PaaS.

**Augmented Analytics.** ML and conversational platform innovations are more applicable to future of applications compared to augmented analytics.

**Business Capability Modeling.** We have innovations such as composable ERP and composable commerce and other packaged application innovations that are more relevant to future of applications than business capability modeling.

**Event-Driven Architecture (EDA).** Event-driven architectures are not necessary to implement composable enterprise.

## On the Rise

### HR Application Frameworks

***Analysis By:*** Sam Grinter

***Definition:*** HR application frameworks are an approach for deploying multiple functional modules from different vendors. They rely on the seamless flow of data from multiple third-party vendors. The anatomy of HR application frameworks includes:

- Functional node — supports specific HR processes as well as caters to local requirements.
- Subfunctional node — functional nodes may act as a central node for other closely-related functions.
- Central node — a hub that unifies data and user experience. The natural evolution of today's cloud HCM suites.

***Position and Adoption Speed Justification:*** HR application frameworks have begun to emerge and the value that they deliver (unifying multiple disparate systems and supporting a more seamless extension beyond the confines of the "traditional" cloud HCM suite) is understood. At present, few vendors exist and appetite to replace a cloud HCM suite (assuming it has been purchased within the last five years) will be low due to cost and time taken to configure and deploy a cloud HCM suite. However, demand for HR to support business resilience and scalability will rise and become more of a priority as businesses begin to recover. In the short- to midterm, it is likely the cloud HCM suites will adapt to deliver some of the capabilities offered by HR application frameworks. However, over time, as technology develops and the limits of existing/old technology are reached, it is expected that a new generation of HR platforms will emerge. Readers should note that the concept of the HR application framework is distinct from cloud HCM suite products offering "out of the box" API integration, which in most cases did not deliver the expected results for end users.

***User Advice:*** HR application frameworks is a very nascent concept, and suitability at present is limited to very early adopters. During this initial period the majority of organizations will be better served lobbying their existing HR technology vendors to invest in their platforms in order to support some of the capabilities offered by HR application frameworks. Examples of such capabilities include smoother integration with third-party applications, PaaS, and application marketplaces. Furthermore, when (re)negotiating terms and conditions of purchase, push for flexibility and scalability for license/user counts and functional modules in order to deliver greater business resilience.

If engaging with an HR application framework vendor demand quality assurances before committing to a deployment. Furthermore, run a deployment as a pilot and/or in tandem with an existing cloud HCM suite to deliver redundant support of HR technology at least initially.

***Business Impact:*** HR application frameworks can potentially provide the following advantages to organizations:

- Consolidation of data — the central node acts to aggregate data across the HR application framework. While this may not immediately seem to be an advantage over a cloud HCM suite, the integration with functional nodes supporting local and functional requirements will improve access to data. This supports improved system performance, reporting and planning.
- Access to innovation/new functionality — organizations are not to be tied to the development roadmap of one (or more commonly a handful of) vendor(s). Instead, organizations will be able

to select and deploy any vendor or product so long as it supports the requirements of the HR application framework.

- Improved user experience — the central node acts as a central point of navigation and will likely incorporate capabilities such as virtual assistants spanning the breadth of the HR application framework.
- Scalability — owing to the connectivity of the functional and central nodes, it is possible to quickly turn functions off/on as desired without much technical intervention. However, commercial terms/norms will need to change to deliver on the business benefits. Typically, the average initial contracting term with an HR software vendor is three years for a set number of user licenses. This approach does not support scalability. However, as we have seen with COVID-19, many vendors (especially smaller vendors) are prepared to offer much more flexible terms including extended free-trial periods and pilots.
- Extensibility/Customization — this type of architecture enables organizations to create an HR application ecosystem customized to their specific requirements.

***Benefit Rating:*** High

***Market Penetration:*** Less than 1% of target audience

***Maturity:*** Emerging

***Sample Vendors:*** ADP; BizMerlinHR

***Recommended Reading:***

"The Future of Cloud HCM Suites"

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

## 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"

## Immersive Workspaces

***Analysis By:*** Marty Resnick

***Definition:*** Immersive workspaces are collaborative work environments that convey a sense of real-world presence through the use of visual, auditory, haptic and other sensory elements. They principally employ virtual reality (VR), augmented reality (AR), and mixed reality (MR) technologies and techniques, but also utilize multiple displays and are delivered to users through head-mounted displays.

***Position and Adoption Speed Justification:*** Immersive workspaces will provide enhanced opportunities for meeting solutions and telecommuting by delivering environments designed for deeper collaboration. They will facilitate richer and more natural collaboration, knowledge sharing, onboarding, and training, facilitated by the use of immersive technologies, multiple displays and other sensory elements.

Immersive workspaces are continuing to appear and mature within VR platforms, such as those of Oculus, but developments have also moved toward MR. Immersive workspaces have the ability to create 3D virtual offices and desktops in a VR world. Also emerging is the ability, using MR, to place

digital objects (such as images of monitors) on walls in virtual representations of the physical world, which offers new collaboration, interactivity, visualization and productivity opportunities.

Immersive workspaces are at a very early stage of development, but the demand for them is increasing, especially as organizations continue to work from home. They are deployed in pilots and proofs of concept (POCs). However, large enterprises are investigating new and innovative ways to enhance collaboration and communication through the use of immersive technologies.

***User Advice:*** Organizations looking to use immersive workspaces to enhance communication and collaboration among members of an increasingly remote workforce and with business partners should:

- Evaluate the market and experience virtual desktop applications through VR ecosystems, such as those of HTC (Vive) and Facebook (Oculus), as well as MR ecosystems such as Microsoft (HoloLens 2).
- Give their employees the opportunity to test immersive technologies.
- Review unified communications vendors' roadmaps and plans for immersive workspaces.
- Start small with a POC, based on a specified business outcome — for VR conferencing, for example. Then, plan specific use cases for a wider rollout, taking account of requirements for networks, hardware and software.

Currently, the use of 3D-enabled applications in immersive workspaces is limited, and availability of these applications will need to grow to meet the true value of immersive workspaces.

***Business Impact:*** Immersive workspaces could offer organizations opportunities to support work from home, reduce travel expenses by improving remote collaboration and to increase productivity through design visualizations. They also could provide enhanced analytics collaboration through immersive analytics. Immersive workspaces could improve connections and engagement between office-based workers and remote workers and suppliers. Providers of virtual meeting, conferencing and training solutions should be looking to add immersive workspace capabilities to their products.

***Benefit Rating:*** High

***Market Penetration:*** 1% to 5% of target audience

***Maturity:*** Emerging

***Sample Vendors:*** Cisco; Facebook; HTC; Igloo Vision; Microsoft; Spatial Systems; vSpatial

***Recommended Reading:***

"Cool Vendors in Augmenting Human Experiences"

"Maverick* Research: Being Human 2040 — The Life of the Architected Human in a More-Than-Human World"

"Market Guide for Workstream Collaboration"

## DesignOps

***Analysis By:*** Brent Stewart

***Definition:*** DesignOps is a set of operational practices that enables centralized design team management and product-level delivery of design assets. The organizational management side of DesignOps focuses on strategic alignment to the business, operations for the central design function, and career development. The product delivery side of DesignOps combines UX, product management and technology operations to enable efficient and DevOps-compatible plans, estimates and processes that increase quality, enable collaboration, and feed ongoing innovation.

***Position and Adoption Speed Justification:*** DesignOps introduces formalized approaches to governance, operations and people management that have been long absent from design disciplines, including UX teams. As a set of easy-to-use operational standards, DesignOps continues to gain in popularity as digital product companies (e.g., Airbnb, Adobe and InVision) and agencies alike discover the tremendous value of a proven operational approach for UX team management and design delivery on product teams. While UX team management is an important component of DesignOps, its growth is due — primarily — to the value it creates during the delivery of design assets for one or many digital products. Here, DesignOps does not alter the core skills and activities of a UX team, rather it reorganizes them in a way that supports ongoing feature enhancement and idea generation without interrupting the continuous workflow of development teams. It represents the first widespread implementation of operational methods and techniques created not only for designers but also for developers. Modeled to be compatible with DevOps and agile practices, DesignOps structures and organizes design work to enable early and frequent feedback via collaboration between the user, the designer and the developer as well as ongoing, iterative delivery of assets and design decisions to the development team. This allows product teams to run parallel tracks of work (dual-track agile) in which UX teams employ "continuous discovery" to understand the user, engage in research, explore various design directions, test possible solutions and document outcomes while also progressively supporting early development activities such as tech design and story creation.

***User Advice:*** Application leaders should educate themselves about the practice of DesignOps, train their UX teams in the basics of agile and pilot the approach with a high-performing, multi-disciplinary feature team. Following a successful pilot, application leaders and the pilot team members should engage in a product-wide rollout that involves training, updated product plans and the allocation of one or more people to the role of design manager — essentially, a UX-focused product manager. It should be noted that a successful rollout of DesignOps at the product level requires complete buy-in from product management, design and development teams as well as robust logistical and administrative skills.

***Business Impact:***

- When coupled with DevOps, DesignOps leads to more innovative solutions. As a practice, DesignOps employees dual-track agile which sets aside ongoing tracks of work dedicated to

new discovery, idea generation and design exploration. This work acts as a constant source of evidence-based, multidisciplinary innovation.

- DesignOps reduces the time to market for major updates and incremental feature enhancements alike. Due to the concepts of continuous discovery and continuous delivery, developers engage in tech design, architectural explorations and proofs of concept sooner than before, and with much deeper understanding of the overall vision.
- DesignOps increases communication and camaraderie between design and development teams. The design-development gap exists for many reasons, one of them being culture. DesignOps promotes multidisciplinary teams in workshop settings, design sprints or one-on-one "pairing and sharing" that promotes understanding, empathy and relationship-building between these two critically important groups.

***Benefit Rating:*** High

***Market Penetration:*** 1% to 5% of target audience

***Maturity:*** Emerging

***Sample Vendors:*** Adobe; Figma; InVision

***Recommended Reading:***

"DesignOps: Organize, Collaborate and Innovate Product UX at Speed"

"Build Links Between Customer Experience, Multiexperience, User Experience and Employee Experience"

"2019 Strategic Roadmap for Becoming a Digital Product Delivery Organization"

"Application Architecture, Development, Integration and Platforms Primer for 2020"

## 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"

## 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”

## 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"

## Composable Enterprise

***Analysis By:*** Yefim Natis; Dennis Gaughan; Gene Alvarez

***Definition:*** A composable enterprise designs its business models, technology architecture, organization and partnership ecosystems in a modular manner, so that it can safely and rapidly change (recompose) at any moment of need. Composable enterprise imposes a model of application design that imagines applications as experiences assembled by or for its users from vendor-provided and custom packaged business capabilities as the building blocks.

***Position and Adoption Speed Justification:*** The core principles of the composable enterprise — modularity, efficiency, continuous improvement and adaptive innovation — are familiar to most organizations. Most organizations have been investing in improving their operation on each of these parameters with some successes, but lacking a cohesive experience of a broad change. The model of composable enterprise brings together these core characteristics and applies in equal manner to managing of business models, organizational structures, ecosystem strategies, the ways of work of the employees, and technology investments. The challenge to achieving consistent benefits of composable enterprise across the organization is not any one particular investment, but the essential underlying requirement for the pervasive practice of "composable enterprise thinking." This, fundamentally cultural, change — from the rigidity of the familiar enterprise structures to the elasticity of active continuous change — is the most significant barrier to achieving the benefits of composable enterprise.

The sudden disruption of the COVID-19 pandemic has woken up the leadership of every business to the existentially critical importance of business resilience. In this context, business leaders and technology vendors all are prepared to make strategic and radical changes to their operations, practices, policies and cultural postures to become better prepared for the new and next business disruptions. This strategic imperative builds a momentum for steady but fast adoption of the core principles of composable enterprise, pushing it toward the Peak of Inflated Expectations and on to the Plateau of Productivity.

***User Advice:*** Application leaders, guiding their organizations in the process of digital transformation, should:

- Use composable enterprise thinking to innovate faster and safer, to reduce costs, and to lay the foundation for business-IT partnerships.
- Prioritize formation of business-IT fusion teams to facilitate faster, smarter and safer decisions in navigating the business through current and future disruptions.
- Assemble a democratized technology platform to best support the operation of fusion teams by combining low-code composition/development tools with the traditional code-centric integration/development technology.

***Business Impact:*** Organizations that adopt the model of composable enterprise in their business, technology and culture achieve a new level of resilience and a transformative access to innovation. They move from the rigid and inefficient traditional normal of hierarchical thinking, to the active agility of composable experience. Such organization assembles (integrates) its application experiences from internal and external ecosystems of components (packaged business capabilities) — to empower their organization to actively track and support the specific (and changing) requirements of its users.

***Benefit Rating:*** Transformational

***Market Penetration:*** 1% to 5% of target audience

***Maturity:*** Emerging

***Recommended Reading:***

“Future of Applications: Delivering the Composable Enterprise”

“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”

“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"

## At the Peak

### Hybrid Application Platform

***Analysis By:*** Anne Thomas

***Definition:*** A hybrid application platform (HAP) is an IT organization's governed portfolio of on-premises, on-edge and cloud-based application platform components that supports all present and future applications — including legacy, heritage, commercial off-the-shelf (COTS), SaaS, homegrown, third-party and digital business applications. Gartner's HAP capability framework helps application leaders define, implement and govern their multiplatform strategy by describing the capabilities required across all application concerns.

***Position and Adoption Speed Justification:*** Many Gartner clients tell us that they have "one of everything" when it comes to application platforms. An organization needs multiple platforms, but an unstructured application platform selection process can lead to a proliferation of redundant and conflicting platforms, which can in turn lead to unmanaged costs and risks. A HAP strategy uses a capability model to classify and categorize application platform technologies and to ensure that the organization has the appropriate platform capabilities it needs (no more or less) to support its diverse application portfolio — supporting old and new, homegrown and purchased, and on-premises and cloud-based applications. It guides organizations to assemble complementary platform technologies and avoid adopting competing ones. Gartner's HAP capability model recommends analyzing platform capabilities based on application use cases, developer skill sets, application types, application architectures, business goals and constraints, portfolio considerations and deployment requirements. An example of applying the model to cloud platforms is presented in "Establish Guidelines for Selecting Cloud Platform Services."

Traditional megavendors, such as IBM, Microsoft, Oracle and SAP, and leading cloud megavendors, such as Amazon, Google and Salesforce, provide broad platform capabilities, and they claim to provide everything an organization needs. But no vendor supplies all types of platform capabilities, supporting all types of applications and all types of developers. A successful HAP strategy should be compiled from multiple vendors and providers.

The notion of using a capability framework to govern an application platform portfolio is new, but it is resonating well with vendors and progressive end-user organizations. We anticipate that the HAP will continue to garner support, although it will take many years to reach maturity.

***User Advice:*** Application leaders responsible for application development and platforms should:

- Use Gartner's HAP capability framework to assess requirements and govern and manage application platform software and service investments.

- Institute a platform selection governance framework to manage and limit platform acquisitions. Start by classifying platform options by use case. Refine selection guidance by developer skill sets, application types and architectures, business goals and constraints, portfolio considerations, and deployment requirements.
- Avoid getting trapped in a strategy dependent on a single-platform solution or provider. If your preferred provider doesn't provide the platform capability you need, bring in third-party services that complement what you have.
- Share your platform selection framework with vendors during requests for proposals to maximize vendor partnership opportunities. Vendors can identify where they fit in your HAP. If they can't, they aren't relevant to your search.
- Invest in integration infrastructure to support managed platform heterogeneity and to reduce dependency on any one platform vendor (see "How to Deliver a Truly Hybrid Integration Platform in Steps").

***Business Impact:*** As they evolve their application platform strategies, application leaders and enterprise architects face conflicting challenges. First and foremost, they must support the established system-of-record application portfolio at the lowest possible cost and, thus, look for stable, low-risk products that are focused primarily on reducing total cost of ownership (TOC). At the same time, application leaders must also provide platforms that enable rapid innovation for their digital business initiatives. Modern applications require new technologies and architectures such as cloud, mobile, in-memory computing, web scale, microservices, hybrid IT and APIs. Standardizing on a single-application platform is impossible. Traditional platforms don't support cloud-native applications, and legacy applications won't run on cloud-native platforms. An effective HAP strategy supports all types of applications. It reduces risks, contains IT costs, and prepares the organization to exploit opportunities.

***Benefit Rating:*** Moderate

***Market Penetration:*** 1% to 5% of target audience

***Maturity:*** Emerging

***Recommended Reading:***

"Establish Guidelines for Selecting Cloud Platform Services"

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

"Top Emerging Trends in Cloud-Native Infrastructure"

"Low-Code Development Technologies Evaluation Guide"

"Technology Insight for Multiexperience Development Platforms"

## Multiexperience Development Platforms

***Analysis By:*** Jason Wong

***Definition:*** A multiexperience development platform (MXDP) offers development teams an opinionated and integrated set of front-end development tools and "backends for frontends" (BFF) services. Its purpose is to enable distributed and scalable development (both in teams and architecture) of fit-for-purpose apps across digital touchpoints and interaction modalities.

***Position and Adoption Speed Justification:*** Adopting an MXDP helps bring together development activities across myriad types of apps so that the user experience (UX) across these apps is seamless and more engaging. The platform is not merely a loose collection of tools and services, but rather an opinionated development platform stack — meaning there is guidance and certain prescribed approaches to development for teams to ensure consistency and productivity. The ability to design and deploy new apps will become an important criterion as MXDPs increasingly support apps for both mobile customers and employees.

Gartner expects that converged development for custom web apps, progressive web apps (PWAs), and mobile apps will be the main near-term driver of adoption of MXDPs to improve UX. Conversational app development will grow in prominence and volume as the tooling and user experience improve. These apps will be deployed as chatbots within custom mobile and web apps, and as part of popular chat platforms such as Facebook Messenger, Slack and WeChat. For the most part, voice apps built on MXDPs will publish to the Amazon Alexa and Google Home platforms. In terms of immersive app development, we expect augmented reality use cases on iOS and Android to be the focus for MXDPs, but the expansion of WebXR support would also be disruptive in the same way that PWAs are for web. Support for specialized hardware for immersive use cases, such as Microsoft's HoloLens or Facebook's Oculus, will be specific to platforms that cater to specific industry solutions. Wearable apps will have smartwatches as their primary targets for the next two years, but we expect broader support for IoT use cases via smart appliances, connected cars and edge equipment.

***User Advice:*** Application leaders must evaluate their MXDP investment and strategy based on these top four factors:

- Ensure the functional depth of capabilities of the platform to meet your app development and business needs in the near term (12 to 18 months).
- Assess the vendor's vision and roadmap for its MXDP breadth to ensure alignment with the direction in which your organization is moving beyond the next 24 months. This may include how to support richer conversational, immersive, wearable and IoT use cases, and scaling development across business units and geographies.
- Evaluate how well-integrated the tools and services are within the platform and with external complementary or supplementary tools and services, and their ability to support the entire design to DevOps life cycle.
- Determine how the MXDP vendor fits as a strategic technology partner for your organization. This product will be a cornerstone of your digital business technology platform, and the vendor should likewise play a strategic role alongside core systems such as CRM and ERP.

***Business Impact:*** An MXDP supports a future of applications strategy and should serve as one of the cornerstones to your digital business technology platform, alongside core systems such as CRM and ERP. Such a platform will be a major influence in terms of shaping your front-end development practices and team skills around its "composable experience" capabilities. An MXDP provides the design-time and runtime platform to better standardize and accelerate the development of these fit-for-purpose apps for customers and partners in the digital business, and for employees in the digital workplace. Treat MXDP vendors as strategic technology partners for your organization. Select vendors that clearly fulfill your current requirements and align with your future application strategy.

***Benefit Rating:*** High

***Market Penetration:*** 5% to 20% of target audience

***Maturity:*** Adolescent

***Sample Vendors:*** IBM; Mendix; Microsoft; Oracle; OutSystems; Progress; Salesforce; SAP; Temenos

***Recommended Reading:***

"Technology Insight for Multiexperience Development Platforms"

"Digital Transformation Demands New Digital DNA for Application Development"

## Fusion Teams

***Analysis By:*** Bill Swanton; Matthew Hotle

***Definition:*** Fusion teams are multidisciplinary teams that blend technology and other types of domain expertise and are often designed to deliver products rather than projects. Fusion teams do not separate the technology work from the rest of the effort to create a complete product or service and often don't report to the IT department, but somewhere else, such as a business unit.

***Position and Adoption Speed Justification:*** Software companies, digital natives, and builders of technology products have had engineering teams outside IT for years. Fusion teams are starting to emerge in more traditional organizations as more products and services have an online component, such as in digital business. While these teams tend to be technically competent, they often don't use the tools or processes of the IT department, creating concerns for the CIO in terms of cost, risk, security, and data protection. CIOs fear they will be stuck supporting this software or cleaning up after a data breach. Fusion teams are well on their way up the Hype Cycle as they create new products but will start to head down as the dysfunctional relationship with IT builds. These issues should get resolved fairly quickly, leading to them maturing in two to five years.

***User Advice:*** Accept that there will be fusion teams doing technology work outside of IT — the business units need to have full control of the resources to deliver their product or service. With control comes responsibility, so organizations should ensure that the CIO and other business

leaders work together to build agile and effective governance frameworks for the work the fusion teams do. CIOs should focus on the human side of managing digital business risk and foster "digital judgment" in fusion team leaders. Digital judgment is the set of beliefs, mind sets and behaviors that lead to sound risk management among front line technology decision makers throughout the enterprise.

***Business Impact:*** The rise of fusion teams is evidence that the boundaries between IT and the rest of the business are blurring at an accelerated rate. Our corporate strategy research shows that fusion teams' benefits are significant. Distributed, simultaneous initiatives with broad-based involvement yield better results than centralized, sequential digital business initiatives. Those that do so effectively can be 2.5 times faster in their digital business transformations than organizations that run initiatives in one centrally managed team that is typically divorced from the legacy business.

***Benefit Rating:*** Transformational

***Market Penetration:*** 5% to 20% of target audience

***Maturity:*** Adolescent

***Recommended Reading:***

"Fusion Teams: A New Model for Digital Delivery"

"Fusion Teams: Cross-Functional Collaboration for the Digital Era"

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

## Data Fabric

***Analysis By:*** Ehtisham Zaidi; Robert Thanaraj; Mark Beyer

***Definition:*** A data fabric is an emerging data management design concept for attaining flexible, reusable and augmented data integration pipelines, services and semantics, in support of various operational and analytics use cases delivered across multiple deployment and orchestration platforms. Data fabrics support a combination of different data integration styles and utilize active metadata, knowledge graphs, semantics and ML to augment data integration design and delivery.

***Position and Adoption Speed Justification:*** The data fabric — as a data management design concept — is a direct response to long-standing issues now being aggravated by digital transformation. These include the multiplicity of data sources and types, the soaring data volume, the increasingly complexity of data integration and the rising demand for real-time insights. Simply put, a data fabric is a design that leverages existing tools and platforms and adds metadata sharing, metadata analysis and metadata-enabled self-healing along with orchestration and administration tools to manage the environment. As a data fabric becomes increasingly dynamic, it evolves to support automated data integration delivery. Data fabrics are almost at the Peak of Inflated Expectations due to the hype in the market and the inherent confusion on how to deliver these. A data fabric is not in itself a tool/platform that can be purchased — it is a design concept that requires a combination of tools, processes and skill sets to deliver. Yet, we witness various tools

being developed and sold under the data fabric tag which do not provision all the requirements needed to fulfill a data fabric. Not least the ability to integrate existing data integration technologies together to deliver a dynamic data integration design that uses active metadata to auto-adjust to new use-case requirements.

Data fabrics will, at the very least, need to collect all forms of metadata (not just technical metadata) and then perform machine learning over this metadata to provide recommendations for integration design and delivery. This capability is typically achieved through the augmented data catalog capabilities of a data fabric. Advanced data fabrics have the capability to assist with graph data modeling capabilities (which is useful to preserve the context of the data along with its complex relationships), and allow the business to enrich the models with agreed upon semantics. Some data fabrics come embedded with capabilities to create knowledge graphs of linked data and use ML algorithms to provide actionable recommendations and insights to developers and consumers of data. Finally, data fabrics provide capabilities to deliver integrated data through flexible data delivery styles such as data virtualization and/or a combination of APIs and microservices (and not just ETL). These are capabilities that together make up a data fabric and will mature over time as more vendors move away from point-to-point and static data integration designs and adopt more dynamic data fabrics.

***User Advice:*** Data and analytics leaders looking to modernize their data management solutions must:

- Invest in augmented data catalogs. These will help you to inventory all types of metadata — along with their associated relationships — in a flexible data model. Enrich the model through semantics and ontologies that make it easier for the business to understand the model and contribute to it.
- Combine different data integration styles to incorporate a portfolio-based approach into the data integration strategy (for example, not just ETL, but a combination of ETL with data virtualization).
- Establish a technology base for the data fabric and identify the core capabilities required before making further purchases. Start by evaluating your current tools (such as data catalogs, data integration, data virtualization, semantic technology and DBMSs) to identify the existing or missing capabilities.
- Invest in data management vendors which exhibit a strong roadmap on augmented capabilities, i.e., embedded ML algorithms that can utilize metadata and provide actionable recommendations to inform and automate parts of data integration design and delivery.

***Business Impact:*** By leveraging the data fabric design, data and analytics leaders can establish a more scalable data integration infrastructure that can provide immediate business impact and enable new use cases, such as:

- Data fabrics provide a much needed productivity boost to data engineering teams that are struggling with tactical, mundane and often redundant tasks of creating data pipelines. Data fabrics once enabled will assist data engineering teams by providing insights on data integration

design and will even automate repeatable transforms and tasks so that data engineers can focus on more strategic initiatives.

- Data fabrics also support enhanced metadata analysis to support data contextualization by adding semantic standards for context and meaning (through knowledge graph implementations). This enables business users to be more involved in the data modeling process and allows them to enrich models with agreed upon semantics.
- Over time, the graph develops as more data assets are added and can be accessed by developers and delivered to various applications as needed. This allows organizations to integrate data once and share multiple times thereby improving the productivity of data engineering teams.
- Data fabrics provide improved decisions for when to move data or access it in place. They also provide the much sought-after capability to convert self-service data preparation views into operationalized views that need physical data movement and consolidation for repeatable and optimized access (in a data store such as a data warehouse, for example).

***Benefit Rating:*** Transformational

***Market Penetration:*** 1% to 5% of target audience

***Maturity:*** Emerging

***Sample Vendors:*** Cambridge Semantics; Cinchy; CluedIn; data.world; Denodo; Informatica; Semantic Web Company (PoolParty); Stardog; Talend

***Recommended Reading:***

"Data Fabrics Add Augmented Intelligence to Modernize Your Data Integration"

"Augmented Data Catalogs: Now an Enterprise Must-Have for Data and Analytics Leaders"

"Modern Data and Analytics Requirements Demand a Convergence of Data Management Capabilities"

"Top 10 Data and Analytics Technology Trends That Will Change Your Business"

"Magic Quadrant for Data Integration Tools"

"Critical Capabilities for Data Integration Tools"

## Hybrid Integration Platform

***Analysis By:*** Massimo Pezzini

***Definition:*** The hybrid integration platform (HIP) is an architectural framework — defining on-premises and cloud-based integration and governance capabilities — which implementation, enables differently skilled personas (integration specialists and nonspecialists) to address a wide range of integration use cases.

An organization's HIP is often built by assembling a variety of technology building blocks, from one or more providers, which are then managed as a cohesive, federated and integrated whole, typically by an integration strategy empowerment team.

***Position and Adoption Speed Justification:*** An HIP combines integration and governance technologies to support:

- Diverse integration personas (specialists, "ad hoc" and citizen integrators)
- Cloud, on-premises, multiexperience, ecosystems and IoT endpoints
- A range of integration patterns and use cases
- Multicloud (public, private), on-premises, hybrid and embedded deployment models

Gartner has defined a generic HIP capability framework, which application leaders can use as a reference when designing an HIP tailored for their needs and use cases, by typically assembling the appropriate combination of:

- Integration platform software (enterprise service bus [ESB] suites, B2B gateway software [BGS] and data integration tools).
- Full life cycle API management (including API gateways).
- Integration platform as a service (iPaaS).
- Event brokers, messaging and data movement.
- Metadata management tools.
- Other technologies that enable additional use cases, such as, multiexperience development, IoT, RPA and process automation support, as well as ML pipelines and digital integration hubs enablement.

Despite the fears of a global economy slowdown, over the past 12 months, organizations have continued to kick off new HIP initiatives, to enable digitalization processes. We expect the trend will not stop and possibly accelerate as organizations strive to adjust their business models to the post-COVID-19 "new normal." Adoption will also be favored and proactively pushed by the growing number of vendors that have now articulated reasonably sound HIP value propositions, in both technical and commercial terms.

***User Advice:*** Application leaders responsible for integration should leverage the Gartner HIP capabilities framework to modernize their strategies to prepare for an even more digitalized business reality by enabling:

- A more collaborative and decentralized approach to integration delivery, where the integration strategy empowerment team enables organizational units to autonomously perform integration work

- Ad hoc and citizen integrators to carry out integration tasks by themselves, thus reduce the burden on scarce and expensive integration specialists, improving business agility and reducing time to value for new business initiatives
- A variety of use cases, including (but not limited to):
- Streamlining and automating business processes to improve efficiency and reduce operating costs
- Fast access to innovation via the creative combination of new SaaS applications and cloud services with established on-premises systems
- Enablement of API strategies and API economy business models
- Providing timely business insights by enabling event-driven architectures that connect mobile and IoT devices with enterprise business and analytical systems
- Improving speed of onboarding of new ecosystem partners

However, application leaders should consider that the Gartner HIP capability framework is an architecture that can be instantiated in multiple ways, depending on their business and technical requirements. Therefore, although several vendors are re-packaging their integration technology portfolios according to a HIP model, for many application leaders implementing their HIP by federating various vendors' products, will remain preferable, to buying an out-of-the-box HIP from a single supplier. In this way it will be easier to maintain backward compatibility with in-place integration platforms and/or mitigate the risks of single vendor lock-in.

In general, to reduce complexity and risks application leaders should put in place a stepwise, initiative-by-initiative HIP implementation strategy, which is usually much easier to justify in business terms than a "big bang" approach.

Challenges associated with designing, developing, deploying, managing and maintaining a HIP are not trivial because they may require significant investment as well as mature processes and skills. Although several external service providers have these skills, they are still relatively hard to find and are costly.

***Business Impact:*** As more organizations engage in digital initiatives, either aimed at business optimization or transformation, the integration challenges they must address will expand in complexity and in quantity.

HIPs can alleviate these challenges by:

- Supporting centralized operations control and governance, while maximizing decentralized and collaborative integration delivery
- Improving business groups' self-sufficiency and business agility by reducing their reliance on specialist integration staff with limited availability
- Accelerating time to value for integration-intensive business initiatives

***Benefit Rating:*** High

***Market Penetration:*** 5% to 20% of target audience

***Maturity:*** Adolescent

***Sample Vendors:*** Axway; Dell Boomi; IBM; Informatica; Microsoft; MuleSoft; Oracle; SAP; Software AG; TIBCO Software

***Recommended Reading:***

"How to Achieve Digital Business Excellence by Mastering the Pervasiveness of Integration"

"How to Deliver a Truly Hybrid Integration Platform in Steps"

## Product-Centric Delivery Model

***Analysis By:*** Matthew Hotle

***Definition:*** Digital business requires a fundamental shift to a product-centric delivery model for application organizations, which involves a shift from project and application to backlog, product and platform. This shift allows the organization to respond more rapidly to demands using agile methods, combined with a continuously prioritized backlog. It also allows the organization to focus on delivering the most important and customer-satisfying features first, rather than waiting for long-lasting projects to complete.

***Position and Adoption Speed Justification:*** Most organizations have begun using agile delivery methods in segments of their business during the past five to 10 years. Since agile methods are a product-oriented delivery method, along with this change has come a (sometimes informal) shift to managing applications as "products." During the past four years, the number of organizations employing this strategy has increased significantly. In most organizations, the shift is organic, and may take longer than the stated two to five years from its inception.

***User Advice:*** If your organization is headed down the digital path, you'll need to adopt agile methods and DevOps. If your organization adopts agile methods (for digital or other reasons), it must also adopt a product delivery paradigm where agile is being used. It is critical to make the shift formally, since mixing and matching project-based and product-based strategies on the same business change is often worse than simply staying with a project-based (incremental or iterative) strategy. Organizations making the shift should clearly identify and train product managers, product owners, business leaders and team members on agile and product management strategy. They should use an agile coach to aid in their transformation. They should also use formal change-management practices as they do so, since the project model has a lot of organizational inertia that must be overcome. Moreover, they *must* have a partnership with their colleagues in the various business areas as they adopt this new delivery model.

This means that, for most organizations, a top-down, organizationwide shift to agile will not be possible, and the transition will take many years. Business leaders have "grown up" in the project-based delivery world, and financial managers are used to project-based value and funding models. For most organizations, the transition will be organic — based on the business need for agility in the

short term and on the success of agile methods in the midterm (where business leaders see the value in adopting agile and products). It can take more than five years once the transition is begun, so the organization will be "hybrid" between projects and products during that time.

***Business Impact:*** Digital business efforts such as websites, mobile applications and APIs are often early targets for a shift to product-based delivery models. Next comes software that automates business capabilities where the pace of change must be high. These efforts mandate a much more agile approach to delivering software than can be achieved by a project-based model, where the "chunk" of delivery (the project) must often be defined a year or more in advance. Done correctly, product delivery focuses the entire business on strategy and business outcomes, and enables it to be more agile in driving toward those outcomes. Moving toward a product-centric delivery model also moves the organization closer to getting everyone who should be in the value stream *on* the value stream. It also limits the "us" and "them" approach that has dominated the IT landscape for years. It also requires a much tighter connection across the organization, in terms of planning and execution.

***Benefit Rating:*** Transformational

***Market Penetration:*** 20% to 50% of target audience

***Maturity:*** Early mainstream

***Recommended Reading:***

"Becoming Product-Centric Should Be an Evolution, Not a Top-Down Transformation"

"Overcome Objections and Sell the Benefits of Moving From Projects to Products and Agile"

"Move Away From Waterfall to Agile and Product-Centric Delivery Methods"

"Leveraging Digital Product Management: A Gartner Trend Insight Report"

"Product Manager Role Description for Digital Business"

## 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"

## 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"

## Machine Learning

***Analysis By:*** Pieter den Hamer; Carlie Idoine; Shubhangi Vashisth

***Definition:*** Machine learning is an AI discipline that solves business problems by utilizing mathematical models to extract knowledge and patterns from data. There are three major approaches that relate to the types of observation provided: supervised learning, where observations contain input/output pairs (also known as "labeled data"); unsupervised learning (where labels are omitted); and reinforcement learning (where evaluations are given of how good or bad a situation is).

***Position and Adoption Speed Justification:*** Machine learning is still a popular concept, given its extensive range of impacts on business. The triggers of its massive growth and adoption have been growing volumes of data, advancements in compute infrastructure and the complexities that conventional engineering approaches are unable to handle. As organizations continue to adopt these technologies, we recently see focus on aspects that relate to ML explainability and operationalization. Augmentation and automation (of parts) of the ML development process improve productivity of data scientists and enable citizen data scientists in making ML pervasive across the enterprise. In addition, pretrained ML models are increasingly available through cloud service APIs, often focused on specific domains or industries. New frontiers are being explored in synthetic data, new algorithms (e.g., deep learning variations) and new types of learning. These include federated/collaborative, generative adversarial, transfer, adaptive and self-supervised learning, all aiming to broaden ML adoption.

***User Advice:*** For data and analytics leaders:

- Focus on the business problem. Start with simple business problems for which there is consensus about the expected outcomes, and gradually move toward complex business scenarios.

- Assemble a (virtual) team that prioritizes machine learning use cases, and establish a governance process to progress the most valuable use cases through to production.
- Utilize packaged applications, if you find one that suits your use case requirements. These often can provide superb cost-time-risk trade-offs and significantly lower the skills barrier.
- Nurture the required talent for machine learning. Partner with universities and thought leaders to keep up to date with the rapid pace of advances in data science. Create an environment conducive to continuous education, and set explicit expectations that this is a learning process and mistakes will be made.
- Provide guidelines and monitor compliance with respect to security, privacy, bias and explainability.
- Leverage the augmentation and automation of ML activities, avoiding unnecessary low level coding and alleviating labor intensive tasks for expert data scientists, while making ML accessible for citizen data scientists.
- Explicitly manage “MLops” for deploying, integrating and monitoring ML models, not underestimating time and complexity. To be successful, early involvement is required of both business stakeholders and IT for integration and operations.
- Focus on data as the fuel for machine learning by adjusting your data management and information governance strategies to enable your ML team. Data is your unique competitive differentiator and adequate data quality, such as the representativeness of historical data for current market conditions, is critical for the success of ML.

***Business Impact:*** Machine learning drives improvements and new solutions to business problems across a vast array of business, consumer and social scenarios:

- Automation
- Drug research
- Customer engagement
- Supply chain optimization
- Predictive maintenance
- Operational effectiveness
- Workforce effectiveness
- Fraud detection
- Resource optimization

Machine learning impacts can be explicit or implicit. Explicit impacts result from machine learning initiatives. Implicit impacts result from products and solutions that you use without realizing they contain machine learning.

***Benefit Rating:*** Transformational

***Market Penetration:*** 5% to 20% of target audience

***Maturity:*** Adolescent

***Sample Vendors:*** Alteryx; Databricks; Dataiku; DataRobot; H2O.ai; IBM; MathWorks; Microsoft; SAS; TIBCO Software

***Recommended Reading:***

"Magic Quadrant for Data Science and Machine Learning Platforms"

"Critical Capabilities for Data Science and Machine Learning Platforms"

"Toolkit: RFP for Data Science and Machine Learning Platforms"

"3 Types of Machine Learning for the Enterprise"

"Top Organizational Pitfalls of Machine Learning Initiatives"

## Digital Twin

***Analysis By:*** Alfonso Velosa; Benoit Lheureux; Marc Halpern

***Definition:*** A digital twin is a virtual representation of an entity such as an asset, person or process and is developed to support business objectives. The three types of digital twins are discrete, composite and organizational. Digital twin class elements include the model, rules, relations and data properties. Digital twin instance elements include the model, data, unique one-to-one association, and monitorability.

***Position and Adoption Speed Justification:*** The idea of modelling people, physical assets, and processes continues to gain traction, especially as the architecture for the future of applications includes digital twins as features of an application, and as stand-alone supplements to portfolios of applications that address an entity.

- People: Digital twins are the evolution of trends including customer 360-degrees, patient electronic health records, and fitness monitors. Their near-term uses include health monitoring and employee safety, particularly in response to the pandemic.
- Physical assets: Digital twins adoption aligns to Internet of Things (IoT) trends. For owner/operators, near-term use includes lowering maintenance costs and increasing asset uptime for equipment users in factories, hospitals, utilities, etc. For product original equipment manufacturers (OEMs), near-term uses include product differentiation, business model differentiation through new product service models, and obtaining customer data.
- Processes: Digital twins are being developed to model IT organizations, financial exchanges, and processes such as purchase orders.

The digital twin profile has moved past the Peak of Inflated Expectations, based on enterprise confusion driven by conflicting vendor marketing and on challenges implementing digital twins. Gartner's CIO Survey 2020 shows that 6% of enterprises have implemented digital twins, although less than 1% of assets have digital twins. Another 41% of enterprises expect to deploy digital twins within three years. These trends lead us to shorten the time to plateau down to two to five years. In the next decade, digital twins will become the dominant design pattern for digital solutions.

***User Advice:*** CIOs should work to guide and protect business adoption of digital twins:

- Business outcomes: Work with business leaders to establish clear business objectives for digital twins. In parallel, establish an IT vision for digital twins, to establish a coherent approach to support the business units.
- Technology: Start with models that are as simple as possible of the entities that are of interest for your business process, whether basic, such as the location of vehicles or a very high fidelity models of a human heart. Determine what data is necessary to "feed" the models and the types of analytics needed; a corollary here is the need to verify and drive data quality. Don't let the dearth of standards limit innovation. Assess how composite and organizational digital twins will require integration and custom development.
- Governance and accountability: Engage the business unit to identify champions, budget support, and to co-build the digital twin strategy and roadmap. Establish a joint business and IT governance process for digital twins, covering their alignment to business KPIs, short and long term value, and their updates and life cycle management.
- Digital ownership and ethics: Work with business and legal teams to establish a policy on ownership of the digital twin models and data, as well as who may participate. In parallel, establish a digital ethics policy to guide the organization to develop twins that positively support the enterprise while serving employees, customers or citizens. This policy will set guidelines to engage ecosystem stakeholders about what data may be shared and what monetization experiments to conduct.
- Vendors selection: Understand most technology providers are still developing their strategy and mostly offer enabling technology. A small number of technology providers have digital twin portfolios which align with specific vertical markets.

***Business Impact:*** Digital twins are transformational as they enable business to drive new digital business models as well as update existing models. For example, they enable superior asset utilization, service optimization and improved customer experience. They create new ways to operate, such as consumption of physical outcomes instead of the capital expenditure acquisition of industrial assets, or new ways to drive an ecosystem or supply chains. And they will open new ways to monetize data.

Digital twins will challenge most enterprises to change their thinking of master data from an IT practice to one that engages the business units and IT to get a more comprehensive situational awareness of assets, people, or processes. In addition, a digital twin can be expensive to maintain, and its value centers on remaining a live model, synchronized with the entity.

***Benefit Rating:*** Transformational

***Market Penetration:*** 1% to 5% of target audience

***Maturity:*** Emerging

***Sample Vendors:*** AVEVA; Bentley Systems; C3.ai; Cognite; GE Digital; Mavim; Microsoft; QPR Software; Schneider Electric; ThoughtWire

***Recommended Reading:***

"Market Guide for Digital Twin Portfolios and Enabling Technologies"

"Survey Analysis: IoT Digital Twin Adoption Proliferates Across Many Sourcing Options"

"Toolkit: Enterprise Readiness for Digital Twin Deployment"

"Market Trends: Software Providers Ramp Up to Serve the Emerging Digital Twin Market" 6

"Software Product Managers Should Exploit the Full Revenue Potential of Digital Twins"

## Design Thinking

***Analysis By:*** Gene Phifer

***Definition:*** Design thinking is a multidisciplinary process used to improve the design of everything from business software to consumer products and services. It is a creative process starting with empathy for users and the gathering of insight into their needs and motivations. These are then developed using an iterative, experimental approach. Deep customer insight combined with a creative process is ideal for digital innovation and digital product development. Design thinking helps to clarify high-value opportunities, and to design high-value solutions.

***Position and Adoption Speed Justification:*** Design thinking dates back to the Industrial Revolution. It has been used by product teams and other areas outside IT for decades, but adopted by the world of enterprise IT only in the past eight to 10 years.

Design thinking has seen an accelerated adoption by enterprise IT. Many design groups, teams, and centers of excellence now commonly use design thinking as part of their design methodologies. While many enterprises have adopted design thinking, many organizations have yet to fully embrace it. A bright spot is the product teams in the business that have embraced design thinking as key to their digital product delivery.

With the advent of COVID-19, digital forms of engagement for all audiences have become paramount. Design thinking has cemented itself as a critical methodology for delivering new products and services grounded in customer experiences and using new technologies. Design thinking is now common among software vendors, system integrators and digital agencies.

***User Advice:*** Design thinking is important for digital business innovation, but also for business optimization and normal business growth. To make progress with design thinking, you must:

- Address the need for digital engagement with selective application of design thinking.
- Build cross-functional teams, drawing from business units and the IT department. Train them in the process of design thinking and give them time to practice it. In most cases, start simply and on a small scale. Take on more complex projects progressively, as experience grows. Consider design centers of excellence (CoE).

*Modify your design thinking approaches to support the no-travel, contactless world of COVID-19 by supporting remote design thinking workshops. The keys here are (1) a collection of digital collaboration tools, (2) electronic conference rooms, (3) multiscreen capabilities for individual WFH workers, and (4) application of DesignOps (see “DesignOps: Organize, Collaborate and Innovate Product UX at Speed”).

*Sample tools for remote design thinking workshops include:

Overall: Microsoft Teams, Google Meet, Zoom, Cisco Webex

Empathize: Typeform, CreatIr

Define: Snaply, Userforge

Ideate: Google Docs, Microsoft 365 Shared Docs, SessionLab, Stormboard, Ideaflip

Prototype: Boords, Mockingbird, Marvel POP

Test: UserTesting, Hotjar, PingPong

Entire Process: Sprintbase, InVision, MURAL, Miro.

***Business Impact:*** Design thinking has the potential to create innovative products and services.

Design thinking also highlights the importance of having a digital design culture based on collaboration and innovation. Design thinking is a process of involving users, customers, developers, architects, product managers and all parties involved to collectively solve the challenge at hand. Design thinking will play a role in the IT-to-business continuous dialogue but also improve the digital dexterity of organizations.

In a COVID-19 world, digital engagement is required, and design thinking can help your teams deliver high quality digital results. The traditional approach to design thinking workshops, having everybody in the same room working collaboratively, may not be possible for some time. Be flexible, with one end of the spectrum being 100% digital/remote, and the other end being 100% in-person, knowing that different parts of the world will be at different parts of that spectrum for some time.

***Benefit Rating:*** High

***Market Penetration:*** 5% to 20% of target audience

***Maturity:*** Adolescent

***Sample Vendors:*** Accenture; frog; IBM; IDEO; Oracle; Pegasystems; Salesforce; SAP

***Recommended Reading:***

"DesignOps: Organize, Collaborate and Innovate Product UX at Speed"

"Toolkit: Design Thinking"

"Ignition Guide to Conducting a Design Thinking Workshop"

"To Scale Digital Design, Add Just Enough Design Thinking Method to Agile Practices"

## Virtual Assistants

***Analysis By:*** Van Baker

***Definition:*** Virtual assistants (VAs) help users with a set of tasks previously only made possible by humans. VAs use semantic and deep learning (such as deep neural networks [DNNs], natural language processing, prediction models, recommendations and personalization) to assist people or automate tasks. VAs listen to and observe behaviors, build and maintain data models, and predict and recommend actions. VAs can be deployed in several use cases, including virtual personal assistants, virtual customer assistants and virtual employee assistants.

***Position and Adoption Speed Justification:*** The most widely recognized virtual assistants are consumer-facing and predominantly use conversational interfaces. This includes Apple's Siri, Google Assistant, Microsoft's Cortana and Amazon's Alexa. However, enterprise VAs such as IPsoft's Amelia, Nuance's Nina, Salesforce's Einstein and Openstream's EVA are rapidly growing in importance in business. Increasingly, VAs will be combined with event triggers and other automation technologies to enhance the value in enterprises. These VAs will increasingly use contextual multiturn conversations to drive business workflows. Additionally, increased integration with back-end and hosted services will enhance the capabilities of VAs as they migrate toward being centered on the user rather than transactions. Cellular phones continue to be the dominant platform for VAs although business driven endpoints are increasingly being deployed. Consumer-connected endpoints such as Amazon's Alexa devices and Google's Home devices have broadened the use of VAs and voice. Tools such as Google's Dialogflow, Amazon's Lex and Polly, Microsoft's Azure Bot Service and Power Virtual Assistant, and IBM's Watson Assistant are making creation of enterprise virtual assistants more accessible. Increasing use of voice to access information and initiate business processes is becoming the focus of many conversational platform providers. We expect virtual personal assistant (VPAs) to see continued adoption by consumers/customers.

***User Advice:*** App development leaders should develop a VA strategy that focuses on text capability first, but with voice following closely, because VAs will increasingly be integrated with business process automation and event-driven software architectures to allow for conversation-initiated workflows.

Deploy VAs in the business conversational user interfaces to increase importance and accessibility. Individuals may use multiple VAs, but there is a limit to the number that employees or consumers will engage with so enterprises should guard against proliferation of embedded VAs. Businesses will

migrate from initial single deployments to a set of VAs that orchestrate groups of specialist chatbots, with narrowly scoped intents. This will be facilitated by increasing levels of integration with multiple data repositories, applications and business processes requiring orchestration or these resources in response to VA initiated workflows.

Coordinate the use of VAs across the use cases in the enterprise and avoid fragmented solutions based on single use case providers.

Look for opportunities to leverage VAs to make users more productive with their business apps by integrating VAs with business process automation to enable conversational triggered business processes in well-defined use cases.

Incorporate analytics to measure the impact of VAs on behavior and performance. Closely monitor the use of VAs by customers as well as your workforce assuming that ongoing model management will be required if VAs are to continue to perform at acceptable levels.

Assume that VAs will be applicable across the enterprise with multiple use cases including customer and employee engagement across multiple domains in the enterprise with increasing integration across enterprise workflows and business processes.

***Business Impact:*** VAs have the potential to transform the nature of application use for the workforce and customers. Conversational initiation of business processes combined with system-initiated events will increase accessibility to business workflows.

VAs can be built using tools and hosted AI services licensed from providers or created using professional services. Performance of the VA is dependent on the quality of the dataset used to add domain-specific information, and the quality of the hosted-language-oriented AI services. Additionally, the level of integration capabilities of the provider will grow in importance.

Security and the collection of personal information must be managed intelligently and adhere to all legal and regulatory requirements as user adoption of VAs grows. Embedded VAs will be easy to use, but will complicate the use models in the enterprise, so adoption should be evaluated on a case-by-case basis.

As they mature, VAs will rapidly shift in focus from being transaction-centric to user-centric whether for employees or customers. VAs will increasingly incorporate user profiles that collect and use contextual data that must be managed to enhance the user experience without violating user privacy concerns.

***Benefit Rating:*** Transformational

***Market Penetration:*** 5% to 20% of target audience

***Maturity:*** Adolescent

***Sample Vendors:*** Amazon; Google; IPsoft; Microsoft; Nuance; Openstream; Oracle; Salesforce; SAP; [24]7.ai

***Recommended Reading:***

"Market Guide for Virtual Customer Assistants"

"Designing Conversational Experiences for Chatbots and Virtual Assistants"

"Market Guide for Conversational Platforms"

"Magic Quadrant for Cloud AI Developer Services"

"Use Master Chatbots to Improve Conversational Experiences"

"Governance and Best Practices for Chatbot Development"

## Enterprise Agile Frameworks

***Analysis By:*** Mike West

***Definition:*** Enterprise agile frameworks are a collection of one or more methodologies and associated principles, such as lean and systems thinking, structured in such a way as to enable the delivery of large, complex agile programs. They may be top-down, bottom-up or a combination of both approaches, and they are increasingly implemented by agile organizations that are scaling up to address enterprise initiatives. Some feature program- and portfolio-level coordination to enable complex software or cyber-physical product releases.

***Position and Adoption Speed Justification:*** Several enterprise agile frameworks have been around for years — Disciplined Agile (DA) Large-Scale Scrum (commonly, LeSS and LeSS Huge), Nexus, Spotify model and Scaled Agile Framework (SAFe). By no means, however, all are development organizations agile. A significant number (laggards) are still developing skilled product teams, piloting agile or considering how adopting it may benefit them, but the majority are using these frameworks. Nevertheless, there are varying degrees of success, hence our current positioning of enterprise agile frameworks pre-trough 35% on the Hype Cycle.

***User Advice:*** CIOs and their application leaders should investigate frameworks such as DA, LeSS, Nexus, Spotify model and SAFe for their organizations if planning to scale agile. Be aware that you can use frameworks partially, applying key best practices, and still get some success. Consider carefully the cultural fit, especially when still developing your organization's agile culture.

Ideally, focus on a single value stream at first, map the value stream and identify the opportunities for accelerated delivery. Match the opportunities to the frameworks to find the best fit.

Potential users should be clear that they are buying into proprietary intellectual property; the major frameworks are not open standards or consortium-controlled — they are products. The alternative is a customized Scrum of Scrums process that some organizations have used successfully. Those who choose this path should be prepared to maintain the framework and provide training for the life of the framework.

***Business Impact:*** Introducing agile methods into a mature IT organization is, by itself, a significant cultural change for every function in IT and for all the business managers who engage with IT. When executed well, the use of an enterprise agile framework has the capability to transform IT-business relationships. It can have a major positive impact on IT value delivery by eliminating unnecessary time and effort expenditure and by imposing predictable release cadences for delivering complex solutions.

An organization's long-term success in using any enterprise agile framework will depend on its fitness for purpose and its adaptability to changing business circumstances, rather than its present popularity in the market.

***Benefit Rating:*** High

***Market Penetration:*** More than 50% of target audience

***Maturity:*** Early mainstream

***Sample Vendors:*** Disciplined Agile Consortium; scrum.org; Scaled Agile; The LeSS Company

***Recommended Reading:***

"Survey Analysis: Enterprise Agile Frameworks Maximize Potential for Achieving Agility at Scale"

"Market Guide for Enterprise Agile Frameworks"

"Implementing Enterprise Agile Using the Scaled Agile Framework (SAFe)"

"Use Disciplined Agile Delivery (DAD) to Increase Agility"

"Learn from the Spotify Model for Better Enterprise Agile Scaling"

"Implement the 'Spotify Model' as a Full Operating Model and Cultural Transformation — or Risk Career Failure"

## 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

### Citizen Developers

***Analysis By:*** Jason Wong

***Definition:*** A citizen developer is an employee who creates new business apps mainly for internal consumption, normally by teams or workgroups, using development tools and runtime environments sanctioned (or at least not actively forbidden) by corporate IT or the business units.

***Position and Adoption Speed Justification:*** Citizen development is part of the business-led IT shift and the democratization of technologies trend. Business leaders are increasingly looking outside the IT organization for applications, as well as building an increasing number of applications themselves. A trend in the digital workplace is promoting digital dexterity in the workforce, which includes fostering citizen development. The COVID-19 pandemic has compounded the need for greater business agility and putting better tools in the hands of employees so they can more rapidly solve their problems with new apps and automation for enhanced productivity and decision making. According to a 2019 Gartner survey on citizen development, 41% of respondents have active citizen development initiatives and 20% of those that don't are either evaluating or plan to start citizen development initiatives. We expect this adoption trend to accelerate further due to the changes brought on by COVID-19, which promote the idea of a digital workplace.

Citizen developers are empowered by the availability and power of low-code development tools, and "no code" tools that specifically market to the nonprofessional developer. Many smaller vendors and some large ones (such as Microsoft and Salesforce) now provide powerful low-code application platforms that make it easier for end users to develop their own applications — even applications that once required professional development skills, such as building mobile apps and using AI services. Typically cloud-based and offered as SaaS, many of these tools require only a web browser to login and build, deploy and run an app. Over time, some citizen developers will become part of fusion teams that include business and IT collaboration and development.

***User Advice:*** Application leaders must engage potential citizen developers more actively to enlist and enable them to become "good citizen developers." Ignoring or attempting to prevent citizen development often carries more risks and limits enterprise innovation. Specifically, application leaders should:

- Mitigate shadow IT risks by working with business unit leaders to enlist citizen developers to establish trust and define safe activity zones.
- Enable self-governing citizen development practices by fostering a community of practice (CoP) across business units and with IT.
- Improve outcomes for citizen-developed apps by joint (business and IT) selection of the right tools and enabling technologies.

***Business Impact:*** The long-term strategic impact of citizen development is enabling self-service business innovation through employees in business units, aided by IT. Citizen development hackathons are a great way to promote and foster citizen development, while enhancing digital dexterity across the enterprise. Citizen developers have the potential to generate new ideas that can lead to greater business agility, as well as increased workforce productivity and efficiency.

***Benefit Rating:*** High

***Market Penetration:*** 20% to 50% of target audience

***Maturity:*** Early mainstream

***Sample Vendors:*** Google; monday.com; Mendix; Microsoft; Oracle; OutSystems; ProntoForms; Quick Base; Salesforce; ServiceNow

***Recommended Reading:***

"The Future of Apps Must Include Citizen Development"

"Platform-Enabled Citizen Development (BP)"

"Maximize Digital Dexterity by Cultivating Citizen IT"

## Full Life Cycle API Management

***Analysis By:*** Paolo Malinverno

***Definition:*** Full life cycle API management involves the planning, design, implementation, testing, publication, operation, consumption, versioning, and retirement of APIs. It includes a developer's portal to target, market to, and govern an ecosystem of developers producing and consuming APIs, as well as API gateways that enforce policies around operational management, security, format translation and analytics for the collection of business and technical metrics associated with the usage of the API.

***Position and Adoption Speed Justification:*** The requirement for API management continues to be driven by the ever growing usage of APIs in platforms enabling digital strategies, supporting new user experiences and packaging integration flows. All of these APIs must be governed, secured and monitored. However, full life cycle API management has now silently gone past the Trough of Disillusionment. This is because there is now less hype around API management; its fundamental role has been generally accepted. Companies generally know they need to run a well-governed API program and mature full life cycle API management to successfully implement a platform and develop an ecosystem, which consumes APIs at scale. The journey up to the Plateau of Productivity has been and will be slow: many companies still make the mistake of thinking that just putting in place API management will automatically create an ecosystem, secure their APIs, or generate new revenue. Most companies realize that API platforms serve digital transformations, but will take time to realize, which APIs are right for their business.

***User Advice:*** For CIOs, API product managers, chief digital officers and application managers in charge of API programs:

- Use full life cycle API management to enable and protect all APIs (not just externally facing APIs), leveraging analytics to assess the value of and improve APIs, and a developer portal to make it easy for developers to use existing APIs.
- Treat APIs as products, and select offerings that have the ability to address needs well beyond the first year. Full life cycle API management is the functionality organizations need to run successful API programs, get an API platform ready for a digital transformation, and build an ecosystem of partners.

- Choose a functionally broad API management solution that supports modern API trends including microservices and multicloud, preferably from a single vendor. Ensure that the entire API life cycle is covered. API management has evolved from being focused only on running APIs to taking a broader view of the API and its usage across the full API life cycle.
- Create and/or support the role of API product manager to govern API life cycles. Avoid an "if we build it, they will come" mentality. Following API deployment, full life cycle API management provides metrics on API usage, which you should link to KPIs (see "How to Use KPIs to Measure the Business Value of APIs"). These metrics can be used to feed into decisions about new capabilities that may be provided by updated versions of the API.
- Understand that any digital strategy and platform/ecosystem strategy needs to be enabled by an API-rich platform, and supported by a well-governed API program.

***Business Impact:*** As the API economy weaves itself into digital transformations, the need to start a platform business on which to build an ecosystem of partners has stolen the limelight. The real business impact of full life cycle API management is governing an API program that enables and supports the transformation. It is now clear to most CIOs that platform and ecosystem are two sides of the same coin, and that APIs form the touchpoints between them. Business use of APIs, the role of APIs as enablers of digital transformations, and APIs' ability to open up new business channels, are now matters of clear interest to CIOs, and even to some CEOs. Obviously, running an API program is not the only way you can run a digital transformation, or build a platform and an ecosystem, but publishing APIs is certainly a great start. For some savvy companies, the idea of the platform comes first, and they then start incrementally delivering APIs as experiments to explore how the platform will work, and enable new user experiences in co-creation mode with partners in the ecosystem.

***Benefit Rating:*** High

***Market Penetration:*** 20% to 50% of target audience

***Maturity:*** Early mainstream

***Sample Vendors:*** Axway; Google (Apigee); IBM; Salesforce (MuleSoft); Software AG

***Recommended Reading:***

"Magic Quadrant for Full Life Cycle API Management"

"Critical Capabilities for Full Life Cycle API Management"

"Ensure Your API Management Solution Supports Modern API Trends Such as Microservices and Multicloud"

"The Evolving Role of the API Product Manager in Digital Product Management"

"How to Use KPIs to Measure the Business Value of APIs"

## API Economy

***Analysis By:*** Paolo Malinverno

***Definition:*** The API economy is a set of business models and channels. It is based on the secure access of functionality and exchange of data to an ecosystem of developers, and the users of the app constructs those developers build. It is delivered through APIs to a developers' community, either within a company or with business partners and customers.

***Position and Adoption Speed Justification:*** APIs have always been everywhere, but in the past they were mostly of interest to developers. REST APIs and the establishment of developer portals and API marketplaces changed that. Now, the basic principle of the API economy is that APIs can be new products that a company offers. They can open new business channels, advance a digital transformations, entice an ecosystem of partners and external developers, run a revenue-generating process faster or sell more of the company's traditional products.

The API economy has established itself as a precursor of digital transformations and the primary way to grow an ecosystem. However, The term "API economy" is seldom used today, despite its principles still holding firm in all the strategic endeavors listed in the previous paragraph. Executives now prefer to talk about digital transformation or digital disruption, but the API economy and its rules are becoming mainstream. The core concept of the API economy remains; but is now articulated in terms of API producers, consumers, internal and external marketplaces as well as direct or indirect business value.

***User Advice:*** In this post-API economy world, CIOs looking to exploit the digital disruption of APIs in collaboration with their chief strategy officer should:

- Take advantage of the benefits of scale and the new business models of the API economy by exploring and promoting the likely business and industry disruptions well-governed API programs come with. Apply design thinking to explore and promote your potential business and industry disruptions. Ensure business executive peers see APIs as business assets and real products, not just technology. Create, foster and promote a culture driven by business outcomes, measured on the APIs key performance indicators (see "How to Use KPIs to Measure the Business Value of APIs").
- No matter what your organization's industry vertical is, leverage the opportunities of open banking by using financial APIs in the new customer or partner interactions your digital transformation will define.
- Start with the pragmatic approach of co-creation with existing and new business partners to identify real-time, high-value digital interactions. Develop, enable and engage an ecosystem of developers, consumers and partners, e.g., by carefully planning and running a series of business-targeted hackathons (possibly remote), to identify high business impact value chains, and the right APIs to support them.

***Business Impact:*** An API platform is the basis of a digital transformation, and companies will either use somebody else's platforms, thus being part of one of more ecosystems, or build one, creating a

fresh ecosystem using it. APIs provide the technical foundation to a platform business, and provide a way to work with platform business giants such as Amazon or Alibaba.

Several new business models are associated with publishing APIs. Companies gain different types of value from publishing APIs or running hackathons to start a platform business model, build innovation and get innovative ideas — value that goes beyond enhancing your company image by appearing innovative. In a minority of cases — especially when the product can be delivered electronically (for example, streaming access to yesterday's final of a sporting event) — companies can directly charge for API volume usage.

However, the most common monetization model in the API economy today is indirect, where a company provides free access to the APIs it publishes, most frequently to its business partners, sometimes as part of a premium subscription to a SaaS offering. In return, the company gets leaner/quicker/more efficient execution of a business process (such as ordering goods in a supply chain) or increased sales of a traditional product (for instance, travel companies get more bookings if they publish APIs into their reservation systems).

***Benefit Rating:*** High

***Market Penetration:*** 20% to 50% of target audience

***Maturity:*** Early mainstream

***Recommended Reading:***

"Digital Disruption Profile: APIs and the API Economy"

"Choose the Right API Monetization and Pricing Model"

"Top 10 Things CIOs Need to Know About APIs and the API Economy"

"From APIs to Ecosystems: API Economy Best Practices for Building a Digital Platform"

"How to Use KPIs to Measure the Business Value of APIs"

## Appendixes

Figure 3. Hype Cycle for Future of Applications, 2019

## 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<br>■ Pilots and deployments by industry leaders | ■ First generation<br>■ High price<br>■ Much customization |
| *Adolescent* | ■ Maturing technology capabilities and process understanding<br>■ Uptake beyond early adopters | ■ Second generation<br>■ Less customization |
| *Early mainstream* | ■ Proven technology<br>■ Vendors, technology and adoption rapidly evolving | ■ Third generation<br>■ More out-of-box methodologies |
| *Mature mainstream* | ■ Robust technology<br>■ Not much evolution in vendors or technology | ■ Several dominant vendors |
| *Legacy* | ■ Not appropriate for new developments<br>■ 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

Future of Applications: Delivering the Composable Enterprise

2020 Strategic Roadmap for the Future of Applications

Predicts 2020: The Future of Application Architecture, Development, Integration and Platforms

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

Success in the Digital Experience Economy Requires Connecting MX, UX, CX and EX

Build Links Between Customer Experience, Multiexperience, User Experience and Employee Experience

**GARTNER HEADQUARTERS**

**Corporate Headquarters**
56 Top Gallant Road
Stamford, CT 06902-7700
USA
+1 203 964 0096

**Regional Headquarters**
AUSTRALIA
BRAZIL
JAPAN
UNITED KINGDOM

For a complete list of worldwide locations,
visit http://www.gartner.com/technology/about.jsp