

Hype Cycle for Web Computing, 2012

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The Web is at the center of the Nexus of Forces (cloud, mobile, social and information) and provides the primary engine for access to all users.

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Analysis

What You Need to Know

The Web is the preferred mode of communication for enterprises and organizations, and is the preferred choice of customers, prospects, business partners, potential employees, investors, regulators and other interested parties. Within the walls of the organization, intranets and enterprise portals offer new modes of collaboration based on aggregated corporate knowledge. The Web is pervasive in our personal and professional lives — not just in the daily activities of knowledge workers and technical professionals in industrialized countries, but also increasingly across diverse demographics and global geographies.

The modern Web has multiple attributes (see "The (Not So) Future Web"):

- Contextual access based on multiple user attributes, session attributes, and a rule mechanism for determining behavior and look and feel
- Mobile access based on consumption of Web resources into hybrid (HTML-wrapped) applications and mobile Web applications, which complement native mobile applications
- Rich experiences, driven by HTML5, Cascading Style Sheets 3 (CSS3) and JavaScript
- Runs on the future user experience platform (UXP), an integrated set of technologies that provides content management, collaboration, social computing, mobile computing, search, analytics and a programming framework
- Social computing, including the ability to create communities and social networks
- Cloud-centric, with the Web providing the primary user interface into cloud-based services
- A set of architecture constructs, known as Web-oriented architectures (WOAs)

- Drives new features in browsers, creating a new era of browser wars
- Enabling and being influenced by a growing wave of consumerization
- Infused with commerce
- Drives digital marketing efforts for enterprises
- Drives disruptive changes in governments, economies and social norms in many regions of the world

The Web continues to be the mainstay of most enterprise user experience (UX) strategies. The ubiquity and increasing utility of the Web makes it the most appropriate tool for interacting with customers, trading partners and employees. The Web enjoys a significant presence in enterprises, but there are still many opportunities for improvement, including better processes and tools for content management, deployment, and the management of international, decentralized and multilingual websites, as well as accessible websites for users with disabilities.

Browser technology is improving through the emerging set of standards around HTML5, CSS3 and JavaScript (see "HTML5 and the Journey to the Modern Web"). Collectively known as HTML5, these innovations promise a canvas as robust as a native application, but the portability, reusability and power of the Web. HTML5 is still a work in progress, but parts of the standard are already complete and implemented in browsers and Web toolkits.

There is still significant room for improvement in terms of enterprise awareness and adoption of user-centered design processes and methodologies (e.g., split A/B testing, multivariate testing, usability testing, persona and interaction patterns) that make effective use of new user interface technologies. Enterprise Web developers need to balance two complementary disciplines: tracking the evolving technologies around UX, and adhering to a design process and methodology that can deliver effective UX (see "A Value-Driven, User-Centered Design Process for Web Sites and Applications" [Note: This document has been archived; some of its content may not reflect current conditions.]).

The mobile Web experience, as first delivered by the iPhone, points the way to a new generation of user interfaces and services on mobile clients. A new level of expectations has been set among consumers. Powerful, yet easy-to-use interfaces, coupled with applications that leverage smartphone/tablet features (such as GPS, compass, camera, accelerometer and altimeter) are enabling enterprises to enjoy compelling interaction with a wide variety of users. Development of Web apps has taken a big step forward, with platforms available to develop native applications, hybrid applications and mobile Web applications. HTML5 and wrapping approaches (the mainstay of hybrid apps) are further enabling mobile application development. Online strategies must increasingly take into account not just a mobile Web experience, but also a mobile app experience, as more applications are offered via mobile platform app stores and other distribution mechanisms.

Customer-facing websites continue to see significant investment. Successful high-end, consumer-oriented sites (such as Amazon, Expedia, Facebook and Google) have long used the principles of user-centered design based on objective data about user behavior, gravitating around core usage scenarios linked to business value. These proven principles for success are starting to migrate into enterprise development scenarios. Enterprises are becoming aware of the need to extend their

traditional customer websites beyond the basic, and typically are offering marketing and e-commerce functionalities in areas such as social software, mobility and social media. Leveraging the wisdom of crowds, and the ability to access those crowds in whatever chosen medium, are important elements of customer satisfaction and customer loyalty.

Employee-centric sites are seeing new investment. Social intranets are becoming the next-generation intranet for many enterprises. We used to talk about business-to-employee (B2E) portals, but now the conversation is about employee-to-employee (E2E) portals.

Recent trends in user demand and independent software vendor (ISV) behavior indicate a shift in the technologies used to deliver the UX. Enterprises have complained for years about the multitude of technologies and tools they must use to deliver the variety of UXs necessary. Enterprises have also come to the realization that, no matter how technically complete a website or portal is, a poor UX will, more often than not, cause it to fail. In addition, the convergence of several UX-related technologies is definitely visible: content, collaboration, context, portal, mashup, rich Internet application (RIA) and analytics. This is leading to an emerging market: UXP. A UXP is an integrated collection of technologies and methodologies that provides the ability to design and deliver user interface/presentation capabilities for a variety of interaction channels. The UXP will subsume traditional portal and mashup technologies, and will overlap significantly with others.

In past years, the hype around Web 2.0 was translated into business value, albeit within the constraints of organizational structure and legacy corporate culture. Web 2.0 technologies, such as blogs, wikis and social networks, are now used by many mainstream businesses. Use of Web 2.0 community approaches is growing in certain areas, such as the use of user-generated reviews and ratings, and crowdsourcing for product designs. New Web 2.0 business models continue to emerge (for example, the exploitation of product information for mashup purposes by exposing the data via RESTful APIs). Many of these APIs are being provided as a set of open, public APIs, and further the penetration of corporate data to third parties. These Web components can be seen in Hype Cycle technology analyses of activity-specific social applications, distributed social Web, social software suites, corporate blogging and content syndication in the enterprise.

Consumerization is a real force in many enterprises. Enterprises that ignore this trend may be setting themselves up to be marginalized, or, worse, users may actively circumvent IT controls if IT is perceived to be out of touch or Draconian.

A major way in which the Web is impacting the enterprise is by providing the context for cloud computing. The shift of IT resources from on-premises to cloud-based, although well under way, has a lot more to offer. What has been seen thus far is only a small portion of what has yet to unfold (see "Global Class: The Inspiration for Cloud Computing" and "Gartner Reference Architecture for Cloud-Enabled Application Platforms" [Note: These documents have been archived; some of their content may not reflect current conditions.]).

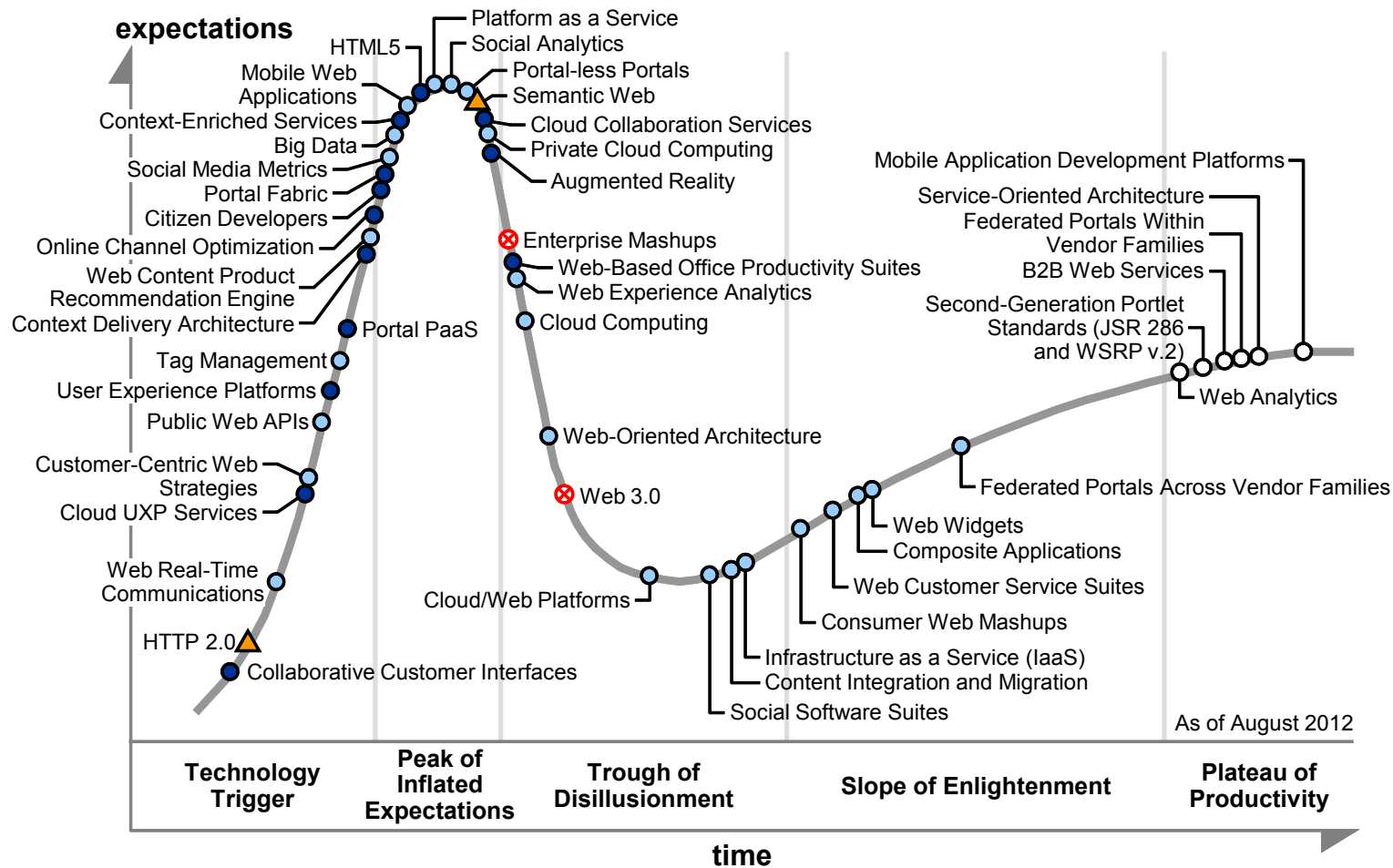
A common question is, "What's beyond Web 2.0?" We already know that Web 3.0 isn't on the near-term horizon, as the step-function change that got us to Web 2.0 is not likely to recur soon. However, new, innovative technologies and approaches are launched every day.

The Hype Cycle

This Hype Cycle covers a broad collection of Web-oriented technologies and methodologies. It is an update of the 2011 Hype Cycle for Web and User Interaction Technologies (renamed Hype Cycle for Web Computing). Particular items to note include:

- User experience platforms — The UXP market will emerge in 2013, initially sourced from the suite-oriented horizontal portal product vendors. The UXP market will be dominated by large ISVs (e.g., IBM, Oracle, Microsoft and SAP), but will be balanced by smaller players (e.g., edge IPK and eXo), as well as new providers of these technologies (e.g., Cisco and Adobe).
- Big data — Web traffic generates most big data. One huge enterprise challenge is how to correlate big data with other sources of analytics information, most of which are siloed (such as data warehouse/data mart [traditional] business intelligence [BI] analytics, Web analytics and social analytics).
- Mobile Web applications — Mobile Web applications are evolving rapidly, with three models: native apps, mobile Web apps and hybrid apps. The hybrid apps model, with HTML wrapping as the leading approach, will dominate soon.
- HTML5 — This powerful new version of HTML is maturing rapidly and is on course for completion within two to three years. Vendors and enterprises are already adopting sections of the specification that are complete.

Figure 1. Hype Cycle for Web Computing, 2012



Source: Gartner (August 2012)

The Priority Matrix

Many technologies on the Web computing Hype Cycle have seen broad adoption, among them enterprise portals and composite applications. These are stable, mature technologies, with little risk in adoption.

Other technologies on the Hype Cycle are not so mature and warrant care in adoption. These include mobile Web applications, HTML5 and Semantic Web. Type A enterprises can use these widely with some caution, Type B enterprises should examine these closely and use them opportunistically, and Type C enterprises should sit back and track them for a while.

Figure 2. Priority Matrix for Web Computing, 2012

benefit	years to mainstream adoption			
	less than 2 years	2 to 5 years	5 to 10 years	more than 10 years
transformational	Mobile Application Development Platforms Service-Oriented Architecture	Big Data Cloud Computing Composite Applications Platform as a Service Public Web APIs Web Real-Time Communications	Citizen Developers Context Delivery Architecture Context-Enriched Services	
high		Cloud/Web Platforms Content Integration and Migration Customer-Centric Web Strategies Federated Portals Across Vendor Families Infrastructure as a Service (IaaS) Mobile Web Applications Portal-less Portals Private Cloud Computing Social Analytics Social Software Suites Web Customer Service Suites Web-Oriented Architecture	Augmented Reality Cloud UXP Services Collaborative Customer Interfaces HTML5 Online Channel Optimization Portal Fabric User Experience Platforms	Semantic Web
moderate	B2B Web Services Federated Portals Within Vendor Families Second-Generation Portlet Standards (JSR 286 and WSRP v.2) Service-Oriented Business Applications Web Analytics	Consumer Web Mashups Social Media Metrics Tag Management Web Content Product Recommendation Engine Web Experience Analytics Web Widgets	Cloud Collaboration Services Portal PaaS Web-Based Office Productivity Suites	HTTP 2.0
low				

As of August 2012

Source: Gartner (August 2012)

Off the Hype Cycle

- Advanced Web services — The WS-* collection of SOAP-based Web services has matured sufficiently that this technology has moved off the Hype Cycle.

- Service-oriented business applications (SOBA) — SOBA is now the standard approach used by packaged application vendors, and has been for several years. SOBA is also broadly adopted by enterprises for custom application development.

On the Rise

Collaborative Customer Interfaces

Analysis By: Michael Maoz

Definition: A collaborative customer interface enables a customer service agent and a customer to share, simultaneously, the live version of the same business application. This requires the enterprise to redesign the graphical user interface (GUI) and the underlying technologies to dynamically generate personalized interfaces.

Position and Adoption Speed Justification: The current crop of CRM applications can only support collaborative browsing, where a customer can be shown an image of an application. With collaborative customer service interfaces, an organization can dynamically generate GUIs that enable the customer to view and share the same information in the same format, in the same position. In 2012, this technology is still in its infancy: Most customer service organizations have neither the technology nor the business process expertise to build such interfaces, and the enterprise business application providers are doing little to create such interfaces.

User Advice: Look at the ways in which social media and personalization tools would be applied to your next-generation customer service desktops, and create a plan to investigate how a collaborative (or shared) interface could enhance the customer experience.

Business Impact: In industries such as financial services, travel and B2B customer support, businesses will be able to offer highly personalized customer experiences, as well as a feeling of participation by the customers in the resolution of their issues.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Embryonic

Sample Vendors: eGain; salesforce.com; SAP; unblu

Recommended Reading: "CRM Technologies for the Emerging Customer Engagement Hub"

HTTP 2.0

Analysis By: Ray Valdes; Gene Phifer

Definition: HTTP 2.0 is the next-generation successor to HTTP 1.1, the protocol that governs the transfer of documents between servers and clients on the World Wide Web. HTTP 2.0 stems from

an initiative of the Internet Engineering Task Force (IETF) to address perceived problems in performance and efficiency, and possibly provide enhanced security as well.

Position and Adoption Speed Justification: The world has been well-served by the HTTP protocol. When Tim Berners-Lee defined version 0.9 in 1991, he chose a deliberately simple and straightforward approach, consistent with other well-established Internet protocols, such as FTP and Network News Transfer Protocol (NNTP). Explicitly rejected were approaches that might have delivered better performance (binary-oriented remote procedure call [RPC]) at the cost of complexity and cultural incompatibility.

In 1995, version 1.0 added content negotiation, plus some basic security mechanisms. This was followed rapidly by version 1.1 in 1996, which introduced reuse of connections across requests (the "keep alive" mechanism), pipelining of requests and chunked transfer encoding (enabling streaming). There have been minor improvements since (for example, in 1999), but the protocol has been mostly unchanged for 15 years.

In the meantime, the Web has grown by multiple orders of magnitude, and with that, application requirements have escalated to include two-way, real-time communication; always-on, rich media; etc. The home page of a modern website is not served by one or several HTTP requests, but may require between 100 and 300 synchronous request/response cycles.

During the past decade, there have been various attempts to improve, replace or work around HTTP. In the late 1990s, there was a World Wide Web Consortium (W3C) working group around HTTP-next generation (NG), which explored concepts that more recent efforts have also taken up. In the mid-2000s, Roy Fielding, best known as the "father of representational state transfer (REST)" and a seminal figure in the history of the Web, spent several years developing Waka, a binary, token-based replacement for HTTP that included client-side macros and allowed unsolicited responses. In that same time frame, other approaches emerged that were more evolutionary and incremental, such as Comet, a name for a family of techniques that leverages a persistent HTTP connection between client and server to simulate real-time server push. These techniques include long polling, hidden iFrame, multipart HTTP response, etc. Browsers open up multiple connections to servers, and use techniques such as domain name aliasing to get around the limitation of six concurrent connections per browser.

More recently, in 1999, Google introduced the SPDY protocol, in which browser and server negotiate to run a different protocol that preserves the HTTP semantics (GET, PUT, etc.), while allowing many concurrent requests to run over the same underlying TCP socket connection. In addition, headers are compressed, and the server can initiate requests (not just the client). SPDY is now implemented in recent versions of Chrome and Firefox. In addition, Amazon Kindle uses it to connect to Amazon's servers.

Another related development is HTML5 WebSockets. While SPDY makes synchronous HTTP-style communications faster, WebSockets enables two-way live communications. SPDY is designed for maximum compatibility with existing Web applications, while WebSockets is intended for a future generation of interactive, bidirectional applications, such as real-time chat.

The IETF standards body has a working group called HTTPbis that is chartered with improving HTTP. The initiative came together in March 2012, and has not yet chosen a starting point. Google SPDY is one prominent candidate for the starting point. Another is Microsoft HTTP Speed & Mobility (S&M), submitted to IETF in March 2012 as a candidate. HTTP S&M builds on SPDY and also incorporates ideas from WebSockets. The main point of difference with SPDY is removing the requirement for header compression, which limits battery life on mobile devices.

Because the process is at a starting point, it is too early to tell how the standard will evolve. If the process around HTML5 video and offline storage is any indication, the road to a standard will have multiple twists and turns, driven both by vendors' competitive agendas and the common desire for a unified standard that advances the Web.

User Advice: HTTP 2.0 is in the very early stages of the standards process, where a starting point has not even been defined. Over time, this initiative will grow and will eventually be implemented across most browsers and many websites. At this point, however, most enterprise development managers need take no action other than tracking the progress and understanding the concepts, many of which date back to HTTP-NG in 1999.

There are some applications that can benefit from the three-times or four-times performance improvement, and more efficient use of network resources. For example, Amazon Kindle is a clear example of where immediate benefits are possible.

Business Impact: There are three areas that can benefit from an improved HTTP: existing websites that are in competitive sectors and need maximum performance, mobile-oriented sites that need efficient use of bandwidth while preserving battery life, and applications that offer a real-time live experience.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Google; Kaazing; Microsoft; Opera; The Mozilla Foundation

Web Real-Time Communications

Analysis By: Geoff Johnson

Definition: Web Real-Time Communication (WebRTC) is an HTML5 standard being drafted by the World Wide Web Consortium (W3C). It's an open-source framework that will enable real-time communications to be delivered from within Web browsers. Applications like voice calls, video chat and peer-to-peer file sharing are expected in early developments, but WebRTC is also expected to eventually facilitate the fundamental building blocks for high-quality communication for business use of browsers in broadly based networking, audio, video and collaboration components.

Position and Adoption Speed Justification: The WebRTC framework was released as open source in June 2011. It built on original work by Ericsson Labs, and is supported by Google, Mozilla

Firefox, Opera and Microsoft. The group's early ambitions are to develop adequate APIs so that broad developer adoption can occur. The companion RTCWeb group at the Internet Engineering Task Force (IETF) is working to define a set of protocols that will also facilitate real-time communications in Web browsers.

Google integrated WebRTC into its Chrome development channel in January 2012, opening use of the WebRTC API. Mozilla integrated WebRTC into its Firefox alpha release in early 2012, providing audio mixing in a media stream. In April 2012, Mozilla released a demo of WebRTC video calling running inside its Firefox browser. Microsoft has begun implementation of the WebRTC API (for Internet Explorer). Google Talk has a video chat plug-in for the WebRTC framework. The FreeSWITCH project (January, 2012) supports the iSAC audio codec. Doubango Telecom (May, 2012) provided an HTML5 SIP client using WebRTC.

Given the interest and active development support from major vendors, it is likely that WebRTC will become a platform that is more than just a vehicle for delivering compound communications for mobile devices and consumers in the short term.

User Advice: Within the next two years, major vendors and the open-source community working on WebRTC developments are likely to solve many of the initial issues required to enable communications from browsers as part of the patchwork of HTML5 solution sets being devised at present. Beyond the next two years, there is significant motivation for a wide range of users and suppliers in very diverse arrays of communications applications to be interested in exploiting WebRTC concepts and practices, and to extend them into mainstream enterprise networking.

WebRTC uses iLBC, iSAC, G.711, and G.722 codecs for audio, and VP8 for video.

Enterprises should expect that WebRTC will eventually become robust enough for use in communications applications generally. Prepare for WebRTC to be used in browser-based unified communications and collaboration (UCC), contact center and video conferencing.

A useful indication of how it may develop comes from Kaazing and its full-duplex, but asynchronous, real-time Web communications for enterprises. Its WebSocket solution uses W3C standards, but has been developed outside the HTML5 standard. It shows how Web application developments may provide communications that are necessary to support massively scalable, low-latency, real-time Web apps. Kaazing's customers use these in financial services, gaming and social networking, and in telecommunications applications.

One obvious weakness of WebRTC deployment for enterprise use, or by communications service providers, is the lack of a central player to provide a managed directory for users. That role will be diffused for some time, unless enterprises or communications service providers (CSPs) act to fill it. Expect enterprising third-party directory facilitators to emerge, but no broad mainstream adoption before 2014 to 2015.

Business Impact: WebRTC applications will become particularly useful when used as an SIP endpoint. Do not confuse the potential enterprise-grade WebRTC developments with today's use of browsers to deliver chat.

Expect communications infrastructure vendors to provide a number of versions of HTML linked to popular mobile devices and applications, initially using the common WebRTC for various media. The popular demand for bring your own device (BYOD) will encourage use of WebRTC for interoperation and federation for tablets and smartphones.

Within contact center operations and communications-enabled business processes, WebRTC can create browser pages as real-time communications objects to be used in workflow, e-commerce and business process applications. As such, WebRTC has the potential to transform industries.

Similarly, WebRTC Web services applications can use a browser to create real-time video connections to other WebRTC devices or to WebRTC media servers using RTP.

Many operational technologies (OT) using thick-client or thin-client applications over limited bandwidth networks will benefit from the ability to derive and provide a rich suite of communications from a Web browser associated with their applications.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Ericsson; Google; Microsoft; Mozilla (Firefox with Greasemonkey); Opera

Recommended Reading: "HTML5 and the Journey to the Modern Web"

"Magic Quadrant for Web Conferencing"

"The (Not So) Future Web"

"Application Frameworks for the New Web"

"Cool Vendors in Web Computing, 2012"

"Manage the Risks of Real-Time Collaboration Tools"

"Magic Quadrant for Web Content Management"

"IT Market Clock for Enterprise Mobility, 2011"

"Predicts 2012: The Rising Force of Social Networking and Collaboration Services"

Cloud UXP Services

Analysis By: Gene Phifer

Definition: Cloud user experience platform (UXP) services are the cloud variant of the UXP offered in a shared, multitenant scenario via platform as a service (PaaS), or a single-tenant scenario running on an infrastructure as a service (IaaS).

Position and Adoption Speed Justification: Like the UXP, cloud UXP services are in their infancy. Cloud UXP services will follow the UXP up the Hype Cycle curve and are likely to stay in this trailing position throughout their life cycle. However, cloud UXP services could accelerate because many vendors have now become more customer-centric with their UXP offerings, and marketing- or sales-driven decisions on customer initiatives may focus on cloud alternatives, rather than on IT-driven decisions.

Cloud UXP services will likely integrate with content, data, applications and processes that reside in public cloud, private cloud, community cloud, hosted and on-premises environments. Therefore, the ability to integrate across all five domains is a necessity, and a hybrid scenario is likely.

User Advice:

- Type A (risk tolerant) enterprises: Examine emerging cloud UXP services; after performing due diligence, engage as requirements, capabilities and risks align.
- Type B (mainstream) enterprises: Allow cloud UXP services to mature before engaging in mission-critical use of such offerings. Use cloud UXP services for non-mission-critical workloads for now. The UXP is an emerging concept, and cloud computing is still in its infancy, so there is some risk in today's emerging cloud UXP services. This risk must be managed; otherwise, allow both the UXP and cloud computing to grow up a little more before engaging in cloud UXP services.
- Type C (risk averse) enterprises: Track maturation of cloud UXP services, but delay engagement beyond experimentation.

Business Impact: Traditional deployment cycles for portal products are two to four months or more. Cloud UXP services can be deployed in a fraction of that time. Other benefits are the same as with other cloud computing alternatives to traditional on-premises deployments.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Covisint; eXo Platform; IBM; Microsoft; Oracle

Recommended Reading: "The Emerging User Experience Platform"

"The Ethos of Vendor User Experience Platforms"

Customer-Centric Web Strategies

Analysis By: Michael Maoz; Gene Phifer

Definition: A customer-centric Web strategy (technology/business strategy) is a cohesive approach to ensuring that a website is intuitive to visitors, placing the customer at the center of the

relationship. It focuses on tying the customer, prospect or partner deeply into the enterprise or organization, and harmonizes the interaction channels.

Position and Adoption Speed Justification: A customer-centric Web starts with improvements to the website, but extends beyond it to other related interaction channels and external services, such as social networking and other forms of social media. The technologies, integrations, analyses, content, communication and business applications are designed and deployed through a collaborative effort between the business and the external customer to achieve the goal of serving customers' needs consistently with business goals. A customer-centric Web will be used to optimize advertising via email, search and other online approaches.

A customer-centric Web is still an immature concept and strategy for most businesses outside online retail, where the concept is maturing. Online channel optimization (OCO) is a closely related concept. OCO is the discipline of maximizing the effect and impact of the engagement with target personae achieved over a variety of communications media.

The challenge (beyond the process synchronization required) is that the technologies are not available as a suite, but rather are cobbled together. There have been good reasons for this:

- The need to rapidly innovate because of the evolving nature of user interaction patterns
- Emerging technologies, such as real-time analytics, social networking and recommendation/reputation engines
- Highly fragmented reporting structures for the people tasked with building Web capabilities

Creating a Web presence that draws customers in, because it is engaging, responsive, reliable and intuitive to their needs, will be a strong business differentiator.

User Advice: The rapid growth of social media and crowdsourcing techniques could lead corporate websites toward extinction. Create an inventory of tools, technologies and applications required to deliver a customer-centric Web. Appoint a project leader who has the approval of the board or CEO to run a customer-centric Web effort. Tap the community of customers, prospective customers, partners and employees as a way of uncovering the true impact and effectiveness of your website. Look for redundancies in systems, and overlapping organizational responsibilities. Test ideas by measuring the impact before deploying fully.

Business Impact: The business impact is high, because businesses waste a tremendous amount of money on marketing, sales and technical support as a way of overcoming the weaknesses in their websites. The desire to better control and optimize spending, and to measure costs and Web effectiveness, will drive customer-centric Web programs.

Benefit Rating: High

Market Penetration: Less than 1% of target audience

Maturity: Emerging

Sample Vendors: Accenture; Deloitte; IBM

Recommended Reading: "Key Issues for Customer-Centric Web Strategies, 2010"

Public Web APIs

Analysis By: Gordon Van Huizen

Definition: Public Web APIs expose data, business processes, and application capabilities through simple interfaces based on Web-oriented architecture (WOA) principles. Enterprises use public Web APIs to expand their reach through new delivery channels, such as third-party websites and mobile apps, as well as for quicker and simpler B2B connectivity. A number of business models may be employed, ranging from free API access to increased demand for goods and services to charging for use of premium content and valuable data.

Position and Adoption Speed Justification: Public Web API industry site ProgrammableWeb.com maintains a directory of public Web APIs, currently numbering nearly 6,000 up from 3,000 in March 2011, and up from less than 2,000 in January 2010.

By 2014, 75% of the Fortune 1000 will offer public Web APIs. By 2015, 20% of non-IT Global 500 companies will be cloud services providers.

User Advice:

- Treat public Web APIs as a key component of your organization's business strategy. Carefully consider how these can be exploited through Web, mobile and social strategies.
- As you plan to expose back-end systems or business data for IT projects, consider doing so via a Web API to create new leverage points for use inside and outside the organization.
- Design your public Web API with the principles of Web-oriented architecture (WOA). Web APIs based on WOA will be more accessible to third-party developers.
- Don't assume that "if we build it, they will come." Establishing traction for a public Web API requires creating developer awareness as well as making the API easy to consume via a self-service developer portal.
- Before releasing your Web API to the outside world, consider the traffic and resource implications for your data center. Complement your infrastructure with Web API management products and cloud services as required, and ensure that you have an adequate funding model in place for its ongoing operation.

Business Impact: Public Web APIs provide the foundation for a vibrant ecosystem of business partners and independent developers that apply their own ingenuity and effort to expand the use of your organization's services and data. As a result, IT organizations can become central players in helping their organization expand top line growth, improve service delivery, drive competitive advantage and reimagine their industry.

A wide variety of organizations have already begun to see measurable — and in some cases dramatic — business growth by leveraging APIs to encourage and support the introduction of their

products, services and content into adjacent markets, new channels and new delivery contexts by third-parties. This is often done in a low-touch way, yet can create significant new opportunities.

Enterprises of all types also benefit from using public Web APIs within their B2B partner networks by simplifying and accelerating the onboarding process and delivering earlier integration successes.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Apigee; Layer 7; Mashery; SOA Software

Recommended Reading: "Mobile and Context-Aware Branches Grow From Public Web APIs"

"Collective Competency: When Value Chains Attack Competitive Advantage"

"The New Web: Rich, Mobile, Social, and Programmable"

User Experience Platforms

Analysis By: Gene Phifer

Definition: A user experience platform (UXP) is an integrated set of technologies used to provide interaction between a user and a set of applications, processes, content, services or other users. A UXP has several components, including portals, mashup tools, content management, search, rich Internet application (RIA) tools, analytics, collaboration, social and mobile tools. It may be delivered as a suite of products or as a single product. The UXP market will fully emerge in 2013, seeded by the existing suite-oriented horizontal portal vendors.

Position and Adoption Speed Justification: The concept of the UXP emerged in 2009. There have been early instantiations (e.g., Microsoft SharePoint, Oracle WebCenter Suite, IBM Customer Experience Suite and Intranet Experience Suite, Adobe Digital Enterprise Platform, Cisco Quad); however, the UXP is in the early phases of its life cycle. There isn't even a formal UXP market yet, but it will emerge in 2013. Vendors of suite-oriented horizontal portal products are starting to embrace the UXP, its concepts and, in some cases, the term.

The components comprising the UXP will evolve over time. For example, additional components to facilitate digital marketing will likely be added to the base definition.

User Advice: Conduct an inventory of the various tools used for presentation management and presentation-layer composition across all supported devices and channels. Determine synergies where common vendors are identified. Demand plans from your vendors for these products and determine where integration will occur. Explore UXP options for many of these tools, then build a road map and plan to adopt a UXP during the next few years.

Determine whether your needs for websites and portal sites would best be met by suite-oriented portal products/UXPs or by lean portals.

Business Impact: Tools and methodologies for delivering the user experience are expensive — that is, for software licenses, as well as developer training and duplicative/overlapping work. However, the biggest downside is the impact on the users who have to deal with inconsistent user experiences and different look/feel/behavior across different sites and devices. A UXP provides significant efficiencies in developing and maintaining the user experience, and provides a consistent user experience across sites, channels and devices. The UXP will save organizations money, but the main benefit is the ability to more effectively engage users and customers.

The UXP addresses the enterprise need for a consistent, integrated, versatile and optimized approach to user interactions across a wide range of scenarios (business-to-employee [B2E], business-to-consumer [B2C], B2B, government-to-constituent [G2C] and digital marketing) and devices (PC, smartphones, tablets and home-based devices). The preintegrated nature of UXP products means faster time to market and lower deployment costs. These cost savings are offset, to a degree, by relatively high licensing costs.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Adobe; Cisco; edge IPK; eXo Platform; IBM; Microsoft; Oracle; SAP; TandemSeven

Recommended Reading: "The Emerging User Experience Platform"

"The Ethos of Vendor User Experience Platforms"

Tag Management

Analysis By: Bill Gassman

Definition: Tag management systems simplify the deployment and maintenance of JavaScript tags, used in online content to interface with applications such as Web analytics, personalization and advertising. A single tag replaces all other tags and when executed, the tag manager publishes other tags, based on business rules and a common data model. This decouples tag control and maintenance from the life cycle of other content, improves the speed of changes, the quality of tags and provides an audit trail.

Position and Adoption Speed Justification: Tag management solutions have been available since 2007, but are only now starting to gain market traction. Market growth is due to the use of tag management for online advertising and providers with lower cost points. We estimate that there are fewer than 1,000 organizations with a tag management system in operation.

Adoption by the target market will take at least two to five years to develop. Most tag management providers are still small, but Adobe has been delivering tag management to its customers using multiple products powered by its Omniture technology. There has also been a marketing campaign

by some providers to position tag management as a solution to comply with the European privacy directive, adding to the hype. Early adopters of tag management are those with tag challenges in terms of scale, agility and control.

There are two distinct markets for tag management systems. First is the digital marketing practitioner, struggling to manage tags for multiple Web analytics products, surveys, A/B testing and recommendation engines. The second market segment is advertising publishers and buyers. Here, numerous tags, dozens in some cases, are placed into Web content so that cross-site user profiles can be maintained and campaign attributes tracked.

For both target markets, the value of using a tag management system is in having a central way to create, edit and publish tags, no matter where or how the content that contains the master tag is published. This means that tag quality is improved, due to better control of the management process, resulting in fewer duplicate or outdated tags.

Business rules permit control of situations when tags fire, which is useful for context-aware situations based on time and visitor profiles, or to control third-party access to user behavior data. These controls also help to protect user privacy, by enforcing policy and user opt-in choices. Additional value includes better page-load performance for the Web visitor, because the tags will be delivered in an optimized way from specialized content delivery networks.

User Advice: Tag management is most useful when multiple tags are being deployed, when custom variables are added to tags, when there are frequent changes, or when rules of when the tag should fire are required. Users of tag management include those involved with Web analytics, marketing campaigns and Web content management, along with advertising publishers and buyers. Subscription fees range from \$50 per month to more than \$8,000 per month, depending on page volume and product functionality.

A ROI calculation can be done by balancing the cost of a full-time employee and tag deployment fees paid to external resources, against the value of quality tags, agility, a common data model and linking business rules to tag invocation.

Business Impact: The impact on businesses will be increased by more sophisticated use of tags for analysis, advertising and optimization of customer-facing content and applications, leading to better business results from digital channels. Quality problems and bottlenecks in making the changes are inhibiting the use of optimization products and excessive tag volume is slowing page loading times, leading to higher abandonment rates.

Where government regulations require better privacy protection for users, tag management offers a foundation to control what is captured.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Adobe; BrightTag; Ensign; QuBit; SiteTagger; TagMan; Tealium; UberTags

Recommended Reading: "Tag Management Systems Bring High Value to Online Channel Stakeholders"

"Cool Vendors in Web Computing, 2011"

Portal PaaS

Analysis By: Jim Murphy

Definition: A portal platform as a service (PaaS) is a cloud-based multitenant offering that companies can use to build, deliver, and maintain portals. Portals are personalized, unified points of access to relevant information, business processes, and people. They use a page framework and visual component (generically, a "portlet") construct to aggregate and deliver a variety of content, applications, and composites. A portal PaaS includes a cohesive set of services for managing security, personalization, content, and integration in the context of portals.

Position and Adoption Speed Justification: Enterprise portal frameworks can embrace the cloud in five ways (see "Five Ways the Cloud Is Rolling Into the Enterprise Portal Market"):

- Cloud-friendly portals
- Portal PaaS
- Cloud-enabled portal platforms (CEPPs)
- Private cloud internal use (using a CEPP)
- Private cloud external use (using a CEPP)

Of these, the portal PaaS represents the greatest potential value to portal customers, the highest potential for growth and the greatest risk.

Enterprises continually express interest in portal PaaS, but their adoption has been slow, compared with infrastructure as a service (IaaS), software as a service (SaaS) and other types of PaaS offerings (see "Platform as a Service: Definition, Taxonomy and Vendor Landscape"). Organizations have been slow to adopt cloud portal services for several reasons; one is the dearth of vendors that offers full-featured, extensible, integratable and horizontal portal solutions as a service. Many of the vendors argue that there isn't enough demand to push forward with more-thorough portal PaaS strategies, instead preferring to feel out the market slowly. In large part, the apparent lack of demand is due to two factors:

- Horizontal portals require integration with enterprise information sources and applications, most of which sit on-premises. Although there may someday be value in employing cloud-based platforms to provide interoperability between cloud-based and on-premises information and applications, an on-premises portal is more likely to support most interoperability needs today. When enterprises adopt real hybrid topology — part on-premises and part in the cloud in more or less equal measure — doing portal work in the cloud will not be as illogical, because a significant portion of resource access will be from the cloud anyway.

- Horizontal portals are also typically highly customized and, in many cases, serve as a foundation for building, deploying and delivering Web-based applications and composites. Organizations that have dealt with portal migration know that such customization can be troublesome when it's time to upgrade or replace their portal platforms. Cloud portal services providers haven't instilled enough assurance that portal customizations and applications will survive when they make upgrades to their IaaS or PaaS offerings, which serve as the foundation for their portal services. Until the offerings have nonintrusive version control and customization, comprehensive portal cloud services will not take off. Thus, traditional on-premises portals will have to be redesigned for cloud deployment.

However, portal PaaS adoption and offerings will inevitably grow with an increase in demand, an increased confidence in and adoption of cloud-based platforms for collaboration and business applications in adjacent areas, and the gradual maturation of PaaS offerings in the development, integration, and other middleware areas. PaaS will enable organizations to address portal initiatives without the unpredictably high costs of supporting data and networking infrastructure. More intense requirements to support mobile devices and more bandwidth-intensive content, such as video, will further incite organizations to look for portal PaaS assistance. Some essential elements of Generation 7 portals, including Web analytics and context awareness, have their footing in the cloud already. Initially portal PaaS will emerge, for many organizations, as a cloud-part of a hybrid portal platform while the enterprise data remains on-premises. With time, as more data is entrusted to cloud providers, the entire portal platform will begin to move to the cloud.

True portal PaaS offerings have been relatively slow to emerge. Of the most established vendors — Microsoft, IBM, Oracle — Microsoft has been by far the most aggressive. Microsoft's SharePoint Online, as part of its Office 365 collaboration and office productivity suite, is offered in shared or dedicated versions. The shared version of SharePoint online fits the definition of a portal PaaS, but its use to date has been less frequently as a customizable and extensible portal platform than as a simple mechanism for sharing documents and deploying team, departmental and personal websites. While IBM and Oracle have begun to accommodate cloud scenarios, including offering their platforms running atop IaaS providers and supporting applications and collaboration specific scenarios, neither offers a true portal PaaS today.

Customers may find portal PaaS offerings from vendors outside of the traditional portal establishment. Covisint offers a pioneering and long-standing horizontal portal PaaS. Its expertise is helping organizations in industries with complex supply chains — such as manufacturing, healthcare, financial services and the public sector — manage their B2B relationships. Over the past year, salesforce.com is beginning to emerge as a viable option for cloud-based horizontal portal capability. Various customers have used Force.com to deliver portal services, and the company introduced Site.com to include better Web content management capability and serve as a focal point for portal efforts, albeit largely for project-oriented platforms and for smaller businesses. Among other vendors to watch is eXo, an emerging portal PaaS provider based in France and expanding to other regions, including North America. Its recently announced eXo portal PaaS capabilities include a CEPP, a cloud-based integrated development environment (IDE), and eXo Cloud Workspaces — a social Internet offered as a service — which could evolve into a more thoroughgoing, enterprise class portal PaaS.

User Advice: Organizations should consider that the cloud will inevitably play a role in the future of their portal initiatives — especially as they expand to user experience platforms (UXP) (see "The Emerging User Experience Platform"). While it's unlikely that organizations of significant size and complexity will adopt portal PaaS as the sole portal initiative, they will inevitably invoke and integrate with cloud based systems to enhance their portals' reach and effectiveness.

Organizations will eventually adopt a hybrid cloud/on-premises portal strategy, which could take various forms. While there may be a lot of complexity in which aspects of portals remain on premises and which reside in the cloud, companies must ensure their portal technologies are equipped to accommodate a range of hybrid models.

Over the next two years, organizations should be cautious about adopting portal PaaS. Integration and customization could prove difficult and costly during upgrades, and providers must effectively insulate such customizations from changes to underlying PaaS offerings. Ensure that offerings support portal interoperability standards, such as Java Specification Request (JSR) 286 and Web Services for Remote Portlets (WSRP), to help mitigate the risk.

Organizations should accordingly limit customization and integration in most cloud portal services initiatives. Although they can be useful, especially for situations requiring portals as mechanisms for team and B2B integration, organizations should use out-of-the-box capabilities, including prepackaged portlets, whenever possible.

Business Impact: Despite the cautions, cloud portal services will emerge as a competitive option during the next five years. Organizations will find value in cloud portal services, whether as go-to platforms for portals or as part of a comprehensive hybrid portal strategy that includes on-premises and cloud-based portals and components.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Covisint (Compuware); Microsoft; salesforce.com

Recommended Reading: "Five Ways the Cloud Is Rolling Into the Enterprise Portal Market"

"The Rise of Portal Platform as a Service: The Vendor View"

"The Rise of Portal Platform as a Service: The Customer View"

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

Context Delivery Architecture

Analysis By: Gene Phifer; Ian Finley

Definition: Context delivery architecture (CoDA) builds on service-oriented architecture (SOA) and event-driven architecture (EDA) interaction and partitioning styles, and adds formal mechanisms for the software elements that discover and apply the user's context in real time.

Position and Adoption Speed Justification: Context-aware computing is about improving the user experience for customers, business partners and employees by using the information about a person's or object's environment, activities, connections and preferences to anticipate the user's needs and proactively serve up the appropriate content, product or service. Enterprises can leverage context-aware computing to target prospects, increase customer intimacy, and enhance associate productivity and collaboration. From a software perspective, context is information that is relevant to the functioning of a software process, but is not essential to it. In the absence of this additional information, the software is still operational, although the results of the software's actions are not as targeted or refined.

The first context-aware technologies were horizontal portal products, which used both static and dynamic context attributes, coupled with a rule engine to deliver relevant access to content, applications, business processes and people. The most visible recent addition of context awareness was delivered via mobile devices, most notably location-based services. Most context-enriched services are implemented in siloed, proprietary systems, where a particular person, group or business process profits from being situationally aware. To replicate, scale and integrate such systems, a new set of services, supported by an architectural construct known as CoDA will emerge.

CoDA provides a framework for solution architects that enables them to define and implement the technology, information and process components that enable services to use context information to improve the quality of the interactions with the user. The technologies may include portal products, context brokers, state monitors, sensors, analytic engines and cloud-based, transaction-processing engines. Context-aware computing is maturing relatively slowly, compared with mobile and Web design. This is natural, because CoDA will rely on those technologies to provide a stable base on which context-enriched services can be built.

CoDA will also define data formats, metadata schemas, interaction and discovery protocols, programming interfaces and other formalities. As an emerging best practice, CoDA will enable enterprises to create and tie together the siloed context-aware applications with increased agility and flexibility. For employee-facing apps in the enterprise, as with SOA, much of the pull for CoDA will come from packaged-application and software vendors expanding to integrate communication and collaboration capabilities, unified communications vendors and mobile device manufacturers. Web megavendors (e.g., Google), social-networking vendors (e.g., Facebook) and service providers will also expand their roles to become providers and processors of context information.

The CoDA style considers information, business and technology domain viewpoints. The technology domains are application infrastructure, communications infrastructure, network services and endpoints (devices). Thus, CoDA provides a framework for architects to discover gaps and overlap among system components that provide, process and analyze contextual information. A key challenge for CoDA will be information-driven, rather than technology-driven. This key challenge will revolve around what information sources can provide context; which technologies will enable that

information to be provided in a secure, timely and usable manner; and how this information can be folded into processes.

Gartner introduced the term "CoDA" in 2007, based on developments in such areas as mobile communications and cloud computing. Through year-end 2013, we expect aggressive enterprise architects and project managers to weave elements of CoDA into their plans to orchestrate and build context-enriched services that rely on federated information models and delivery services.

CoDA relies on SOA as a foundation and is related to EDA, because enterprise architectures need to be agile and scalable to support context-aware computing. We expect CoDA to evolve into a new, lighter-weight style of architecture, leveraging the progress of the main context providers. It will reach the Plateau of Productivity gradually, after 2015.

User Advice: Although CoDA is an emerging architectural style, Type A organizations can benefit in the short term by applying its principles as they experiment with use of context information to improve user experiences in customer-facing services and enterprise productivity. Leading-edge organizations should begin to incorporate CoDA constructs into infrastructure and services to gain competitive advantages with the early use of context-aware computing. Type A organizations should now be identifying which information sources, internal to the enterprise and external to it (e.g., from social software sites), will provide context information to a range of applications.

Build competencies in CoDA's technology domains, particularly in communications, because the migration of voice from silos to general applications will be a key transformation, opening up further opportunities to create applications enhanced by context-enriched services. Understanding mobile development will also be key. The refinement of your enterprise architecture to include CoDA constructs assumes prior investment in SOA. Most mainstream, risk-averse organizations should not invest in building a CoDA capability. Instead, they should explore the acquisition of context-enriched services through third parties.

Business Impact: Context awareness is a distinguishing characteristic of some leading software solutions and advertising services, particularly personalized advertising that targets mobile users from Apple, Microsoft, Google, Facebook and others. During the next three to five years, context-aware computing will have a high impact on Type A businesses in two areas:

- Extending e-commerce and mobile-commerce initiatives toward consumers
- Increasing the efficiency and productivity of the businesses' knowledge workers and business partners by providing relevant access to content, applications and business processes

Context-aware computing will evolve incrementally and gain momentum, as more information sources become available, and cloud-based, context-enriched services emerge. However, these will initially be siloed and will not use a standard or shared CoDA model.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Appear Networks; Apple; Google; IBM; Interactive Intelligence; Nokia; Pontis; Sense Networks

Recommended Reading: "The Seven Styles of Context-Aware Computing"

"Context-Enriched Services: From Reactive Location to Rich Anticipation"

"Context-Aware Computing and Social Media Are Transforming the User Experience"

"Personalization and Context-Aware Technology's Impact on Multichannel Customer Loyalty"

Web Content Product Recommendation Engine

Analysis By: Bill Gassman

Definition: A Web content product recommendation engine provides algorithmically derived links to digital content for use on the Web, mobile applications, email or advertisements. Algorithms can be configured to bias recommendations based on context, such as similar items put in a shopping cart, stock-on-hand, price affinity, user geography and time of day. Products run as a cloud-based service or on-premises. Recommendations are delivered to content management systems or substituted directly into dynamic content formats.

Position and Adoption Speed Justification: The hype level raised only 5% this year, because adoption growth continues to be slow and there are few new providers to the market. Recommendation engines for Web content have been adopted in high-end retail sites for some time. Some e-commerce engines have basic recommendation features built in, and there are stand-alone products. In addition, manual approaches are used by some organizations. The cost to deploy is still fairly high, keeping it away from low-volume or low-profit sites, but prices will fall as demand picks up. Evolving uses include customer service resolution recommendations, such as driving an FAQ application, greater ties with customer and transaction information from back-office systems, and context-aware computing. Some systems even take the weather forecast into account. Placement in the "pre-peak" segment is justified by the relatively low penetration of commercial products. The value of the technology is not over-hyped at this point. We estimate a two- to five-year speed to Plateau adoption, based on the narrow target market of retailers.

User Advice: Start with an ROI calculation to see if an uplift of 5% in website revenue will justify the cost. This is a conservative but realistic result. Dedicate at least one full-time resource to learn and operate the tool, and to train others to work with the rules that bias the recommendations. Develop an attribution model with a test control that takes into account how many people would buy an item anyway, or make use of the feature if it is built into the product. Adopt the advanced features such as inventory and margin data integration once the basic skills are mastered. Monitor the recommendations to ensure relevancy.

Business Impact: The potential is high. Most organizations we have spoken with are realizing a 2% to 5% uplift in revenue, with some outliers significantly above that. As the algorithms improve, along with better adaptation to context, segmentation and integration with back-end systems, so will the customer experience and uplift yield.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Adobe; Baynote; Certona; IBM; Monetate; MyBuys; Oracle; RichRelevance; SAS

Recommended Reading: "Tutorial: Web Content Product Recommendation Engines"

"Real-Time Customer Offer Engine Vendor Landscape for Retail"

At the Peak

Online Channel Optimization

Analysis By: Mick MacComascaigh

Definition: Online channel optimization (OCO) is the discipline of maximizing the effect and impact of the engagement with target personae achieved over a variety of communications media. The phrase "online channel" refers, therefore, to a channel of "communication" and is a collective term that includes emails, IPTV, multiple websites, portals, various social media, search and mobile applications.

Position and Adoption Speed Justification: Initially, OCO entails the careful collection of information about particular individuals from the first point of interaction, and will typically combine this with historical and/or modeled data or business intelligence — to derive the intelligence required to decide on follow-up actions. This information is used to establish the context in which the interaction is taking place and to gain an understanding of the needs of the individual persona. The delivery of an experience that resonates with that understanding is the next crucial step. The term "optimization" pertains to the practice of modeling and measuring this interaction in terms of its intended effect, and allowing for progressive improvement of that measurement through incremental, interactive and sometimes experimental steps, such as through the use of multivariate testing. Optimization also refers to the "media mix," or extent to which you may wish to use the online channel for communications, as opposed to other media such as print or telecommunications. Critical to this discipline is the correlation and optimization of communications across multiple channels, both on- and offline; for example, in the context of a single dialogue.

The promise of this level of capability in understanding/response has been the battle cry of Web content management and online measurement since the end of the last century. However, the then so-called "implicit personalization" always presented a challenge in terms of cost-benefit, not to mention technology and know-how. Also, the behavior and attitude of end users sometimes creates a negative backlash against such "creepy" attempts by companies to get to know them better, and this will require an opt-in approach in some cases and contexts.

The individual components of OCO are, therefore, not necessarily all new. In overlapping disciplines, such as analytics, multivariate testing and recommendations, progress has been made

toward improving the performance of a given website or portal. Concepts such as "User Experience Platform (UXP)" and "Intent-Driven Customer Support Systems" also resonate well with OCO. However, OCO as a coherent discipline has only emerged recently and is rendered more urgent with the exponential rise in the popularity of diverse mobile and social channels. Therefore, while the term will appear fresh, the precepts of this discipline will be understood by organizations of all verticals — along with the associated benefits. Adoption rates will vary greatly and will depend primarily on vertical and region, and on legal or cultural barriers to the perceptions surrounding the associated techniques.

User Advice: There is absolutely no requirement for a "big bang" approach when it comes to OCO. However, your initial steps will need to be made in the next six to 12 months depending on the extent to which your online strategy is linked to the overall success of your organization:

- The first step is to quantify the effect the collective group of stakeholders wish to achieve over the online channel. As well as considering internal efficiency, you should increase the focus on overall impact.
- You will then need to assess whether your online strategy supports those organizational goals that have already been laid out.
- Adopt optimization technologies aggressively, especially testing, navigation improvements and high-level personalizations/contextualizations.

Once you have made these initial considerations, you are in a better position to assess what components in your broader solution architecture will be needed in order to start on the path toward optimizing the effect of your online channel.

Business Impact: The business impact will be transformational for some organizations, and very high for many others. Since optimization requires quantitative transparency with regard to the desired effect, a new era of "causality" will emerge. Marketers, for example, will have greater evidence of which actions worked, and which didn't. Authors will be provided with automatic feedback on whether or not specific pages are having the desired effect, or what might be required to improve the overall impact.

OCO will also mean that decision making concerning the direction of the online channel will, necessarily, involve those leaders that have a more holistic perspective in terms of client interactions. OCO transcends a website or a customer service point. The positive impact of OCO will, therefore, rely as much on the people driving the initiative as the processes and technologies supporting the ongoing optimization process.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; Autonomy; Bridgeline Digital; CoreMedia; Ektron; GX Software; IBM; OpenText; Oracle; SDL; Sitecore; Webtrends

Recommended Reading: "Project Overview: Optimizing Your Online Channel With Web Content Management"

"Context-Aware Computing Will Increase the Impact of Your Online Strategy"

"The Emerging User Experience Platform"

"Magic Quadrant for Web Content Management"

"Incorporating the Web Into Cross-Channel Customer Analysis"

Citizen Developers

Analysis By: Ian Finley

Definition: A citizen developer is a user who creates new business applications for consumption by others using development and runtime environments sanctioned by corporate IT. In the past, end-user application development (AD) has typically been limited to single-user or workgroup solutions built with tools like Microsoft Excel and Access. However, today, end users can build departmental, enterprise and even public applications using shared services, fourth-generation language (4GL)-style development platforms and cloud computing services.

Position and Adoption Speed Justification: In an era of shoestring IT budgets, end users are looking outside the IT organization for AD. Enterprises need a range of applications to function optimally, but resource constraints are forcing IT organizations to focus on fewer high-priority applications. The long tail of applications needing development continues to get longer. Furthermore, even with priority applications that IT does build, today's rapidly changing business climate demands greater application agility. Although agile development techniques help IT respond to business needs more rapidly, a lack of resources often impedes a rapid IT response. Finally, the tacit knowledge locked into business areas is often difficult to translate into project requirements, making IT projects slow and time-consuming for end users. End-user development is one of the key ways enterprises address these issues.

These issues have existed for some time, but new, simple-to-use AD options are empowering end users to build more ambitious applications. End-user developers are empowered by new forces, including mass customization, the industrialization of infrastructure through cloud computing, the evolution of developer tools and changing workforce demographics. These emerging trends — which have been heartily endorsed by vendors such as Microsoft, Oracle, VMware and Zoho — not only make it easier for end users to develop their own applications, but they also enable end users to create applications that extend into the traditional realm of IT AD. As a result, the number of end-user developers, and the applications they've developed, is surging.

Citizen development is end-user AD with IT's blessing and support. This past year, we've seen an increasing number of IT organizations looking for help in addressing the challenges and opportunities of end-user development by implementing a citizen developer program, as well as an increasing level of interest from vendors looking to provide citizen developer platforms. Though not yet at the peak, interest in citizen developers grew significantly over the past year.

User Advice: Although end-user AD has operated under the radar for years, IT now needs to engage with end-user developers more actively to enable them to be good citizen developers. The new, more powerful applications that end users are building have the same risks and rewards as some IT-developed applications, and they need an appropriate level of quality, security, performance and availability. Ignoring or attempting to prevent end-user development carries high risks and limits enterprise innovation. Instead, IT should implement a citizen developer program to help end users be safe and innovative developers. Specifically, IT should:

- Be proactive and engage with the business to design a citizen developer program that meets both business and IT needs. Make sure the rights and responsibilities of IT, the citizen developer and the business are clearly defined.
- Actively challenge and dismantle negative IT attitudes toward end-user AD. Extend user support to include citizen development, and measure progress in the volume and sophistication of citizen-developed applications.
- Don't just roll out IT's tools to businesspeople. Instead, offer sanctioned development platforms that are end user friendly and allow IT staff to manage and monitor citizen development.
- Provide just enough governance so IT can review the quality, security, performance and availability of major end-user applications before they are deployed.
- Provide platforms, support and governance that citizen developers want to use. "Shadow development," away from IT oversight, generally occurs when working with IT is too slow, restrictive or expensive to meet business needs; not because end users are capricious or malicious.
- Implement monitoring to detect end-user applications that could create risks for the enterprise, and develop procedures to handle them.
- Create a protocol for transferring responsibility for risky and problematic applications to IT.

Business Impact: End users can now develop more powerful applications to support business goals without IT assistance; however, this new power comes with additional risks that IT must manage. Until recently, most end-user AD could be safely ignored by IT organizations. The applications ran on local PCs or servers within the firewall and could only serve a small number of users. However, new technologies now make it easier to build applications in the cloud than within the firewall. These new applications can serve thousands or even millions of users and store massive amounts of sensitive data outside the enterprise. In addition to the tremendous potential benefits, these applications can pose potentially serious risks to business continuity, compliance and security. While the IT organization may not condone or even know of these applications, it is ultimately responsible for maximizing the returns of and minimizing the risks of IT. If an adverse event happens, saying "we told you so" or "we didn't know" is a poor defense. End-user AD can't and shouldn't be stopped, but it can and should be made safer and more innovative.

A citizen developer program that includes IT guidance, IT-supported AD platforms and just enough governance can create a safe environment for end users to unleash their innovative potential. By engaging with end users and helping them help themselves, IT can accelerate the exploitation of

new technology, help end users create competitive advantage and new business innovations, and reduce the risks of modern end-user development.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: LongJump; Microsoft; Oracle; salesforce.com; TrackVia; VMware; Zoho

Recommended Reading: "Citizen Developers Are Poised to Grow, 2011"

"Case Study: Citizen Developers Can Help Business Keep Pace"

"New Developers Can Help Deliver More"

Portal Fabric

Analysis By: Jim Murphy

Definition: The portal fabric is a concept whereby portals and Web resources adapt to users' preferred environments and interaction patterns, rather than forcing them to change their behaviors based on a portal they're visiting. The technology underpinnings of the portal fabric rely on standards for federated identity and access management, context awareness, social interaction, content interoperability, and presence awareness.

Position and Adoption Speed Justification: Today's Web users access a multitude of portals and Web resources, whether for work, banking, travel, government, shopping or news. The influx of new devices such as smartphones, tablets, gaming devices into the market has only further fragmented and complicated the user experience and any attempts by Web providers to rectify the problem. In their efforts to more closely engage constituents and fend them off from competitors, portal, website, and social environment providers have often created confined environments.

However, as portal and website providers define their roles in a more expansive, user-centric Web, most realize that they must interoperate, rather than dominate, to engage their users.

The portal fabric is the set of capabilities and standards that will provide this interoperability for portal providers while allowing users to invoke applications and services into their preferred environment. With the portal fabric, all the portals and Web resources the user cares about could be aggregated into a single portal shell, social platform, or other Web-based user interface, taking the form of a personal portal (or MyPortal).

The portal fabric will allow providers to engage their constituents through highly relevant content and services informed by a wider range of context clues, including location, time, social relationships, interests, intent, and sentiment. It will allow various portals and Web resources to syndicate content, data and user information with each other. It will allow businesses and other

organizations to leverage existing social and business networks rather than forcing constituents toward their own portals.

In terms of technology and standards, significant progress will be necessary to realize the portal fabric. Universal, federated identity management that provides key security and personalization data will be an essential enabling factor for the portal fabric. Web Service for Remote Portlets (WSRP) provides basic portlet-level syndication, but additional interoperability standards must be in place for the portal fabric to progress toward widespread use. The portal fabric will require federation across private and public networks, and it will require trust, especially for highly secure transactions. As context clues like location and social scenarios come more strongly into play, the portal fabric must also include an architecture for context awareness (see "Context-Aware Computing and Social Media Are Transforming the User Experience"). Presence awareness, too often underestimated as a feature of IM, will emerge as a requirement for the portal fabric and will require more reliable and universal standards. Federation and syndication requirements are further increasing as social objects, including social identities, activity streams and microblogs come into the picture.

Several of the largest portal providers are employing a portal fabric to bring a single user experience to a widening range of collaboration platforms, content management systems, social networking suites and business applications. Yet the portal fabric's fundamental requirement for interoperability may be compromised by larger providers with aspirations to sell comprehensive suites to the exclusion of competing vendors. Meanwhile, several more focused portal providers emphasize interoperability, and seek to leverage existing service-oriented architecture (SOAs) in supporting the portal fabric idea. Some consumer-oriented portals, especially those embracing and enabling mashups and standards like OpenSocial, are also positioned to participate in the portal fabric.

Meanwhile, consumerization, mobility, social software, and business pressures from certain vertical markets are catalyzing the portal fabric's growth sharply. Consumer-centric portals and social platforms, like Facebook and Twitter, are gaining interoperability through standards like OpenSocial, Activity Streams and Salmon Protocol. The need to provide a continuous user experience across devices has raised the necessity of ensemble programming — orchestrating user experiences across devices or environments (see "Ensemble Programming Will Emerge to Help Designers Create Context-Aware User Experiences").

In vertical industries like healthcare, the portal fabric is an exigency, rather than an option. The entire complex healthcare value chain among providers, insurers, government organizations, pharmaceuticals and device manufacturers, and patients will only accomplish the goals of universal healthcare, reduced costs of healthcare and better patient outcomes through collaboration and cooperation, rather than competition. As the center of the healthcare universe, patients and their doctors must be able to access medical records and services across a wide range of repositories and systems from various providers. Ultimately, healthcare could provide a foundation and a model for the portal fabric that proliferates into other industries.

User Advice: Enterprises must escalate the importance of user experience design in skill development, extending from optimizing user interfaces to providing engagement and continuity across all computing platforms.

Organizations should pay attention to evolving standards for portal interoperability and federation, and be wary of vendors that employ proprietary technologies and protocols to sell comprehensive suites. Most companies should employ SOA and Web-oriented architecture (WOA) principles as the fundamental foundation for their user experience platforms.

Organizations should prepare for the portal fabric by addressing security, identity management and privacy policies upfront. Among other intricacies, the incorporation of consumer-facing portals into the portal fabric is likely to require alternative, single-sign-on approaches, such as OpenID, Facebook Connect and InfoCard. Universal, federated identity management capturing portal-centric user information will be a cornerstone of the portal fabric.

Enterprises should track the evolution of portal interoperability standards, and should leverage federated identity management as business requirements dictate. Press portal product vendors to implement portal fabric features as standards emerge.

Business Impact: Vendors providing aggregation mechanisms for the portal fabric will own the user experience. Early adopters that provide aggregation of relevant nodes of the portal fabric can achieve competitive advantage in their industries. Other providers besides traditional horizontal portal players may seek this role, including consumer Web personal portal providers. Some enterprises will provide aggregation of the portal fabric, while others will expose their content and data for aggregation by others. From a user perspective, the ability to aggregate multiple portals and Web resources will result in the ability to correlate and orchestrate them into on-the-glass composites, including enterprise mashups. Finally, vendors that offer mashup-enabling technologies will serve a valuable role in transitioning enterprises from "walled gardens" to full participants in the portal fabric.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Recommended Reading: "The Portal Fabric Will Enable Each User to Be the Center of the Portal Universe"

"Ensemble Programming Will Emerge to Help Designers Create Context-Aware User Experiences"

"Context-Aware Computing and Social Media Are Transforming the User Experience"

Social Media Metrics

Analysis By: Bill Gassman

Definition: Social media metrics is a style of social analytics, focused on content created in Internet-based social applications, such as blogs, social media sites and product ratings. Social media metrics include dozens of counter attributes, such as comments posted, friends reached and

reposts. The real value comes from prime and aggregate social media metrics derived from raw counters, such as sentiment, buzz, rating, influence, exposure and virality.

Position and Adoption Speed Justification: The position for social media metrics at Pre-Peak is justified by the wide adoption of metrics by those involved with social media. However, the breadth of metrics definitions vary by user role, metrics vendor and social application. Products for social media monitoring are getting better, shifting from finding comments to better linguistic analysis of what is being said. Discussions continue, however, about the lack of value for sentiment and other social metrics, meaning some of the hype shine is already wearing thin. The connection of social metrics to business value is still primitive. It will be two to five years before the productive use of social media metrics is widespread. A driver of adoption is the availability of tools via software as a service models. In addition, advertisers will create ad hoc metrics to use as currency within social media advertising efforts. Metrics will not fully standardize however, so users within customer support, product marketing and research must learn to calibrate available metrics to their environment and manage the trends.

User Advice: It is essential to embrace social media metrics as part of a social media strategy. Use the unique metrics to help optimize social media activity, but also merge social media metrics with other metrics already in use. For example, in marketing and advertising, especially on the Web channel, metrics such as unique and repeat visitors, conversations, registrations, value of sale and cost of campaigns are already understood, and measured within Web analytics or campaign analysis tools. Measuring tweets or Facebook page visits alone is as wrong as measuring Web hits. To have long-term value, social metrics must correlate with some business value, such as triggers for customer engagements, optimized campaigns, lower cost of sale, greater lifetime customer value or customer satisfaction metrics.

Business Impact: Using social media metrics will improve the yield of social media initiatives by showing what is working and what is not. Social media metrics have the most impact in vertical industries and departments where social media has an impact. Business to consumer, especially in retail, consumer product goods, finance and government are the early adopters. Marketing, advertising, customer support, product management and research are departments where social media, and using metrics, will have the most impact. In some cases, users are new to the proper use of metrics, and will benefit from those within the organization with expertise. The most impact will come to those that tie social media metrics to process and establish a feedback loop of social activity decisions to business value.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; Attensity; IBM; Nielsen; salesforce.com; SAS

Recommended Reading: "Selection Criteria for Social Media Monitoring Platforms"

"Measuring the Value of Online Social Media Activity"

"Marketing Essentials: How to Integrate Social Media Into Your Marketing Communications Strategy"

"Social Media Makes Marketing Metrics More Meaningful"

"Apply a Comprehensive Planning Framework as Business Gets Social"

Big Data

Analysis By: Mark A. Beyer; Sid Deshpande

Definition: Big data is high-volume, high-velocity and high-variety information assets that demand cost-effective, innovative forms of information processing for enhanced insight and decision making.

Position and Adoption Speed Justification: A wide array of hardware and software solutions has emerged to address the partial issue of volume. Big data is almost at the Peak of Inflated Expectations. Because the practices are developing quickly, it will go over the Peak of Inflated Expectations and possibly start into the Trough of Disillusionment in 2012. However, big data should spend very little time in the trough. MapReduce is the current darling of big data processing, but it is a batch solution and therefore has to be combined with other information management and processing technologies to provide complex-event processing support and support for larger user populations. Hadoop implementations require expert-level staff or system implementers. Attempts to combine MapReduce with Graph will follow, as well as natural-language processing and text analytics. Other big data assets, such as images, video, sound and even three-dimensional object modeling, will also drive big data into the trough. Some big data technologies represent a great leap forward in processing management. As a result, these new technologies represent a capability to overtake existing technology solutions when the demand emerges to access, read, present or analyze any data. Throughout 2010 and 2011, big data focused primarily on the volume issues of extremely large datasets generated from technology practices such as operational technology, Internet logging, social media and streaming sources.

The larger context of big data refers to the wide variety and extreme size and count of data creation venues in the 21st century. Big data practices introduce the concept that all data can be integrated and promote the development of new technologies. This is in stark contrast to the current view that only selected data can be integrated due to existing technology limitations. As a new issue with requirements that demand an approach, the expansion of traditional boundaries will occur extremely fast because the many sources of new information assets are increasing geometrically (for example, desktops became notebooks and now tablets); portable data is everywhere and in multiple context formats. The increasing number of digital information devices is causing exponential increases in data volumes. Additionally, the information assets include the entire spectrum of the information content continuum, from fully undetermined structure ("unstructured") to fully documented and traditionally accessed structures ("structured"). As a result, organizations will seek this as differentiation from their competitors, so they can become leaders in their markets in the next two to five years. This makes big data a current issue demanding almost immediate solutions. Vendors are almost universally claiming that they have a big data strategy or solution.

However, Gartner clients have made it clear that big data must include large volumes processed in streams as well as batch (not just MapReduce) and an extensible services framework that can deploy processing to the data or bring data to the process, and that spans more than one variety of asset type (for example, not just tabular, or just streams or just text). Importantly, the different aspects and types of big data have been around for more than a decade — it is only recent market hype around legitimate new techniques and solutions that has created this heightened demand.

The final and most important point is that current specialized technologies will become mainstream, and then the next big data issue will emerge and force even newer technologies and practices, constantly renewing itself.

User Advice:

- Identify existing business processes that are hampered in their use of information because the volume is too large, the variety is too widespread or the velocity creates processing issues. Then identify business processes that are currently attempting to solve these issues with one-off or manual solutions.
- Review existing information assets that were previously beyond existing analytic or processing capabilities (referred to as "dark data"), determine if they have untapped value to the business, and make them a first or pilot target of your big data strategy. In particular, look for information use cases that combine extremely diverse information assets into analysis and data mining solutions.
- Plan on utilizing scalable information management resources, whether they are public cloud, private cloud or resource allocation (commissioning and decommissioning of infrastructure), or some other strategy. Do not forget that this is not just a storage and access issue. Complex, multilevel, highly correlated information processing will demand elasticity in compute resources similar to the elasticity required for storage/persistence.
- Extend the metadata management strategies already in place and recognize that more is needed to enable the documentation of these information assets, their pervasiveness of use, and the fidelity or assurance of the assets, tracking how information assets relate to each other and more.

Business Impact: There are three principal aspects to big data — success will be limited unless all are addressed. The quantitative aspects of big data generally do not emerge one by one. Volume, variety and velocity most often occur together. The second aspect is that innovation must be cost-effective both in costs to deploy and maintain, and in terms of time to delivery — solutions that arrive too late are useless regardless of cost. Finally, the focus must be on increased insight by the business into process optimization from immediate automation through the development of completely new business models. Big data permits greater analysis of all available data, detecting even the smallest details of the information corpus — a precursor to effective insight and discovery. The primary use cases emerging are: leveraging social media data, combining operational technology (machine data) with back-office and business management data, and further validating existing assets (increasing their "fidelity").

Big data has multiple use cases. In the case of complex-event processing, queries are complex with many different feeds, and the volume may be high or not high, the velocity will vary from high to low, and so on. Volume analytics using approaches such as MapReduce (the Apache Hadoop project, for example) are valid big data use cases. In addition, the business intelligence use case can utilize it in-database (for example, Aster Data and Greenplum), or as a service call managed by the database management system (IBM Big Insights, for example), or externally through third-party software and implementation services (such as Cloudera or MapR). Enterprises using portals as a business delivery channel have the opportunity already to combine geospatial, demographic, economic and engagement preferences data in analyzing their operations, and/or to leverage this type of data in developing new process models. Life sciences generate enormous volumes of data in clinical trials, genomic research and environmental analysis as contributing factors to health conditions.

The primary imperative remains. A new standard in determining cost-effective solutions has emerged. Gartner estimates that organizations that have introduced all 12 dimensions of big data to their information management strategies by 2015 will begin to outperform their unprepared competitors within their industry sectors by 20% in every available financial metric.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Cloudera; EMC-Greenplum; HortonWorks; IBM; MapR; Teradata-Aster Data

Recommended Reading: "'Big Data' Is Only the Beginning of Extreme Information Management"

"How to Choose the Right Apache Hadoop Distribution"

"CEO Advisory: 'Big Data' Equals Big Opportunity"

"The Importance of Big Data: A Definition"

Context-Enriched Services

Analysis By: Anne Lapkin

Definition: Context-enriched services are those that combine situational and environmental information with other information to proactively offer enriched, situation-aware and usable content, functions and experiences. The term denotes services and APIs that use information about the user to optionally and implicitly fine-tune the software action with better situational awareness. Such services can proactively push content to the user at the moment of need, or suggest products and services that are most attractive to the user at a specific time.

Position and Adoption Speed Justification: Context enrichment refines the output of services and improves their relevance. Since Gartner began covering this topic more than five years ago,

context-enriched services have gone beyond simple scenarios (for example, one category of context information — such as location) to more complex services that use several categories of context information (for example, location, group behavior and purchase history) to further refine the output. The majority of implementations today are consumer facing, in mobile computing, social computing, identity controls, search and e-commerce — areas in which context is emerging as an element of competitive differentiation. Gartner believes that enterprise-facing implementations, which use context information to improve productivity and decision making by associates and business partners, will begin to emerge in the next several years (see "Context-Enhanced Performance: What, Why and How?").

Current context-aware solutions are fragmented — they are individually designed, custom-developed and deployed and, because of their competitive importance, are often not widely distributed or advertised. The movement in social computing toward open and shared social relationship (social graph) information is an early step toward the standardization of context-aware computing APIs; however, most of the required standardization effort has not yet begun. Context-enriched services will require multiple stages of innovation and platform technology evolution before their essential benefit is well-understood in the broad mainstream computing markets.

Context-enriched services continue to steadily climb toward the Peak of Inflated Expectations in 2012. We are seeing an increasing number of applications that, while they may not use the term "context-aware computing," are clearly using context information to improve the user experience. In addition, we are seeing "platform level" services offered by context providers such as Apple and Google that allow advertisers to plug content into certain situations. Previously, these services were custom-built for a specific service.

Currently, most services are reactive: that is, while they may use some information about the user to personalize the interaction, they fundamentally provide content to a user based on a specific request. As context-aware computing becomes more prevalent, proactiveness will become the norm. That means that a service will deduce what the user requires based on detection of a context event (for example, the appearance of a user in a particular location), an analysis of all the available information (including situational and environmental information) pertaining to that user and a determination of the best course of action. This course of action may be the presentation of a personalized offer or content, or it may be "do nothing" if it is determined that the user is not receptive at that time.

User Advice: Application developers and service providers should take advantage of the wide range of contextual opportunities in their e-commerce, security, social computing and mobile computing systems. Some early context processing can be achieved using event processing and complex-event-processing technologies; enterprises need to plan to incrementally develop or source more context-enriched services in step with their ambition levels for improving the user experience.

Business Impact: Context-enriched services will be transformational for solution providers; context enrichment is the next frontier for business applications, platforms and development tools. The ability to automate the processing of context information will serve users by increasing the agility, relevance and precision of IT services. New vendors that are likely to emerge will specialize in gathering and injecting contextual information into business applications. New protocols such as

real-time bidding will allow for the mashing up of and delivery of context-enriched services. Most context-aware applications are likely to arrive as incremental enhancements to service-oriented architecture, without a major disruption to the prior architecture. However, the new kinds of business applications — especially those driven by consumer opportunities — will emerge, because the function of full context awareness may end up being revolutionary and disruptive to established practices.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Apple; Atos; Google; Microsoft; Pontis; Sense Networks

Recommended Reading: "Cool Vendors in Context Aware Computing, 2012"

"Predicts 2012: Context Aware Computing Changes Consumer-facing and Security Strategies"

"Context-Aware Computing and Social Media Are Transforming the User Experience"

"A World-Class Patient Experience Is the Disney Family Cancer Center's Focus"

"Evaluating Privacy Risks and Business Benefits in Four Context-Aware Technologies"

Mobile Web Applications

Analysis By: David Mitchell Smith

Definition: Mobile Web applications are applications for mobile devices that require only a Web browser to be installed on the device. They typically use HTML and Ajax (and, increasingly, HTML5 components). Rich, mobile Web applications have usability roughly equivalent to rich Internet applications (RIAs), when designed specifically for smaller form factors. Mobile Web applications differ from mobile native applications, in that they use Web technologies and are not limited to the underlying platform for deployment.

Position and Adoption Speed Justification: For many years, users have hoped that mobile Web applications would go mainstream. Although acceptance has been higher in some locations than in others, until the introduction of the Apple iPhone, the experience was less than ideal. Its Safari browser, good JavaScript support and overall ease of use has made the difference. When the iPhone was introduced, the only way to develop for it was via Web programming. Although, subsequently, Apple has moved emphasis toward native applications (via the App Store), its contribution greatly raised the bar for mobile Web applications.

Many vendors have libraries that provide a richer-than-expected user experience, using primarily HTML and Web technologies. Often, these are used in conjunction with extensions or native code wrappers for JavaScript that enable mobile Web applications to access capabilities such as the accelerometer, geolocation and multitouch. The popularity of Android devices and tablets has

increased the need for apps and sites that can be used by different OSs and browsers. The fragmentation of mobile will continue to drive this as well.

Google's Gmail is a Web application without a wrapper. It uses HTML5 functions and offline storage to provide a user experience comparable to the native iPhone Mail application, without any installation or upgrade. One driver of the mobile Web will be improvements in other platforms and browsers. The real movement will happen as critical mass for various pieces of HTML5 materializes; however, testing and interoperability issues will remain due to implementation differences. The proliferation of WebKit-based browsers in mobile will help with this. HTML5 is early in the Hype Cycle, but components of the specification are beginning to see adoption. The hype has not yet peaked (see "HTML5 and the Journey to the Modern Web" for more details).

User Advice: The mobile Web experience is driven by consumer applications first. It is the result of the direct impact of consumerization on enterprises. The difference between Web apps and websites is largely semantic. Further investment in sites that are optimized for mobile access is happening in parallel with development of offerings often thought of as "apps."

Portability among applications in the mobile world remains a challenge. This is largely due to fragmentation in the mobile market. Gartner recommends Web standard approaches when portability and ease of development are goals. Other issues, such as form factor (small screens are not optimal) and connectivity (intermittent and costly in many cases), also need to be factored into decisions.

HTML5 and Web technologies make the most sense when reach across multiple platforms is a strong requirement. Native approaches make more sense when there is a need to take advantage of the leading-edge device capabilities. Hybrid approaches are becoming increasingly viable as well.

Business Impact: Mobile presence has become a critical requirement for reaching consumers and, increasingly, business users. The mobile Web, as first delivered satisfactorily by the iPhone, has made mobile Web clients feasible. Although many organizations may have started down a mobile Web path with early-generation technologies, such as Wireless Application Protocol (WAP), the advent of native applications for the iPhone and other smartphones has become the focus. Online strategies must increasingly take into account a native mobile application experience, as well as the need to reach more platforms. A mobile Web experience is a good way to do this.

Two major reasons for adopting mobile Web applications are to hedge your bets regarding platforms and to support multiple platforms. Another consideration is security, because direct access to device software introduces additional security concerns. Mobile Web applications can — in certain scenarios and with careful attention to APIs and extensions — provide a rich user experience that does not equal native applications, but approximates it at a fraction of the development effort, with greater portability and flexibility.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Apple; Google; Microsoft; Netbiscuits; Nokia; Research In Motion; Sencha; Usablenet

Recommended Reading: "Magic Quadrant for Mobile Consumer Application Platforms"

"HTML5 and the Journey to the Modern Web"

HTML5

Analysis By: David Mitchell Smith; Ray Valdes

Definition: As the heir apparent to HTML4, HTML5 is a next logical step in the development of HTML. However, the term "HTML5" is often used to mean more than the formal specification, and less simultaneously (see "HTML5 and the Journey to the Modern Web"). HTML5 is the proposed specification for the next generation of HTML. It is important, because it brings to the Web much of the rich Internet application (RIA)-like capabilities that have required additional software.

Position and Adoption Speed Justification: HTML5 has increased in visibility and has garnered extremely charged opinions as a result. The extreme opinions range from "HTML5 will make everything else (especially Flash) irrelevant" (see "HTML5 and the Future of Adobe Flash") to "It will take more than a decade for HTML5 to be ratified, so we don't need to pay attention to it until then." The reality is, as usual, somewhere in between, and is time- and scenario-dependent.

HTML5 is not one thing. At one extreme, the hype and aura around the term can lead to using it to mean one particular feature (e.g., video). At the other extreme, treating it as if it is one large, inseparable thing will lead to a "wait until it's done" approach, which will be a bad choice for most companies. HTML5 consists of many components, including video, canvas, audio and offline capabilities. In addition, other modern Web capabilities, such as JavaScript, CSS3 and WebSocket, are closely related and are often grouped together.

The working subset and de facto standards may be driven by mobile devices. OS fragmentation continues to be a significant issue in mobile. However, most mobile browsers for smartphones are, or will be, based on WebKit. OS fragmentation increases the need for a viable cross-platform strategy. The common technology base of WebKit and the evolution of working subsets and the de facto nature of HTML5 pieces may fit this need.

HTML5 usage and stability will appear first in mobile environments, then on the desktop. HTML5 usage and stability will be driven by desktop and mobile use scenarios, and there will be different drivers for both environments.

User Advice: Developers should:

- Familiarize themselves with the components of HTML5, and the browsers that support them.
- Exploit the available features of HTML5 now, but recognize that they are based on a draft standard and are subject to change. Higher-level frameworks can help insulate developers.

- Consider HTML5 when designing applications that require the broadest reach across the most browsers and devices.

Business Impact: There is visible momentum around HTML5; however, as with most technologies, especially on the Web, interest is occurring primarily outside the enterprise sector — among progressive Web designers and among mobile application developers. Web developers are starting to design around new elements in HTML5, such as canvas, offline mode and video. Developers of RIA-based sites that rely on Flash and Silverlight need a strategy that relies less on Flash and Silverlight. Mobile developers are interested in HTML5 as a cross-platform technology that doesn't rely on "native" applications and proprietary app stores.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; Apple; Google; Microsoft; Research In Motion

Recommended Reading: "HTML5 and the Journey to the Modern Web"

"Flash, Silverlight and the RIA Dilemma in a World of HTML5"

"Browser Vendors' HTML5 Strategies Are Not All the Same"

"HTML5 and the Future of Adobe Flash"

Platform as a Service

Analysis By: Yefim V. Natis

Definition: A platform as a service (PaaS) offering, usually depicted in all-cloud diagrams between the SaaS layer above it and the IaaS layer below, is a broad collection of application infrastructure (middleware) services (including application platform, integration, business process management and database services; see "Platform as a Service: Definition, Taxonomy and Vendor Landscape, 2012"). However, the hype surrounding the PaaS concept is focused mainly on application PaaS (aPaaS) as the representative of the whole category.

Position and Adoption Speed Justification: In prior years, much of the attention in cloud computing was focused on software as a service (SaaS; such as by salesforce.com CRM). More recently, the emphasis has been on infrastructure as a service (IaaS; such as by Amazon Web Services), including the private cloud rendition of IaaS. However, as leading software vendors adjust their long-term strategies to reflect the emerging importance of cloud computing to their customer and prospect bases, they are investing to establish a leadership position in the middle layer of PaaS. Over 130 vendors (mostly small innovators) deliver some form of a PaaS service. By the end of 2012, most leading application infrastructure (middleware) vendors will have production PaaS offerings (all were at least in beta at the start of the year) in application platform, integration, business process management and other middleware service areas.

Users turn to PaaS (instead of on-premises deployed middleware), with the expectation of greater productivity, lower costs of operation and faster time to results, to access state-of-the-art data center and middleware technologies (which small or midsize businesses [SMBs] and many large organizations cannot afford or lack the talent to handle). Some turn to PaaS to establish an independent service provider that avoids the internal and external political issue of trust (choosing an independent third-party intermediary often helps overcome trust issues among parties). Users also choose PaaS for its ability to support rapid and continuous unintrusive versioning of software, simplified self-service management and administration, and the expected competitive pace of innovation by PaaS providers.

The process of establishing the platform architecture and standards for PaaS is in its early stages. Most leading vendors are still developing their insights into cloud computing while investing in backward-compatibility with on-premises skills and programming models. IBM, Oracle, Red Hat, VMware and Microsoft are in this category, and all except Microsoft are still in beta or limited release as of the first half of 2012. As a result, available PaaS offerings are slow in coming (prolonged betas), come from small providers with limited ability to execute, or are proprietary. Most offerings are specialized in a relatively narrow middleware function, and consolidation of services and vendors in the market is on the rise. Many users, having heard the promises of what's available, are disappointed in the reality. The degree of cloudiness and standardization in available PaaS trails behind users' expectations. Most options focus on a few areas of service, and are not functionally complete enough to meet end-to-end project requirements. This pushes PaaS technology past the Peak of Inflated Expectations, and down the slope toward the Trough of Disillusionment. With more PaaS services becoming available from the largest software vendors, more users will enter the space, and will begin to understand and adjust to the reality. As always, this reality will not match the hype. Users will have to learn how PaaS fits into their overall IT strategy based on the real merits of real products.

User Advice: Recognize that PaaS can provide application platform, integration, business process management, portal, database management system (DBMS), messaging and other middleware services, although few vendors currently offer all major options. Many users will combine the services of multiple providers to meet their project objectives, or will combine the use of on-premises middleware with cloud PaaS services.

PaaS offerings are at varying stages of development in maturity, functional completeness and cloudiness. Select PaaS services for their projects, carefully matching the functionality and service levels of PaaS offerings with the requirements of the organization. No provider offers a comprehensive PaaS suite, so users should use services from multiple providers, and should combine them with applications and platform technologies on-premises to form a hybrid computing environment.

Build applications using PaaS to gain expertise in this important emerging area of technology. The applications built using today's PaaS should be designed for ROI within the next two to three years to allow organizations the flexibility to transition to more mature PaaS offerings as they emerge. Massive projects that cannot deliver ROI in a limited time should either not be committed to PaaS at this time or should be subdivided into smaller components, and some of those may be built on a PaaS.

When engaged in long-term planning, give preference to vendors that are more likely to accumulate comprehensive PaaS offerings. Unlike on-premises — where users can take a best-of-breed approach to selecting component technologies from different vendors — in the cloud, the winning scenario will be where many platform requirements of an application are provided from one data center footprint of one cloud provider.

Business Impact: Historically, a prerequisite for leadership in software infrastructure markets has been a vendor's ability to take a leading role in establishing the prevailing programming models and architectures for software developers. This role enabled vendors to build ecosystems of partners, and a leading ecosystem amounted to sustainable industry leadership. In cloud computing, analogously, leadership in the PaaS market will require leadership in the evolution of standards, architectures and best practices in cloud application platforms and application services. IT megavendors such as Fujitsu, Google, IBM, Microsoft, Oracle, salesforce.com, SAP and VMware are strategically invested in this market.

During the next five years, reliable and functionally rich PaaS offerings from industry-leading providers will alter the business of engineering and delivering software to enterprises and consumers. A mature, functional, always-on, high-productivity PaaS will form the foundation for a wave of innovation in business application services, as independent software vendors turn their engineering efforts to these platforms. New levels of agility, resource sharing, ubiquitous access, quality of service and the productivity of software engineering will change the way IT organizations plan and develop software, the kinds of skills they'll require and how they'll be managed, evaluated and budgeted. With time, the cloud-native PaaS will lead to new cloud-native applications that cannot be delivered at justifiable costs today.

Enterprise IT will refocus on its core, differentiated business to become more responsive; however, the cost of IT will not decline. Instead, it will be rearranged, with more spending going to cloud services providers and brokerages, and more internal IT spending on the composition of user-facing business solutions, management and integration. Full-scale internal custom engineering will be limited to highly differentiating specialized legacy application systems. All businesses will become consumers and providers of cloud services, expanding their IT perspective from inward-looking enterprise class to outward-facing global class.

Benefit Rating: Transformational

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Appistry; CloudBees; Cordys; Dell Boomi; Engine Yard; GigaSpaces; Gnuzilla; Google; IBM; Informatica; LongJump; Microsoft; Oracle; Pegasystems; Red Hat; salesforce.com; VMware; Wolf Frameworks; WSO2

Recommended Reading: "Platform as a Service: Definition, Taxonomy and Vendor Landscape, 2012"

"PaaS 2012: Tactical Risks and Strategic Rewards"

"Gartner Reference Model for PaaS"

"PaaS Road Map: A Continent Emerging"

"Hype Cycle for Cloud Application Infrastructure Services (PaaS), 2011"

Social Analytics

Analysis By: Carol Rozwell

Definition: Social analytics describes the process of collecting, measuring, analyzing and interpreting the results of interactions and associations among people, topics and ideas. These interactions may occur on social software applications used in the workplace, in internally or externally facing communities, or on the social Web. Social analytics is an umbrella term that includes a number of specialized analysis techniques, such as social filtering, social network analysis, sentiment analysis and social media analytics.

Position and Adoption Speed Justification: The desire to find meaning in the myriad sources of social information available on the social Web, as well as internal information, is spurring interest in social analytics. There are huge volumes of data that appear in a variety of forms and much of this information is changing very rapidly. These issues contribute to the complexity of analysis.

Social software vendors, such as IBM and Microsoft, have added tools for social analytics to their applications that measure adoption and growth to provide an understanding of community dynamics. The data makes individual behaviors, content and interactions visible. Social media monitors look for patterns in the content of conversations across all social media spaces. They extract actionable or predictive information from social media and, in some cases, offline media. The acquisition of Radian6 by salesforce.com is an example of a social software platform vendor extending its social analytics capability to include social media monitoring.

User Advice: Organizations should ensure that their initiatives are positioned to take advantage of social analytics to monitor, discover and predict. Some enterprises will be content to monitor the conversations and interactions going on around them. Enterprises with social software platforms that provide social analysis and reporting can use this information to assess community engagement. They can also easily monitor what is being said about the company, its products and the brand using simple search tools or more sophisticated sentiment analysis applications.

The results of social analytics (for example, discovered patterns and connections) can be made available — often in real time — to the participants of the environment from which the data was collected to help them navigate, filter and find relevant information or people. Other enterprises will mine the social analytics data, actively looking to discover new insights using a wide range of business intelligence applications. At this time, the use of social analytics information for predictive purposes is a largely untapped source of value. However, marketing and product development teams express great interest in this capability.

In many organizations, social analytics applied to external activity (for example, sentiment analysis across the Web) will be sourced by marketing professionals and others (such as the legal

department, product development and customer support). In those cases, IT needs to play a leadership role in orchestrating a coordinated set of activities across departments to, for example, minimize duplication of effort, ensure coordination between efforts and standardize taxonomies.

Business Impact: Social analytics is useful for organizations that want to uncover predictive trends based on the collective intelligence laid open by the Internet. For example, a biopharma researcher could examine medical research databases for the most important researchers, first filtering for the search terms and then generating the social network of the researchers publishing in the biopharma's field of study. Similarly, social analytics could be used by marketers who want to measure the impact of their advertising campaigns or uncover a new target market for their products. They could look for behaviors among current customers or among prospects that could enable them to spot trends (deterioration in customer satisfaction or loyalty) or behaviors (demonstrated interest in specific topics or ideas).

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Attensity; BuzzLogic; galaxyadvisors; IBM; News Patterns; salesforce.com; SAS; Trampoline Systems; Visible

Recommended Reading: "Turn Information Into Insight With Social Analytics"

"Marketing Essentials: How to Build a Social Analytics Strategy to Mine Customer Insights"

"Competitive Landscape: Social Analytics"

Portal-less Portals

Analysis By: Jim Murphy

Definition: Portal-less portals provide a personalized interface with relevant information from multiple sources — without using traditional portal server software. Approaches to portal-less portals vary and include rich Internet applications (RIAs), mashup platforms, Web content management systems and social software platforms. Most portal-less portals exploit modern Web-oriented architectures (WOAs), representational state transfer (REST)-based interfaces and widgets to offer a simple, yet flexible, path to interoperability.

Position and Adoption Speed Justification: Although enterprise portal frameworks and platforms constitute the established approach to building websites and Web applications across a range of scenarios, portals are becoming easier to build without traditional portal products. The portal goal of a single, personalized point of access to enterprise information, processes and people is no longer the sole domain of the established horizontal portal vendors and technologies. RIA platforms and Ajax technologies, enterprise mashup assembly platforms, Web content management systems with portal-like features, open-source frameworks and components, and social networking approaches

are offering new means toward the same ends, and often without the complexity, heavy infrastructure, and long implementation times of traditional portal products.

Vendors focusing on portal-less portal scenarios are often small, relatively inexpensive, and lightweight, characteristics which favor open source. A few larger vendors offer portal-less portal capabilities in the context of other software categories, like content management, business intelligence, or social software. Many portal-less projects, in fact, don't involve a specific vendor or product but are accomplished by developers employing open source Web frameworks and widgets.

The attraction toward portal-less portals (see "Get Ready for the 'Portal-Less' Portal") is largely the result of frustration with stagnant or failed portal projects and initiatives. Too many portal projects have failed or grown stagnant, falling short on user adoption and delivering few measurable business results. Business units and end users in many organizations have come to view established portal products as restrictive, requiring heavy IT involvement and intervention whenever they want to add an application or make a change. Rather than a facility for delegating administration and putting control into the hands of business units and users, too many portal projects have come to represent an IT bureaucracy. In the meantime, business users and consumers have not only seen the alternatives, but also sometimes use them more often than any enterprise-deployed portal.

However, there remain several weaknesses with portal-less portals, compared with longer-standing traditional portal products and platforms. Portal-less portals rely more heavily on service-oriented architecture (SOA) and WOA than many traditional portal platforms, which tend to offer a great variety of front-, middle- and back-end means of integration. Thus, SOA and WOA are prerequisites for effective and extensible portal-less portals. While widgets are decidedly more simple today than standards-based portlets or Web parts, without firmly established standards, they may also be less capable and sophisticated when it comes to features like interportlet communication, supporting granular levels of security and advanced personalization.

User Advice: Of course, alternatives to long-established portal architectures, although undeniable in their appeal to end users, raise challenges. First, organizations must ensure that new efforts are aligned with business goals and existing systems, while mitigating risk. Second, organizations must prevent alternative approaches from creating yet more information and process silos. Third, organizations must avoid subverting value propositions ingrained in portal initiatives, such as delegated administration, portlet standards implementations, directory integration and ready-to-use portlets for common applications. Organizations should consider portal-less portals part of their portal and broader user experience platform (UXP) strategy.

While independent vendors, such as Backbase and edge IPK, are making progress in the market, the portal-less portal idea is not entirely lost on the more established portal providers. Even the largest and most established portal vendors, like Microsoft, Oracle, SAP and IBM, have portal-less portal qualities, if not direct capabilities, although they're often underplayed in light of the more traditional portal approaches. In addition to seeking portal alternatives, organizations should, therefore, dig deeper toward understanding their providers' portal-less portal capabilities.

Business Impact: Given the right conditions, some companies can benefit greatly from portal-less portals. Organizations with relatively simple access to many disparate systems and resources, and that have a thorough SOA or WOA foundation in place, can use portal-less portals to provide useful user interfaces far more quickly than traditional portal approaches. Given the right conditions and scenarios, portal-less portals can offer faster time to market, more satisfying user experience, and more direct business value than traditional portal platforms.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; Backbase; edge IPK; JackBe

Recommended Reading: "Generation 7 Portals: Unifying the User Experience"

"The Emerging User Experience Platform"

"Get Ready for the 'Portal-Less' Portal"

Semantic Web

Analysis By: Gene Phifer

Definition: The Semantic Web is a grand vision of a machine-readable Web, and a collection of technologies to implement that vision.

Position and Adoption Speed Justification: The Semantic Web was first described in detail by Tim Berners-Lee in 2000, and envisions a shift from a "Web of documents" to a "Web of data," where information is richly described by tags or links embedded in documents and Web pages or other data structures. [The Semantic Web](#) uses an array of technology standards, formats and languages (for example, XML, Resource Description Framework [RDF] and Web Ontology Language [OWL]) to define information properties and relationships, and to connect Web components to each other.

The World Wide Web Consortium (W3C) Semantic Web standards define how to connect content components without regard for what the components themselves contain or define. Those specifics are developed and maintained by groups with domain expertise, for example, the subgroup for publishing works on branding and digital rights, and a healthcare subgroup that works on disease monitoring and linking patients to clinical trials. There's no structural similarity or relationship among the different subgroups, or an overarching model that's evolving. Domains have their own Semantic Web models (for example, Systematized Nomenclature of Medicine [SNOMED] for healthcare, and eXtensible Business Reporting Language [XBRL] for finance) that provide specific value, but are not attempts to define syntactic or Semantic Web models that can cover all information.

The traditional use of Semantic Web has a lot of baggage associated with it. Lack of definitive progress and confusion would drive the traditional Semantic Web into the Trough of

Disillusionment. However, significant new advances are breathing new life into Semantic Web, and are causing their own new hype to occur.

A major advance in the vision of the Semantic Web, the one that has pushed it along on the Hype Cycle, has been the explosion of social networking and social tagging with sites such as Facebook, YouTube, Myspace, Flickr, Wikipedia and Twitter. Users directly and indirectly add tags by making comments, adding pointers to other websites and embedding links in everything they communicate about. The "social graph" generated by this tagging is a form of the "Giant Global Graph" as envisioned by Berners-Lee. However, the constrained implementation of this in closed and controlled platforms falls short of Berner-Lee's vision of an open, interoperable Semantic Web. In fact, the Semantic Web has fallen short of many expectations. The startup ventures that arose in the early 2000s have faded or been absorbed into larger initiatives (e.g., Bing absorbed Powerset, and Google absorbed Metaweb) without much user-visible impact.

The term "linked data" has been used a lot recently to denote efforts to bring sanity to the world of big data. Linked data is an old Semantic Web concept, but one that has seen some recent activity. The W3C has an outreach group on Semantic Web, and sponsors the [Linking Open Data](#) community project. The goal of this project is to publish multiple open datasets as RDF and to [establish links between data from different sources](#). As of September 2011, this effort has produced 31 billion RDF triples, interlinked by around 504 million RDF links.

Since its unveiling, the Semantic Web has been full of promise, which has been largely unfulfilled. In the latter part of the 2000s, this changed as interest in and awareness of semantic tagging and mining technologies grew, and then subsided as many of the pioneering ventures were acquired or absorbed, and disappeared from the radar. However, interest continues, as evidenced by the following:

- Enterprises are investigating how to mine their huge content corpora to extract intellectual property, prior thinking, research findings and other information that may be relevant for solving today's problems. Some content dates back many years and includes both electronic and nonelectronic records.
- Some enterprises are revisiting their data to see whether they have conducted research or pursued product development in the past relevant to what they're investigating in 2011. This is to learn from the earlier work, but also to avoid pursuits that may lead to failure or suspended projects, as they have in the past.
- A few enterprises are working to make their corporate memory accessible to all who need it. They are looking to Semantic Web technologies to see how they might do this.

The effort to leverage the wisdom of the crowds via analysis of big data is moving forward. There are vast amounts of information buried in data created by the collective. Where tags and relationships are included, this data becomes available for analysis via Semantic Web approaches. Early implementations of this include Google's move toward semantic search.

Even with this growing interest in exploiting semantic technologies, it will be a long time before a significant part of the Web is semantically tagged with rich OWL/RDF ontologies. It is social tagging

that is preceding formal processes. This informal Semantic Web of linked references lacks the reasoning power afforded by RDF. The tags don't capture the explanation for why the content is linked. The links aren't labeled — with "is," "has" or "happened earlier" — as they are with RDF. This tagging achieves the goal of creating a Web of connected information, but leaves finding and navigating the connections to the users.

Proprietary schemes such as those used by Facebook have superseded open standards like "friend of a friend" (FOAF), and have themselves been challenged by competing initiatives (e.g., Google+), resulting in fragmentation and lack of data portability, as well as limited interoperability.

The formal principles of the Semantic Web are being adopted earlier by some groups, such as life sciences, where there are complex data relationships and the value of highly structured ontologies is high. Web pages are adding semantics via semantic hypertext. Maturing technologies and standards, along with a broader view of the Semantic Web that embraces multiple approaches to creating linked data (for example, tagging schemes using microformats), are generating a renewed interest in semantics. As Semantic Web experiences a resurgence with the social Web, we expect to see it continue to move along the Hype Cycle curve.

Multiple projects exist that are advancing the concepts of the Semantic Web. These include:

- DBpedia — with structured data from Wikipedia
- FOAF — describes social connections
- GoPubMed — provides Semantic search for life sciences
- GoodRelations — for e-commerce; expresses product information for e-commerce applications
- SmartData, FIBO — for financial services transactions
- Linking Open Data — links RDF data

User Advice: Identify existing ontologies that are specific to your domain, and use them where there is a need to define extensive formal vocabularies or complex data relationships. If possible, use vocabularies that are specific to a smaller community (for example, business partners or suppliers), but have growing adoption and developing support by vendors. Industries where there is the most activity and that are most likely to be financially valuable include life sciences, healthcare, library sciences, defense, government and financial services.

Business Impact: Delivering information across the Web with machine-readable and interpretable semantics offers the potential for enhanced application/site interoperability, automation of information discovery, more contextually relevant searches, and search options that are difficult or impossible without rich semantic information. In addition to tagging data elements with basic vocabularies (for example, tagging items to identify personal and organizational information), Semantic Web ontologies enable the creation of more sophisticated concepts, enabling systems to infer relationships across datasets where they have not been explicitly defined, thus improving the quality of content management, information access, system interoperability and database integration.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Google; IBM; Microsoft; Mondeca; Ontoprise; Oracle; Reuters; SAS; SchemaLogic; Thetus; TopQuadrant

Cloud Collaboration Services

Analysis By: Jeffrey Mann

Definition: Cloud collaboration services typically include email, IM, document repositories, team workspaces, discussion forums, wikis, blogs, Web/audio/video conferencing and many types of social software provided from a shared, multitenant public cloud infrastructure.

Position and Adoption Speed Justification: Collaboration services are particularly well-suited to cloud-based deployment. They are: generally well understood and reasonably mature technologies; require less integration and tailoring than many other software categories; and are most valuable when deployed widely.

Collaboration services in some form have been available from the cloud for some time. In fact, Web conferencing was the first technology to gain widespread acceptance using the cloud deployment model. Cloud-based email and team workspaces have also existed for many years. However, reports of sporadic outages and privacy, data sovereignty, confidentiality and security concerns with other cloud collaboration services have limited widespread adoption. Gartner believes many of these attitudes are poised to change. Cloud email in the consumer market from services like Yahoo, Hotmail and Gmail has convinced many that the model works, even though business requirements for availability, confidentiality, archiving, security and compliance are higher for enterprise users. Although cloud email is usually the primary driver for cloud collaboration services, usage usually expands into other areas as the services prove their worth.

Although some vendors provide narrow offerings that concentrate on one or two of these technologies, the larger trend is to provide a bundled suite of capabilities across the spectrum of collaboration services. Megavendors like Microsoft (with its Office 365 offering), Google (with Google Apps for Business) and IBM (with SmartCloud for Social Business) provide these cloud-based collaboration suites. At the other end of the market, many social software startups are launching specific collaboration services based on cloud deployment models.

Two more recent drivers for cloud-based collaboration services are the increasing need for mobile access, and requirements for interenterprise collaboration. IT departments find it difficult to keep up with the technical demands of supporting many different devices. Moving responsibility for mobility and providing widespread network access needed for mobility and remote access makes cloud deployments more attractive. Cloud-based systems provide a somewhat neutral ground when collaborating with other enterprises. They reduce the complexity of traversing firewalls and managing external users.

User Advice: Unless the cloud model is unappealing or impossible due to organizational culture or compliance, privacy and security concerns, most organizations should be evaluating some form of cloud collaboration services, especially if they are facing necessary change in their current collaboration infrastructure due to major upgrades or vendor swaps. At a minimum, understand your incumbent collaboration vendor's plans (or lack of plans) to support cloud deployment. However, in the absence of other compelling drivers, organizations that are happy with their current infrastructure need not abandon what they have to move to the cloud. Cloud collaboration services are not suited to all organizations.

Business Impact: Although the expected growth in movement to the cloud for collaboration services will have wide implications for the industry as a whole, it will have a moderate to low impact on individual organizations. They will experience lower costs and more flexibility, as fewer resources will be needed to provide collaboration services to employees. Although these benefits will allow companies to provide more employees with access to these services, they will not suddenly enable large shifts in business practices or new capabilities. The potential benefits are real, however. For those organizations comfortable with the idea of cloud deployment, collaboration services will be a natural contender.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: Cisco; Google; IBM; Microsoft; salesforce.com; Yammer; Zoho

Recommended Reading: "The Cloud E-Mail and Collaboration Services Market"

"Google Apps for Business: Leading With Gmail"

"Explore Microsoft's Office 365 Plans and Suite Options Now in Advance of IT Operations Inquiries"

Private Cloud Computing

Analysis By: Thomas J. Bittman

Definition: Private cloud computing is a form of cloud computing that is used by only one organization, or that ensures that an organization is completely isolated from others.

Position and Adoption Speed Justification: Cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service to customers using Internet technologies. Private cloud contrasts with public cloud computing, where access to the service is open to any customer willing to pay (unless the service is subsidized, for example, by advertising).

Private and public cloud computing are extremes. There are a number of variations that fit somewhere between those two, such as community cloud computing (shared, but with limited users), virtual private cloud computing (less than full isolation between multiple users), and hybrid cloud computing (a service federated between private and public cloud services). For our purposes

here, the focus will be on private cloud computing that is fully private to an organization — usually on-premises, but could be hosted by a third-party.

Organizations building a private cloud service are trying to emulate public cloud computing providers to acquire similar benefits, but within their control and often on-premises. In most cases, this is at an infrastructure level (using virtual machines), but platform as a service (PaaS) and even software as a service (SaaS) private clouds exist. Private cloud computing requires both technology and nontechnology changes to be successfully implemented. Technologies include standardization, automation, self-service tools and service management, metering and chargeback, to name a few. Many of these technologies are still evolving, and early deployments often require custom tools. Regardless, the biggest challenges with private cloud computing tend to be process-related, cultural, political and organizational.

Unlike public cloud providers, which maintain a small number of offered services, enterprises have many complex and interrelated services to deliver. A private cloud computing service can fit within a broader portfolio of services delivered by a real-time infrastructure.

Although some of the technologies required for private cloud computing exist, many do not, or are immature. Many early examples of private cloud computing services are focused on development and test provisioning. However, a growing number of enterprises are now deploying private cloud services in production, and are learning where private cloud computing makes sense and where it does not.

Enterprise interest is already high, with roughly 75% of respondents in Gartner polls saying they plan to pursue a private cloud computing strategy (at least for a small set of services) by 2014. This trend will move very quickly on the Hype Cycle in the next two years, as private cloud moves from strategy to pilot and production deployments.

User Advice:

- Let service requirements lead your private cloud computing plans, rather than technologies (see "Getting Started With Private Cloud: Services First").
- Create a business case for developing a full private cloud service versus using public cloud services, or modernizing established architectures.
- Consider the long-term road map for your private cloud service (see "The Road Map From Virtualization to Cloud Computing"). Build with the potential to take advantage of hybrid sourcing (using both your private cloud services and public) at some point in the future.
- Start slowly with development/test lab provisioning; short-term, low service-level agreement computing requests; and simple, nonmission-critical Web services (e.g., self-service requests and dynamic provisioning for Web environments). Pilot a private cloud implementation to gain support for shared services and to build transparency in IT service costing and chargebacks.
- Implement change and configuration management processes and tools prior to implementing private cloud services to ensure that you can standardize on the software stacks to be delivered through self-service provisioning, and adequately maintain them.

Business Impact: Most private cloud implementations will evolve from a virtualization foundation. Virtualization reduces capital costs, but private cloud computing will reduce the cost of operations and (most importantly) enable faster service delivery. It is primarily attractive to the business because it enables agility — self-service ordering of frequently requested services — as well as dynamic provisioning. Private cloud is not the right approach for every service. Test lab provisioning is an early example of a private cloud service that enables testers to improve time-to-market and efficiencies, while labor costs associated with provisioning are reduced.

Private cloud computing also changes the relationship between the business and IT, transforming how IT is consumed. The shift to services (rather than implementation and assets), pay-per-use and chargeback enables the business to focus on rapidly changing service requirements and consuming IT based on variable costs, while IT can focus on efficient implementation and sourcing (including the potential to leverage public cloud services in the future without negatively affecting the business).

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Emerging

Sample Vendors: Abiquo; Adaptive Computing; BMC Software; CA Technologies; DynamicOps; Eucalyptus; HP; IBM; Joyent; Microsoft; VMware

Recommended Reading: "Private Cloud Computing: Target Services That Need Agility"

"Design Your Private Cloud With Hybrid in Mind"

"Top Five Trends for Private Cloud Computing"

"How to Build an Enterprise Cloud Service Architecture"

Augmented Reality

Analysis By: Tuong Huy Nguyen; CK Lu

Definition: Augmented reality (AR) is the real-time use of information in the form of text, graphics, audio and other virtual enhancements integrated with real-world objects. It is this "real world" element that differentiates AR from virtual reality. AR aims to enhance users' interaction with the environment, rather than separating them from it.

Position and Adoption Speed Justification: The maturity of a number of mobile technologies — such as GPS, digital cameras, accelerometers, digital compasses, broadband, image processing and face/object recognition software — has made AR a viable technology on mobile devices. As all these technologies converge in maturity, AR has also benefited from a growing number of open OSs (promoting native development), the increasing popularity of application stores (increasing awareness and availability of applications), and the rising availability of overlay data, such as databases, online maps and Wikipedia. The combination of these features and technologies also

allows AR to be used in a number of different applications, including enhancing user interfaces (UIs), providing consumers with information and education, offering potential for marketing and advertising, and augmenting games and entertainment applications. We also believe that AR will play a role in mobile contextual interactions, and will be particularly powerful for:

- Discovering things in the vicinity
- Presenting real-world objects of potential special interest
- Showing a user where to go or what to do
- Providing additional information about an object of interest

Most current efforts in AR do not fully leverage the potential of this technology, but given the extended adoption curve, they are moving in the right direction.

There are currently two approaches with regard to the content displayed within the AR application and the underlying delivery technologies and processes: object-specific/private data and shared/public data. Marketing and branding are the most prevalent applications for AR and fall into the former category. They focus primarily on logos, product images, bar codes and quick-response codes. Examples include Tesco's price drop campaign, Yoplait gamification to promote charitable giving, and Weetabix's cereal box AR game. AR has also been trialed in sales-oriented environments, such as Macy's Backstage Pass program and Zugara's Webcam Social Shopper. Most recently, Google's Project Glass announcement increased the hype for AR but at nowhere near the level seen in 2010. We expect efforts and adoption in this type of AR to continue steadily, as brands, marketers and advertisers look to inspire engagement with their user base.

On the other hand, we expect a number of factors will slow adoption of the more advanced form of AR, which relies more on shared/public data. These issues include:

- Device requirements for AR in mobile devices are rigorous; so, although mobile services provide a great use case for this technology, it will be restricted to higher-end devices. Mobile devices have smaller screens than other consumer electronics devices such as laptops and even handheld gaming consoles, restricting the information that can be conveyed to the end user. Tablets have good potential to overcome some of these challenges — providing a good mix of portability and screen real estate. The interface (a small handheld device that needs to be held in front of you) limits use to bursts, rather than continued interaction with the real world. GPS technology also lacks the precision to provide perfect location data, but can be enhanced by hardware such as accelerometers, gyroscopes or magnetometers.
- As with other location-based services (LBSs), privacy is a potential concern and a hindrance to adoption.
- Always-on connectivity is required — data cost and battery drain are concerns of users.
- As a newer solution, there are also issues with compatibility: Competing AR browsers are using proprietary application programming interfaces and data structure, making the AR information from one vendor's browser incompatible with that of other browsers.

User Advice:

- **Communications service providers:** Examine whether AR would enhance the user experience of your existing services. Compile a list of AR developers with which you could partner, rather than building your own AR from the ground up. Provide end-to-end professional services for specific vertical markets, including schools, healthcare institutions and real estate agencies, in which AR could offer significant value. A controlled hardware and software stack from database to device will ensure a quality user experience for these groups. Educate consumers about the impact of AR on their bandwidth, to avoid being blamed for users going over their data allowance.
- **Mobile device manufacturers:** Recognize that AR provides an innovative interface for your mobile devices. Open discussions with developers about the possibility of preinstalling application clients on your devices and document how developers can access device features. Build up alliances with AR database owners and game developers to provide exclusive AR applications and services for your devices. Secure preloading agreements and examine how you could integrate AR into your UIs or OSs.
- **AR developers:** Take a close look at whether your business model is sustainable, and consider working with CSPs or device manufacturers to expand your user base; perhaps by offering white-label versions of your products. Integrate AR with existing tools, such as browsers or maps, to provide an uninterrupted user experience. Build up your own databases to provide exclusive services through AR applications. Extend your AR application as a platform that individual users and third-party providers can use to create their own content. Explore how to apply AR, through different applications and services, to improve the user experience — with the aim of predicting what information users need in different contexts.
- **Providers of search engines and other Web services:** Get into AR as an extension of your search business. AR is a natural way to display search results in many contexts.
- **Mapping vendors:** Add AR to your 3D map visualizations.
- **Early adopters:** Examine how AR can bring value to your organization and your customers by offering branded information overlays. For workers who are mobile (including factory, warehousing, maintenance, emergency response, queue-busting or medical staff), identify how AR could deliver context-specific information at the point of need or decision.
- **Brands, marketers and advertisers:** Use AR to drive increased engagement with your user base.

Business Impact: AR browsers, applications and seamless integration will be the focus of innovation and differentiation for players in the mobile device market in 2012. There are interesting branding opportunities for companies and businesses. Points of interest can be branded with a "favicon" (that is, a favorites or website icon) that appears when the point of interest is selected. Companies such as Mobilizy are offering white-label solutions that allow core Wikitude functionality to be customized. AR products such as Wikitude can lead to numerous LBS advertising opportunities.

CSPs and their brand partners can leverage AR's ability to enhance the user experience within their LBS offerings. This can provide revenue via set charges, recurring subscription fees or advertising. Handset vendors can incorporate AR to enhance UIs, and use it as a competitive differentiator in their device portfolio. The growing popularity of AR opens up a market opportunity for application developers, Web services providers and mapping vendors to provide value and content to partners in the value chain, as well as an opportunity for CSPs, handset vendors, brands and advertisers.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Adolescent

Sample Vendors: GeoVector; Google; Layar; Metaio; Mobilizy; Nokia; Research In Motion; Tonchidot; Total Immersion; Zugara

Recommended Reading: "Emerging Technology Analysis: Augmented Reality Shows What Mobile Devices Can Do"

"Contextual Smartphone Applications Will Exploit Augmented Reality"

"Innovation Insight: Augmented Reality Innovations Add Business Value"

Sliding Into the Trough

Enterprise Mashups

Analysis By: Ross Altman

Definition: Mashups are lightweight composite applications that source all of their content from existing systems and data sources; they have no native data store or content repository. To access the resources that they leverage, mashups employ the technologies of the Web, including representational state transfer (REST) APIs, RSS and ATOM feeds and widgets.

Position and Adoption Speed Justification: A number of issues have, collectively, slowed much of the mashup hype, and the proliferation of mashups has similarly slowed:

- Mashup standards that ease integration and interoperability among vendors in the cloud and on-premises have not evolved beyond the Web-oriented architecture standards of HTTP, RSS and ATOM and JSON.
- The mashup concept is often met with cynicism among enterprise developers and architects. Cultural and organizational barriers, predispositions toward other means of composition, a dearth of enterprise-class examples, and the situational nature of mashups have also limited the acceptance of mashups and the platforms that support them as serious enterprise technology investments.

Given this moderation of mashup hype, many large enterprise software vendors have distanced themselves from enterprise mashup positioning, although a few continue to use the term in the context of their portal offerings. This doesn't suggest that the type of application described by the term has gone away. To the contrary, lightweight composite applications continue to reflect the influence of broader trends in application development and integration. Many enterprises have come to view the development of APIs as their replacement strategy for the development of mashable resources, although for all practical purposes the two are the same.

Under the circumstances, Gartner's position is that the term "enterprise mashups" has become obsolete before reaching the Hype Cycle's Plateau of Productivity. However, under a different name, like "lightweight composite application" or "API management," many of the capabilities and advantages of enterprise mashups will live on. In many cases, the desired capability of the enterprise mashup will be provided by products and cloud services in the evolving portal and user experience platform (UXP) markets. These products and services will likely serve as the preferred mechanisms for end-user access to multiple Web and enterprise resources.

User Advice: While end-user developed enterprise mashups have been a disappointment, lightweight, situational composite applications offer enterprises multiple opportunities to deliver support for transformational business processes and products. To better address these requirements, IT organizations should equip IT and business unit developers with tools to build and deploy simple operational and situational composite applications. To strike the best balance between agility and control, IT should follow these best practices:

1. Develop or refine a business case for lightweight composite applications in the context of related initiatives — e.g., service-oriented architecture (SOA), composite applications, portals and other strategies that make enterprise applications and content Web-accessible.
2. Implement effective governance strategies appropriate for situational composite application initiatives.
3. Create a repository of leverageable APIs or Web services.
4. Account for the security issues raised by all forms of composite applications.

Business Impact: End-user development of lightweight composite applications has proven to be too difficult. However, when the notion of enterprise mashups is translated as "lightweight, integrative applications developed by IT and business unit developers," these solutions can deliver agility by quickly addressing business opportunities that require the integration of a variety of Web-accessible programs and data sources.

Benefit Rating: Low

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Apigee; Connotate; Convertigo; Denodo Technologies; Extensio; Google; IBM; JackBe; Kapow Software; Magic Software Enterprises; Microsoft; Netvibes; Nexaweb Technologies; Oracle; Pageflakes; RSSBus; WorkLight; Yahoo

Recommended Reading: "Enterprise Mashups and Mashable Resources"

"End-User Mashups Demand Governance, 2010"

"End-User Mashups: Overpromised, and Barely Delivered"

"The Emerging User Experience Platform"

"Going Forward, Most Transformational Applications Will Be Composite Applications"

"Addressing the Seven Primary Challenges to Enterprise Adoption of Mashups"

Web-Based Office Productivity Suites

Analysis By: Michael A. Silver; Tom Austin

Definition: Office productivity suites are generally collections of basic productivity applications for tasks such as word processing, spreadsheet creation and presentation graphics. Traditionally, suites such as Microsoft Office and OpenOffice are thick-client applications that require significant maintenance on users' PCs. The Web paradigm enables personal content creation and editing support services to be provided, using a rich-client experience that does not require explicit delivery and maintenance of the software on individual PCs by the enterprise.

Position and Adoption Speed Justification: Although some products in this market also offer hosted email, here we consider only the productivity functions, such as word processing and spreadsheets. Office productivity products have been available on the Web for more than five years. These applications generally do not approach the level of functionality of full-function, fat-client suites (such as Microsoft Office); however, they usually provide a useful, but smaller, function set. Google Apps for Business (GAB) is being adopted, largely for Gmail, but customers usually experiment with Google Docs for certain users. Microsoft's Office 2010 includes a Web version (Office Web Apps) that maintains good compatibility with Microsoft Office, but with a much smaller feature set than the installed fat-client version. Office Web Apps is free for consumers, but enterprises must purchase full Office 2010 Standard or Professional Plus licenses to get access to Office Web Apps. It is not available for purchase separately, except through Microsoft's Office 365 software as a service (SaaS) offering.

Individual users have been using free, consumer-grade versions to augment, rather than replace, functionality in traditional office suites (such as for real-time collaboration) for years. Offline functionality has been limited, but features continue to be added by all vendors, sometimes on a weekly basis. Many vendors offer some type of Web-based productivity suite, with IBM Docs (now in public beta and included in IBM SmartCloud for Social Business), Zoho and Adobe's Acrobat.com as additional examples. As functionality improves, Web-based office productivity applications will make the traditional versions of Microsoft Office relatively less important, as users rely on the fat-client products for less time each week. More recently, mobile applications for smartphones and tablets have also started to emerge. These will challenge not only traditional fat applications, but Web-based ones as well.

We have seen some significant adoption of Google Docs for certain segments of users in organizations that have moved to GAB for mail and in educational institutions. In many cases, the Web-based applications are used in addition to traditional products like Microsoft Office and few, if any, organizations have been able to eliminate Microsoft Office entirely. Customer interest in mobile applications (as evidenced by Google's recent purchase of Quick Office and rumors of offerings from Microsoft) may slow the growth of Web based products.

User Advice: Web-based products are not an adequate replacement for Microsoft Office for all users, and will not be anytime soon. However, some users do not need the richness of Microsoft Office, and for them a Web-based product may suffice. The critical issue is determining who can survive with Web-based tools, who requires installed Microsoft Office, and whether the complexities involved in supporting Web-based suites and locally installed versions of Microsoft Office simultaneously are worthwhile. Google Docs will challenge installed versions of Microsoft Office in enterprises where a substantial proportion of users can get their jobs done without Microsoft Office, especially in organizations that select Google to host email. Additional features of Web-based products, including ease of co-authoring, could help attract users away from traditional suites.

There are four areas to test regarding user segmentation. Web-based suites may suffer compared with installed versions of Microsoft Office in feature richness, roundtrip fidelity, extensibility and offline operation:

- **Feature richness** — Users that require a large number of features or the more advanced features of Microsoft Office may not be able to run an alternative product.
- **Roundtrip fidelity** — With any alternative product, every time a document is edited with a product other than the one in which it was created, inconsistencies are introduced, especially with visual fidelity.
- **Extensibility** — Many organizations run multiple applications that integrate with Microsoft Office. Office is a development platform, and few independent software vendors integrate with alternative office solutions.
- **Offline operation** — Web-based products offer varying degrees of offline capability. Users that are not deskbound will require offline capability (or ubiquitous network access) before a Web-based product can replace Microsoft Office.

Audit the degree to which other applications (such as CRM and ERP) provide Microsoft Office macros or integrate with Office to facilitate interacting or integrating with those applications via an Office tool. Determine what Office application user segments do not require the use of those functions.

In many instances, use of Web-based office suites by organizations is closely tied to email outsourcing because vendors that supply one usually provide the other, often in a packaged bundle. Organizations with access to these products should consider if they can suffice for some users. However, it is not likely that all users can be moved from Microsoft Office, so organizations that try to run Web-based office products will likely run a mixed-product environment.

Whether or not there is organizational interest in Web-based office products, realize that end-user experimentation with these tools is taking place. Give your users guidelines on practicing safe experimentation (whether at work or not) with Web-based and with mobile applications. Encourage them to share their findings with you, including their best and worst practices. Appoint a champion of freeware (and software as a service) to track these trends, and ensure that the enterprise experiments with and implements such software where appropriate.

Business Impact: A new generation of productivity applications could significantly change how users collaborate on projects, and how organizations pay for, deploy and manage office productivity services. Web-based products provide access from a greater variety of devices, and organizations may be able to offload the maintenance of these applications.

Benefit Rating: Moderate

Market Penetration: Less than 1% of target audience

Maturity: Adolescent

Sample Vendors: Adobe; Google; Microsoft; Zoho

Recommended Reading: "Toolkit: Segmenting Users for Alternative Office Productivity Software"

"Microsoft Office: Buy It or Use It From Office 365 'in the Cloud?'"

"When to Consider Alternatives to Microsoft Office"

"Google Upsetting Microsoft's Cloud-Office System Ambitions"

Web Experience Analytics

Analysis By: Robert Hetu

Definition: Analytics tools are meant to measure consumer engagement and purchase activities in the e-commerce and m-commerce channels.

Position and Adoption Speed Justification: Web experience analytics are analytics tools that measure various aspects of Tier 1 retailers' commerce sites, including websites and mobile sites, to help ascertain customer sentiment. These analytics include more-mature analytics tools, such as page load times and shopping cart abandonment rates, as well as tools that are newer, such as multivariate A/B testing, interaction sequence and navigation tracking, and sentiment indexes.

These tools vary in maturity, which is why we show this technology as moving more slowly within Tier 1 retailers. The more direct measures, such as page load times, are relatively mature, while other measures, such as sentiment indexes, multivariate testing, information clarity measures and customer satisfaction, are just beginning to emerge. To some degree, some of these tools are as much art as they are science, such as neuromarketing, which measures consumer brain activity when consumers are engaged in shopping activities.

With innovations in big data, there is a possibility to use as an information base for experience analytics. SAP, through its Hana offering, and Oracle with Exalytics both provide in-memory computing that allows for fast processing of large amounts of data.

User Advice: These measures help Tier 1 multichannel retailers improve the customer experience on their sites and adjust elements of their commerce sites, such as rich-media applications, navigation and flow paths, and shopping aids to suit changing consumer tastes and preferences for e-commerce sites. Multichannel feedback technology can also provide retailers an assessment of their customers' shopping experiences — especially for cross-channel shopping processes.

Deploy the straightforward measurement tools, such as page load times and shopping cart abandonment measures, if you haven't already done so, as these factors can have a significant impact on your overall revenue. As consumers grow tired of generic offers and retailers run the risk of losing customers, measures such as multivariate testing can be valuable tools for retailers in migrating toward a more personalized presentation of their website. The emergence of sentiment analysis and social media monitoring tools can give retailers insight into where changes are needed to ensure customer retention. Still, retailers should proceed with caution and confirm findings over time, rather than make changes that run a greater risk of alienating customers.

Business Impact: When used appropriately, these tools can lead to improvements in the customer experience and engagement for the e-commerce and m-commerce channels for the retailer. In addition, these tools can help retailers identify the right combination of media elements and applications that lead consumers to purchase more and that attain a higher degree of satisfaction from customers.

Benefit Rating: Moderate

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Adobe Systems; Celebris Technologies; Google; iPerceptions; IBM Coremetrics; IBM Tealeaf; Oracle; ResponseTek; SAP; SAS; Teradata; Webtrends

Recommended Reading: "An Overview of the Strategic Technology Map for Tier 1 Multichannel Retailers"

"E-Commerce Websites: Features That Make Consumers Buy"

"Key Challenges in Web Analytics, 2009"

"Key Issues for Customer Experience Management, 2010"

"Top 10 Mistakes in Web and User Experience Design Projects"

Cloud Computing

Analysis By: David Mitchell Smith

Definition: Cloud computing is a style of computing in which scalable and elastic IT-enabled capabilities are delivered as a service using Internet technologies.

Position and Adoption Speed Justification: Cloud computing is still a visible and hyped term, but, at this point, it has clearly passed the Peak of Inflated Expectations. There are signs of fatigue, rampant cloudwashing and signs of disillusionment (e.g., highly visible failures). Although cloud computing is approaching the Trough of Disillusionment, it remains a major force in IT. Users are changing their buying behaviors, and, although they are unlikely to completely abandon on-premises models or buy complex, mission-critical processes as services through the cloud in the near future, there is a movement toward consuming services in a more cost-effective way and toward enabling capabilities not easily done elsewhere.

Although the hype has peaked, there is still a great deal of hype surrounding cloud computing. Every IT vendor has a cloud strategy, although many aren't cloud-centric. Variations, such as private cloud computing and hybrid approaches, compound the hype and demonstrate that one dot on a Hype Cycle cannot adequately represent all that is cloud computing.

User Advice: User organizations must demand road maps for the cloud from their vendors. Users should look at specific usage scenarios and workloads, and map their view of the cloud to that of potential providers, and focus more on specifics than on general cloud ideas.

Vendor organizations must begin to focus their cloud strategies on more-specific scenarios, and unify them into high-level messages that encompass the breadth of their offerings.

Cloud computing involves many components, and some aspects are immature. Care must be taken to assess maturity and assess the risks of deployment. Tools such as cloud services brokerages can help.

Business Impact: The cloud computing model is changing the way the IT industry looks at user and vendor relationships. As service provisioning (a critical aspect of cloud computing) grows, vendors must become provider or partners with, service providers to deliver technologies indirectly to users. User organizations will watch portfolios of owned technologies decline, as service portfolios grow. The key activity will be to determine which cloud services will be viable, and when.

Benefit Rating: Transformational

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Amazon; Google; Microsoft; salesforce.com; VMware

Recommended Reading: "Agenda for Cloud Computing, 2012"

"The What, Why and When of Cloud Computing"

Web-Oriented Architecture

Analysis By: Daniel Sholler

Definition: Web-oriented architecture (WOA) is a substyle of service-oriented architecture (SOA) that leverages Web architecture. It emphasizes the generality of interfaces (user interfaces and APIs) via five fundamental generic interface constraints: resource identification (e.g., uniform resource identifier [URI]), manipulation of resources through representations (e.g., HTTP), self-descriptive messages (e.g., Multipurpose Internet Messaging Extensions [MIME] types), hypermedia as the engine of application state (e.g., links) and application neutrality.

Position and Adoption Speed Justification: WOA has dominated Web user-to-application (U2A) implementations for years. It is frequently used for Internet B2B, and has experienced some intraenterprise application-to-application (A2A) implementation successes. Many enterprises are engaged in implementing or seriously considering WOA in addition or as an alternative to WS-*. The WOA style has been used by many services delivered by major Web service providers (e.g., Amazon, Google, etc.), and the popularity of these services is propelling enterprise interest in WOA as a viable architectural approach to SOA. Thus, WOA is moving through the Hype Cycle as architects and developers explore and employ it for enterprise applications. It often is referred to as representational state transfer (REST), or RESTful, as these constraints are the fundamental constraints of the REST architectural style.

Most popular development and integration tools support the development of WOA services and applications that follow the WOA style. Other environments, such as Java, have added WOA-compatible structures and conventions to facilitate this development. These structures are mostly code frameworks that specify many of the conventions used to translate the WOA model into the program environment. There is a developing market in testing and other life cycle management tools for WOA interfaces, as well as technology to secure and manage these interfaces. Conventions for managing quality of service are still developing.

There remains a fair amount of resistance to using WOA designs for core enterprise application functionality, not the least of which is due to a lack of WOA design skills. Advanced WOA concepts, such as WOA quality of service (QoS) support and hypermedia-based application state management, are still immature. However, the intense interest in mobile access to server-resident data and functions, coupled with maturing frameworks, has brought WOA design into mainstream organizations.

User Advice: Application architects should use the WOA approach for information-centric applications, U2A integration and A2A integration if the system design can leverage moderated middleware functions. Organizations using Web services should still embrace the architectural principles of WOA as much as possible to gain the shareability and scalability benefits of the Web, and to enhance Web interoperability.

Business Impact: Significant increases in the shareability and extensibility of SOA due to WOA's emphasis on application neutrality and hypermedia-oriented interface design should result in faster application integration, an overall decrease in the cost and effort to modify applications and systems, and an increase in the planned and serendipitous reuse of services.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Recommended Reading: "SOA Overview and Guide to SOA Research"

"Tutorial: Web-Oriented Architecture: Putting the Web Back in Web Services"

"Reference Architecture for Web-Oriented Architecture"

"Understanding and Applying the Design Differences Between WS-* Based Architecture and Web-Oriented Architecture"

"WS-I or RESTful Web Services: When, Where and Why"

"Best Practices for RESTful APIs"

"Developing the Enterprise Solution Architecture: Architecting Solution Patterns"

Web 3.0

Analysis By: Gene Phifer

Definition: The term "Web 3.0" is applied by some as the next era of the Web, and is usually associated with existing items like Semantic Web technologies. The current wave of Web technologies doesn't represent the revolutionary changes required for a new era of the Web. There is likely a Web 3.0 in the future, but the technologies being cast as such today are not it.

Position and Adoption Speed Justification: Web 2.0 was a significant shift from prior eras, and thus warranted a numbering system. However, the next era of the Web will be more of an evolution than a revolution. Applying the term Web 3.0 to a singular technology is incorrect. Therefore, Web 3.0 as it is currently cast will be obsolete soon.

Although Web 2.0 innovation experienced a relative spike, the Web will evolve steadily during the next five to seven years, making radical shifts more difficult to pinpoint, and minimizing the possibility of another step-function change, such as Web 2.0.

The next generation of the Web will focus on the expansion of the social Web, the Semantic Web, the programmable Web, the mobile Web, and the real-time Web. It will also encompass "the Web of things," where there are direct connections between the online world and the physical world. These changes are long-term, multifaceted and infrastructural, and, therefore, will occur in a much longer time frame than the rapid explosion of innovation that occurred with Web 2.0 (see "The (Not So) Future Web"). Additionally, the increasing fragmentation of devices used to interact with the Web will make Web 3.0 unlikely. With the addition of contextual-awareness, it is likely that many people will move from sharing the same Web to favoring their personalized views on specialized devices.

Jockeying for the Web 3.0 position will only increase confusion and hype, decreasing the odds of any one prediction emerging as the successor to Web 2.0. Despite being inappropriate and ineffectual, the Web 3.0 term may persist because of the popularity of the Web 2.0 term, because Web 2.0 technologies and approaches are seeing broad adoption in enterprises, and because vendors are always looking to sell the next big thing.

User Advice: IT leaders should not adopt, promote or search for meaning in the term Web 3.0. The term will remain confusing and ineffectual. IT leaders must recognize the shortcomings of the term Web 3.0 and concentrate on extracting business value from existing and emerging Web technologies, practices, products and services. Look for Web 2.0 to develop along an evolutionary path — Web 2.1 and Web 2.2 would be more appropriate to use than Web 3.0.

Business Impact: Danger surrounding the hype of a catchy term, such as Web 3.0, arises from its tendency to consume mind share. Business and IT leaders risk being distracted by Web 3.0 mania before realizing the potential benefits of current and emerging Web technologies.

Benefit Rating: Low

Market Penetration: Less than 1% of target audience

Maturity: Early mainstream

Recommended Reading: "The (Not So) Future Web"

Cloud/Web Platforms

Analysis By: David Mitchell Smith; Gene Phifer

Definition: Cloud/Web platforms use Web technologies to provide programmatic access to functionality on the Web, including capabilities enabled not only by technology, but also by community and business aspects. This includes storage and computing power. We use the terms "Web platform" and "cloud platform" interchangeably, as well as the merged term "Web/cloud platforms." They have ecosystems similar to traditional platforms, but the concept originally emerged as a result of market and technology changes collectively known as Web 2.0.

Position and Adoption Speed Justification: The use of cloud/Web platforms is happening first in consumer markets. As further adoption of all the cloud services layers increases, use and maturity will evolve. Enterprise use of Web-based capabilities, such as Amazon Simple Storage Service (Amazon S3) and Amazon Elastic Compute Cloud (Amazon EC2), has begun as well. Public APIs are also gaining traction and are a part of the overall phenomenon.

The cloud/Web platform is not the same as platform as a service (PaaS). According to the National Institute of Standards and Technology (NIST), PaaS refers to the middleware layer in cloud architectures. The cloud/Web platform is broader and employs a more accurate use of the term "platform" as a relative term (see "NIST and Gartner Cloud Approaches Are More Similar Than Different") and can span all layers of cloud architecture. Our use of the term "cloud/Web platform" predates the PaaS term and current cloud terminology, but is not inconsistent with it.

Cloud/Web platforms will serve as broad, general-purpose platforms; however, more specifically, they will support business flexibility and speed requirements by exploiting new and enhanced forms of application development and delivery. Web platforms reuse many of the capabilities and technologies that have been accessible on websites for more than a decade through browsers by adding programmatic access to the underlying global-class capabilities. Reuse is occurring via services, and is being delivered via Web-oriented architecture (WOA) interfaces, such as representational state transfer (REST), plain old XML (POX) and RSS. In addition to the capabilities of Web 2.0, these platforms provide programmatic access to cloud computing capabilities. The public API phenomenon has taken WOA beyond consumer markets (e.g., Twitter) into enterprise B2B integration.

User Advice: Web platforms and related phenomena have affected consumer markets, and enterprises should evaluate this growing space as an appropriate extension to internal computing capabilities. The use of Web platforms will drive WOA, which enterprises should adopt where appropriate, along with simple interfaces, such as REST, POX and RSS (wherever possible), to exploit the interoperability, reach and real-time agility of the Internet.

Business Impact: Web platforms can be leveraged as part of business solutions, and will form much of the basis for the next generation of interest in the virtual enterprise. Web platforms can decrease barriers to entry, and can deliver substantial value for small or midsize businesses that cannot afford to build and maintain capabilities and infrastructures. Examples include Amazon Web Services (including S3 and EC2), salesforce.com's Force.com, Google's App Engine and Microsoft's Azure Services Platform. Note that the term "cloud/Web platform" is broader than, and includes multiple layers in, cloud computing terminology (e.g., infrastructure as a service [IaaS], PaaS and software as a service [SaaS]), and the use of the term "platform" is different from the term "PaaS."

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Early mainstream

Sample Vendors: Amazon; Google; Microsoft; salesforce.com

Recommended Reading: "Web Platforms Are Coming to an Enterprise Near You"

"NIST and Gartner Cloud Approaches Are More Similar Than Different"

Social Software Suites

Analysis By: Nikos Drakos

Definition: Social software suites encompass a broad set of capabilities such as user profiles, groups, content authoring and sharing, discussions, wikis, blogs, microblogs, activity streams, social tags, social bookmarks, content rating and social analytics. Social software suites facilitate, capture and organize free and open interactions among individual users.

Position and Adoption Speed Justification: Because of the popularity of related consumer social software and the "socialization" of the Web, the awareness of socializing technology is high. Within businesses, there is growing evidence of production deployments as well as increased vendor activity. We see pent-up demand from workers who use consumer products for work activities and enthusiasm from business managers who expect these tools to help them boost the performance of their workers. However, we also see some apprehension from those responsible for security, compliance, enterprise architecture and risk management in general.

On the supply side, options available for business use are maturing rapidly as new vendors establish themselves in the market, and as every enterprise vendor delivers a social software suite. The movement from point tools to integrated suites has brought relief, as well as high expectations. We still see many organizations paying too little attention to the work that needs to be done — beyond technology deployment — to achieve the expected business results.

Some products focus more on internal users, with an emphasis on integration with existing infrastructure, business applications and other enterprise requirements (such as auditability and compliance). Others place more emphasis on extranets, with support for secure information transfer between organizations. Some target closed or open external customers or user communities, with good support for large-scale deployments, consumer engagement and management of untrusted content (such as moderation and spam filtering). Some vendors provide a technology platform, while others provide a full-service approach, including strategy, implementation, administration and content moderation services.

User Advice: Early implementations should focus on the usability of the technology and on "low-hanging fruit" in terms of business value and relevance. In later stages, the focus should shift to dealing with volume (for example, in terms of information handling or participant interactions), on spreading awareness of what has worked and what has not, and on linking the social interactions and social context captured in social software suites with relevant business activities. IT managers should resist user demands to simply install social software tools without thinking through how they'll be used. Given the broad range of use cases and activities that can be supported by social software suites, prioritize them with respect to business value when it comes to deployment.

Many early deployments have failed, been ignored or slowly withered, because they lacked a clearly defined and appropriate purpose. Deployments should incorporate several elements, including ease of use, identification of the right context, exposure of connections, appeals to self-interest and the achievement of management recognition. Before investing in social software suites, IT and business managers should understand where this will fit in the context of existing workplace applications and practices: for example, in creating documentation, classifying information, improving search relevancy, exploring ideas, or making decisions.

Business Impact: Social software adds persistence to otherwise transient informal interactions among participants. Valuable information is created, shared and refined through self-selection, social incentives and decentralized control, rather than by top-down resource allocation and mandates. We expect social software to be relevant in connecting individuals to communities of interest and practice, as well as stimulating multidisciplinary collaboration that involves communication, exploration, innovation, creativity, discovery, knowledge capture and training.

The benefits are likely to come from behavioral changes (for example, information sharing, discovery and capturing informal ideas). Thus, success depends on an outcome-oriented change management program. Evidence of successful social software deployments is growing, but not yet widespread. The risk of organizational culture clashes, privacy issues and questions about worker productivity and content quality highlight the need for caution.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Early mainstream

Sample Vendors: Acquia; Atlassian; Cisco; EPiServer; IBM; Igloo Software; Jive; Microsoft; Microsoft (Yammer); MindTouch; Moxie Software; NewsGator; Novell; OpenRoad (ThoughtFarmer); OpenText; Qontext; salesforce.com; Saba; Socialtext; SuccessFactors; Telligent; Tibco Software; Traction Software; TWiki; VMware; VMware (Socialcast); XWiki

Recommended Reading: "Magic Quadrant for Social Software in the Workplace"

"Maturity Model for Enterprise Collaboration and Social Software"

Content Integration and Migration

Analysis By: Gavin Tay

Definition: Content integration refers to the consolidation of enterprise content that is typically dispersed throughout enterprises in a myriad of repositories into a single view. Integration tools may sit above these repositories as data integration middleware, or above workflow and business process management systems, to provide a unified interface with federated content. Enterprises may also integrate content by migrating it to hybrid content architectures featuring a linked repository of records and a content infrastructure toolset.

Position and Adoption Speed Justification: The vast majority of enterprises have multiple content repositories. Customized interfaces dominate, along with commercial connectors and adaptors to link them. Many enterprise content management (ECM) suites use connectors from IBM and Adobe, among other vendors. But the long-term prospects for custom connectors are limited, partly due to the difficulty of maintaining them, and partly due to the emergence of Web services, representational state transfer APIs and other early integration options such as the Java Specification Request (JSR) 170/283 standard. But none matches the potential impact of Content Management Interoperability Services (CMIS), the most important industry sponsored standard to have emerged, which is now supported by most of the major ECM vendors and their partners.

Still, many enterprises are also considering using portals, federated or contextual search as options for the virtual consolidation of frequently used content at different levels of abstraction. The recent focus on content migration to SharePoint or ECM alternatives uses connectors for the one-time, one-way trip required for large volumes of content currently stored on file servers or in obsolete repositories. Content integration tools are persistent and bidirectional, whereas migration tools are

occasional and typically one-way bulk loaders, although they are increasingly becoming more granular in approach.

User Advice: Enterprises should look beyond JSR 170/283 and Web Distributed Authoring and Versioning (WebDAV) to integration architectures from vendors such as IBM, Oracle (Context Media) and Adobe, and to third-party offerings such as those of T-System's Vamosa. Most system integration partners also have toolkits to connect the products they support with multiple repositories and business applications.

Enterprises should pick content management vendors that have standardized and easily accessible repositories. At present, migration tools that support the movement of large volumes of content from expensive or poorly managed network drives or end-of-life repositories to newer technology are the biggest story in the market and can add immediate value; they include those of Axceler, AvePoint, Idera, Metalogix and Quest Software. Longer term, the focus should be on CMIS version 1.0, which was approved as a standard in May 2010 by the Organization for the Advancement of Structured Information Standards (OASIS). As with all standards in their infancy, it will take a while before all vendors become compliant. The preliminary aim with CMIS is to provide information sharing across CMIS-enabled repositories, but the value may ultimately increase by allowing those repositories to coexist, even as they feed search engines, portals and UXP applications with more information at lower cost and with less complexity. One immediate benefit may be a single view into content repositories via a CMIS-enabled "content client" that is richer than what has typically been delivered by ECM vendors. Mobile-enabled CMIS applications or browsers are also gaining traction as organizations look to bring their content and connectivity out into the field. Connecting content to structured data and to end users in a more engaging manner has many implications for commercial applications, with mashups, portlets and widgets becoming popular alternatives to hard-wired integration approaches.

Business Impact: Content integration technology can improve interoperability between a company's content, its content-centric processes and related data. It can therefore support both governance and cost reduction initiatives by optimizing information assets for availability. Classic use cases often include search tools for legal discovery, as well as for providing access to content across newly merged or acquired companies. But the biggest potential impact of content integration comes from relating it to the semantic layer over structured data in application databases, as well as from linking a horizontal business information supply chain to vertical processes and end-user context.

Content integration technology can facilitate cost control and content availability, provide a single view of the customer, and relate content and data objects via metadata management. Content migration technology is similar. It enables volumes of stored content to move from legacy silos to more strategic — and more often consolidated — repositories. This now includes considerable interest in pushing information — and users — toward cloud platforms such as Microsoft Office 365/SharePoint Online, SpringCM, Google Apps and IBM LotusLive, even as hybrid content architectures try to manage the security risks associated with the integration of public cloud or hosted repositories (as they have done with hosted email).

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Adobe; Autonomy; AvePoint; Axceler; CIMTrek; EMC; IBM; Idera; Metalogix; OpenText; Oracle; Quest Software; T-Systems (Vamosa)

Recommended Reading: "Strategic Best Practices for SharePoint 2010 Migration"

"Who's Who in SharePoint 2010 Migration Tools"

"Social Content Demands an Enterprise Strategy"

"The Open-Source Upstart: Behind Liferay's Portal Success"

"The Copernican Revolution in Content"

Infrastructure as a Service (IaaS)

Analysis By: Lydia Leong

Definition: Compute infrastructure services are a type of infrastructure as a service (IaaS) offering. They offer on-demand computing capacity from a service provider. Rather than buying servers and running them within their own data center, businesses simply obtain the necessary infrastructure from a service provider in a shared, scalable, "elastic" way, and access it via the Internet or a private network.

Position and Adoption Speed Justification: Four main use cases exist for cloud-based compute infrastructure services: Web hosting, high-performance computing, test and development infrastructure, and general production infrastructure.

The most rapidly maturing use case is the hosting of websites and Web-based applications. In some cases, the applications deployed on IaaS serve a general consumer audience, via the public Internet. In a growing number of cases, however, IaaS is used to serve internal applications to users within the enterprise, including hosting applications like Microsoft SharePoint. IaaS may also be used as the back-end to a mobile application, such as an iPhone app. These uses of IaaS are convergent with the general Web hosting market; features and capabilities formerly available only on dedicated hardware are now being extended to shared cloud resources.

The use of these services for test and development infrastructure is growing for pilot projects, rapid application development environments and formal lab environments. As test and development-specific features and management tools improve, formal development environments will become more common. Batch-oriented, compute-intensive workloads (such as modeling, simulation, scientific computing and one-time processing needs such as transcoding) are highly cost-effective in the cloud.

However, before cloud computing for general workloads can achieve broader mainstream adoption, security, risk and compliance issues must be overcome and costs driven down even further.

These services are maturing and being adopted most quickly in the U.S. Although global demand is robust, including in emerging markets, the growth of the market is slower outside the U.S. due to less competition, less mature offerings, and fragmentation resulting from regulatory data-sovereignty requirements and users' desires to keep data and processing in-country.

User Advice: Cloud providers' capabilities vary significantly, but enterprise-class clouds, with strong service-level agreements backed by financial penalties, high levels of security and solid service and support, have emerged. Businesses can safely adopt these services. The risks are not significantly greater than other outsourced hosting approaches, assuming the cloud services used match the service-level and security needs of the applications.

Many businesses have already successfully executed pilot projects, and have begun to adopt IaaS in a broader way, including for production applications. Businesses that have not yet trialed IaaS should consider pilot projects for test and development, compute capacity augmentation, and Web content and applications. Successful pilots can be expanded into broader production use.

Both public multitenant and private single-tenant offerings are available, but the distinction between public and private cloud IaaS is blurring. The most cost-effective clouds are highly standardized and use a shared capacity pool. Hybrid public-private cloud offerings — enabling "cloud bursting" for on-demand capacity and business continuity — currently exist but the technology will not be mature until at least 2016.

This market is evolving extremely quickly, so the suitability of these services should be re-evaluated at least once every six months.

Business Impact: Cloud compute infrastructure services will be broadly advantageous to IT organizations. The cost benefits, driven primarily by automation, will be particularly significant for small and midsize businesses. Larger enterprises will benefit primarily from greater flexibility, rather than direct cost reduction.

In the short term, the benefits will be driven primarily by rapid provisioning that requires minimal manual intervention. Over the longer term, more system management tasks will be automated, leading to more efficient infrastructure management.

The metered-by-use attribute of these services will result in more efficient use of capacity. The self-service nature of these services will empower employees outside IT operations, improving developer productivity and making it easier for business buyers to obtain infrastructure.

Benefit Rating: High

Market Penetration: 1% to 5% of target audience

Maturity: Emerging

Sample Vendors: Amazon Web Services; Bluelock; CSC; GoGrid; Joyent; Rackspace; Savvis; Terremark

Climbing the Slope

Consumer Web Mashups

Analysis By: Jim Murphy

Definition: Consumer Web mashups are lightweight, composite applications built using consumer Web-based mashup infrastructures and consuming publicly available consumer Web resources. A Web mashup is a Web page or application that combines data from two or more external online sources.

Position and Adoption Speed Justification: In a technology context, mashups gained their initial momentum on the consumer Web. They began as content and Web application aggregation and access points — or dashboards — largely providing personalized portals geared for end users. They typically use only a thin layer of JavaScript aggregation code on the client while leveraging Web APIs, Web widgets, XML feeds, screen scrapings, or other components.

Today, thousands of consumer Web mashable components (or "mashables," often in the form of widgets and gadgets) exist, and users of sites, including iGoogle, My Yahoo, MSN, AOL, Amazon and NetVibes, leverage them to offer services to developers and end users. ProgrammableWeb.com and Mashable provide an overview of the widening range of consumer Web mashups available. Enterprises have found that they can provide quick production value for simple, low-risk projects and applications.

Consumer mashups have suffered from a backlash in the course of the last couple of years. The future, however, holds the potential that consumer-oriented Web mashups will again surge forward as organizations adopt cloud-based infrastructure, platforms and applications, and look to invoke more consumer-oriented services and information sources to enhance their websites, portals, and composite applications. Mobile and social influences, in proliferating the potential destinations for content and services, are also greatly increasing the desire for organizations and their technology providers to create open, public and consumer-accessible APIs. Organizations like Mashery are helping organizations treat such APIs more strategically than in the past — allowing them to secure, scale, and analyze the effectiveness of growing sets of APIs and other mashables. These factors will increase the utility and growth of consumer Web mashups.

User Advice: Enterprises should look to consumer Web mashups to demonstrate the mashup concept to business leadership (see "A Process for Successfully Selling Mashups to Enterprise Leaders"). However, enterprises looking to leverage consumer Web mashups for enterprise needs should be wary about their limitations and risks. Few consumer Web mashup infrastructures provide security or governance functionality, and consumer Web mashups don't provide connectivity to on-premises applications and content repositories. However, companies that overcome these hurdles may find considerable benefits in employing consumer Web mashups.

Organizations should consider embedding Web mashups in business-to-employee portals, intranet pages and dashboards to provide easy access to information sources for users. But they should

choose only safe and reliable sources, and they should not expect or attempt deep integration with enterprise resources.

With the same cautions in mind, organizations should consider using consumer Web mashups to augment and enhance the information they provide to customers and partners for their own Web properties. Companies looking to extend their Web presence beyond their websites should consider providing mashables (in the form of gadgets or widgets) or mashups for consumption on consumer or enterprise portals and websites.

Business Impact: Consumer Web mashups can deliver business value in three areas:

- Consumer Web environments serve as excellent demonstration tools to expose business leaders to the mashup concept. Consumer Web mashups provide a ready catalog to demonstrate several different use cases for mashups.
- Some consumer Web mashups can be used in enterprise settings, with appropriate governance and security. Doing so eliminates the need to rely on traditional application development organizations to develop their own mashups for those use cases, or if a portal framework is deployed, to create some custom portlets.
- Enterprises seeking to extend their services can attract and engage customers by making widgets and gadgets available to consumers using sites like iGoogle and My Yahoo.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Adolescent

Sample Vendors: Google; Microsoft; Netvibes; Yahoo

Web Customer Service Suites

Analysis By: Johan Jacobs

Definition: Web customer service (WCS) suites are considered a collaborative CRM component and provide customer-enabling technologies via multiple Web and mobile phone channels (excluding voice). They support assisted channels such as email response management systems (ERMSs), Web chat and collaborative browsing as well as unassisted channels such as knowledge management for self-service, virtual assistants, multimodal communications, video service, and social channel interactions.

Position and Adoption Speed Justification: Seldom does the introduction of a WCS channel face customer adoption issues. Often, the adoption problems lie within the organization, as the organization is not ready to expose its data and systems to an external audience for self-service or does not have the staff ready to deal with customer issues that might be posted on a social network or other channel. Internal adoption efforts must, therefore, be focused on organizational readiness, data preparation, expanding staff competencies and the development of WCS business processes. Functionality is expanding as WCS vendors' maturity increases, with some WCS vendors starting to

cross over into the telephony and contact center space in an attempt to capture more channels. The technology is mature, and the return on investments in the business case is focusing on moving services to a less-expensive channel.

User Advice: Spend time building your knowledgebase for use across multiple WCS channels (such as self-service, Web chat, virtual assistants and ERMS). Spending on best-of-breed, single Web-channel customer service solutions (excluding voice) is in the minority (18%), with most vendors' and buyers' spending going toward multichannel suite-based approaches (82%). When looking at a single-channel business requirement, focus on the ultimate multichannel, multifunction solution, and procure a multichannel product suite that enables a phased channel implementation approach. When looking at a multichannel solution, focus on a solution that can be integrated with your established technology choices. Set realistic expectations, and dedicate staff to only a few channels at a time before starting the rollout of the next channel. Link this to customer-centric Web strategies.

Business Impact: Cost reduction and increasing the number of customer access points are the primary business drivers for WCS deployments. WCS assumes that the customer is interested in Web self-service. Once self-service is engaged, the customer could escalate the problem to an assisted contact center channel. The benefits associated with the deployment of WCS channels are call avoidance, reduced average handle time, increased channel availability and customers helping each other in hosted communities, which all help reduce the cost of service. When procuring a WCS vendor's solution, get access to all the functionality of the suite. If you are only implementing, for example, an ERMS as a first stage, then the additional channels can be implemented from the same vendor at a later stage, alleviating the necessity for costly and difficult integration with point-based solutions. WCS suite technology will affect lead management (marketing), sales automation, customer service and self-service. It will also expose new channels to a new market, enabling the engagement of different clients.

Benefit Rating: High

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Avaya; eGain; Genesys; Interactive Intelligence; Kana; Moxie Software; Oracle RightNow CX Cloud Service

Recommended Reading: "Toolkit: CRM Web Customer Service Readiness Assessment"

"CRM Web Customer Service Application Framework, 2012"

"Roundup of 2011 CRM Web Customer Service Research"

"Magic Quadrant for CRM Web Customer Service"

Composite Applications

Analysis By: Ross Altman

Definition: A composite application orchestrates independently developed programs, data and devices to deliver a new solution that none of the previously available applications could deliver on its own. Each resource accessed by a composite application uses a different data model. In most cases, the composite application supports user interactions beyond those provided by the leveraged applications. In other cases, a composite application may act as a service. Some composite applications are built by leveraging other composite applications.

Position and Adoption Speed Justification: As the requirements for new applications proliferate, the appeal of leveraging and extending existing applications, rather than implementing new ones, is attractive as a means to reduce development costs and the time to deployment for integrated solutions and services. Organizations in various industries have been developing composite applications for decades, mostly in conjunction with the implementation of service-oriented architecture (SOA; see "Understanding and Measuring the Business Value of SOA").

Leveraging applications to build composite applications reduces development costs, and frees resources to work on pressing projects. Reusing applications and data sources to enable composite applications also helps improve data and process consistency (see "The Advantages, Economics and Value of Reuse" and "MDM, SOA and BPM: Alphabet Soup or a Toolkit to Address Critical Data Management Issues?").

A large percentage of transformational applications are composite applications, and that percentage will grow in the next four to five years. By 2015, 80% of operational applications that have a transformational impact on the business will be compositions (see "Going Forward, Most Transformational Applications Will Be Composite Applications"). While the skills required to build and support composite applications are different from those to build monolithic, stand-alone applications, the business benefit of integrating business functionality from multiple parts of the organization (or multiple organizations) cannot be matched by building another stand-alone, monolithic application (see "How Do Composite Applications Deliver Value to the Enterprise?").

Until recently, composite application development was too complex and technically challenging for all but the most proficient IT organizations. A decade's worth of IT investment in SOA, however, now enables developers to readily leverage functionality in enterprise systems and packaged applications. Web services make consumer-oriented functionality easily accessible. The emergence of cloud-based applications and Web APIs, as well as the increasing use of SOA to enable B2B integration, has facilitated the development of applications that bridge enterprise boundaries. Eventually, many mobile applications will become composite applications.

User Advice: Adopt composite applications to leverage established application assets, reduce development costs, accelerate application deployment and leverage readily available cloud services. View composite applications as the most effective way to realize the intrinsic value of high-level trading partner collaborations.

Prior to designing a composite application, project leaders should carefully evaluate how to suitably address design challenges, including middleware selection and semantic reconciliation, as well as

management, security and governance (see "What Is Composite Application Governance?" and "How Much Should You Invest in the Governance of Your Composite Applications?"). IT and business executives should not expect the IT department's ability to create composite applications to translate into a business user's ability to do the same via mashups (see "End-User Mashups: Overpromised, and Barely Delivered").

Business Impact: The benefits of building composite applications (especially when they are built using SOA) will translate into higher-quality applications, and lower costs to develop and maintain them. More significantly, the ability to compose applications that include partner and cloud services and Web APIs will represent substantial opportunities for building systems with greater reach, more efficiency and more relevance to users.

Composite applications support business requirements by enabling organizations to improve the effectiveness of their sales, purchase and support operations by reaching customers, suppliers and employees through varied integrated channels (such as the Internet, call centers, digital TV, wireless devices, self-service terminals and kiosks). Composite applications make it possible to increase operational and decision-making efficiency by supporting one integrated view of critical business entities — such as customers, suppliers, products, patients and taxpayers — whose data is typically scattered across databases and applications.

Composite applications can help improve efficiency and customer satisfaction by streamlining and integrating business processes. This capability represents the segue between the functionality of composite applications with the role of business process management and improvement efforts.

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Compuware; GT Software; IBM; InterSystems; Kapow Software; Magic Software Enterprises; Microgen; Microsoft; ObjectBuilders; OpenText; Oracle; OutSystems; Progress Software; SAP; Skyway Software; Software AG; Tibco Software

Recommended Reading: "Q&A: What Should IT Leaders Know About Composite Applications?"

"Going Forward, Most Transformational Applications Will Be Composite Applications"

"How Do Composite Applications Deliver Value to the Enterprise?"

"Understanding and Measuring the Business Value of SOA"

"What Is Composite Application Governance?"

"How Much Should You Invest in the Governance of Your Composite Applications?"

"End-User Mashups: Overpromised, and Barely Delivered"

"The Advantages, Economics and Value of Reuse"

"MDM, SOA and BPM: Alphabet Soup or a Toolkit to Address Critical Data Management Issues?"

Web Widgets

Analysis By: Jim Murphy

Definition: Web widgets are reusable, stand-alone Web applications that can be embedded into third-party sites by any user that has appropriate rights of authorship. They don't require site-specific compiling or giving control of the site to the party providing the widget. Widgets use representational state transfer (REST)-based APIs to communicate with Web-accessible resources.

Position and Adoption Speed Justification: Web widgets have been available on the consumer Web since 2002, and they were almost exclusively a consumer Web phenomenon until 2006. Since then, enterprises have garnered value in building Web widgets to extend marketing, sales and services presence. Web widget use has accelerated over the past year as a result of mobile, social, and user experience trends. Web widgets are increasingly used to provide simple, self-contained, and platform-independent applications that support user experience trends like the shift toward apps (see "The App and Its Impact on Software Design") and citizen development. Web widgets are also proving useful in supporting hybrid (Web/native) mobile apps.

Anyone using a personal start page, such as iGoogle or My Yahoo, uses Web widgets. In an enterprise context, Web widget use is frequently provided through a portal framework, with widgets constituting a lighter-weight form of portlet for many enterprises. However, horizontal portal platforms are not prerequisites for Web widget use, and widgets are finding their way into other applications and platforms, including Web content management systems, collaboration platforms, social software, business intelligence dashboards and open source Web frameworks. In some cases, vendors with comprehensive portal, content management, collaboration and social suites are leveraging widgets to provide interoperability among their applications and services.

Web widgets constitute a relatively simple way to create and distribute reusable user interface (UI) components. They also serve as a basis for mashups and other front-end application composites. Further, because Web widgets are self-contained, visual, and easily manipulated, business and end users can employ them to compile and share their own mashups and dashboards.

The widget proposition resembles the enterprise portal/portlet proposition as a simple way to make Web information, applications and services available to more people in more contexts. Unlike portlets, however, widgets rely mostly on client-side processing. Widgets can be easily deployed on a mobile device or PC desktop, while portlets are bound to the server environment for which they're developed. However, the Web widget's current simplicity, lightweight and cross-platform nature also necessitates sacrificing some of the portlet's sophistication, especially in areas such as interportlet communication and federation. Raising the sophistication of the widget may only compromise its simplicity, which is part of its appeal, and lead it toward the same frustration that some portlet standard efforts have encountered.

Widget standards are still evolving. A few vendors have sought to promote their own approaches, but the lightweight, interoperable, and user-centric nature of Web widgets urges an open approach. Open Social and W3C have emerged as the most promising efforts, spanning both the consumer and enterprise markets. Broader Web standards, such as HTML5 and CSS3 will undoubtedly play a role in the evolution of Web widgets.

Developer use of Web widgets is already widespread, but few organization have devised a cohesive strategy for their management. Web widgets will provide a simple, yet vital means of enhancing interoperability, scaling development efforts, and improving user experience amid the nexus of forces — mobile, social, the cloud, and information — driving the Web's evolution.

User Advice: Organizations should recognize that widgets can be an effective part of an overall user experience platform strategy. In addition to providing a simple mechanism for developers to integrate Web-accessible resources, organizations can delegate widget building and distribution responsibilities to citizen developers and power users.

Organizations should be wary of widespread and uncontrolled widget use. Assess and monitor widget use while paying heed to emerging standards. Organizations must find the appropriate balance of control and flexibility when employing Web widgets. Effective governance can ensure consistency and compliance while providing the flexibility that bring business innovation and agility.

Business Impact: Using widgets in employee portals and other internally facing websites could reduce development costs and improve the user experience. Providing the ability to embed widgets in an externally-facing Web presence can attract and retain users. Web widgets present an opportunity as a component of a Web projection strategy. In conjunction with providing open APIs or RSS/Atom to expose information to other Web consumers, Web widgets enable enterprises to expose data, functional features and branding to consumers on the public Web. Enterprises can also use Web widgets to expose elements of their Web presence and managed communities to public Web community environments, such as Facebook and Twitter. Organizations are already employing widgets to employ existing Web interfaces and applications in their hybrid mobile applications.

Benefit Rating: Moderate

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: Google; IBM; Microsoft; Netvibes; Pageflakes; Yahoo

Federated Portals Across Vendor Families

Analysis By: Jim Murphy

Definition: Portal federation allows portal components, applications and content, often in the form of portlets, to be produced in one portal environment, instance or server, and consumed in another portal framework or instance. Portal federation is a means of integrating portals, sharing resources

across portal deployments and providing a unified experience for end users. Portal federation across vendor families describes this interoperability among products from various portal vendors.

Position and Adoption Speed Justification: Organizations will invariably find an increasingly pronounced need for portal federation across vendor families, to suit needs both within the enterprises and among their partner ecosystems. The demand for portal federation across vendor families continues to increase. Customers with internal portal initiatives want federation across vendor families as a result of two overriding factors. First, organizations have portals from many providers, and these portals have undeniable appeal and strength for certain types of processes and interactions. For example, many organizations use one portal centered on business applications and processes (such as SAP NetWeaver or Oracle WebCenter), one portal for general-purpose knowledge and content management (such as Microsoft SharePoint or Oracle WebCenter Interaction), and one portal for customer or citizen engagement (such as OpenText Portal [formerly Vignette Portal] or Liferay). Second, organizations seek to provide a unified portal experience for employees, customers, partners and citizens across these portal products and vendors.

Portlet federation is also an issue in providing organizations with a means to interoperate with external partners, customers and affiliated organizations.

Web Services for Remote Portlets (WSRP), often referred to as the go-to standard for portal federation, is proving most useful in scenarios that require maintaining the branding of portal services. Inside organizations where the branding of portlets is less of an issue, more fundamental API-level approaches, including representational state transfer (REST), may constitute a more flexible means of ensuring interoperability than federation through WSRP.

Large-vendor product expansion into adjacent areas, like content management, collaboration and social computing, is in some cases hampering progress toward portal federation across vendor families. Vendors expanding beyond portals to more comprehensive user experience platforms are often less supportive of federation with increasingly competitive solutions from rivals. Lean portals, on the other hand, because of narrower product scope and less account control, are often a more supportive portal federation, whether they're to be treated as producers or consumers.

Although WSRP v.2.0 promises to address the challenge of federating portals based on different vendors' technologies, portal federation requires more than just portlet syndication and remains a daunting challenge. WSRP isn't universally available in all the platforms, and even when it is, its use is often discouraged by vendors whose innovative features rely on proprietary capabilities.

User Advice: Enterprises seeking to federate portals across vendor families should consider WSRP as a means to syndicate and evoke portlets and portal components with branding intact. However, organizations should look more broadly to integration approaches, such as those based on REST or plain old XML (POX), and should consider other emerging standards, such as OpenID and Content Management Interoperability Services (CMIS), for more versatile integration requirements.

Enterprises should also strongly consider federation approaches at the foundational level, rather than solely through portlets and gadgets. Many organizations have effectively used enterprise service buses (ESBs), business process management (BPM) and more integration-focused approaches to achieve deeper portal integration than federation can accomplish.

Business Impact: Federation across portals from different vendor families will:

- Enable users to access the resources exposed by those portals without having to log in to multiple portal interfaces.
- Provide complete interoperability across portals, without developing custom integration code and replicating user profiles across multiple portal directories.
- Allow organizations to syndicate or distribute pluggable portal services to customers and partners.

Benefit Rating: High

Market Penetration: 5% to 20% of target audience

Maturity: Adolescent

Sample Vendors: IBM; Liferay; Microsoft; OpenText; Oracle; SAP; Tibco Software

Entering the Plateau

Web Analytics

Analysis By: Bill Gassman

Definition: Web analytics is a market of specialized analytic applications used to understand and improve online channel user experience, visitor acquisition and actions, and to aid optimization efforts in digital marketing. Products offer reporting, segmentation, analytical and performance management, historical storage and integration with other data sources and processes. The tools are used by marketing professionals, advertisers, content developers and the website's operations team, and provide input to automated marketing processes.

Position and Adoption Speed Justification: The maturity of this market moved forward by 5% this year, reflecting more complete adoption and better use of the products. Over the next few years, there will be new opportunities at the high end of the market, but that market innovation is just emerging. More than 90% of the addressable market is using some form of Web analytics tools. Google reports over 10 million registrations and at least 200,000 active users of its free Google Analytics product, and there are over 20,000 customers of the leading fee-based products. While most organizations use one or more Web analytics service, less than 50% of the addressable market is using advanced functions, such as customer-based segmentation, data warehousing and exporting user activity events into search engine marketing, targeted email, banner advertising and content management engines.

Globally, Adobe, IBM and Webtrends lead in terms of market revenue. Teradata and SAS Institute have niche businesses at the high end, and some vendors with big-data technology are chasing opportunities. New entrants are gaining minor traction, such as KISSmetrics and open-source offering, Piwik, and there a number of solutions focused on mobile devices, such as Kontagent and

Localytics. Deployment skills and process are inhibitors to this market, with big gaps between leading and trailing edge use cases. Delivery of Web analytics solutions continues to be predominantly (over 80%) software as a service (SaaS) rather than in-house products.

User Advice: Most enterprises with a website have a reporting package, but many receive less than the potential value from the tools. The degree to which the initiative should be improved is related to the strategic and potential value of an enterprise's website. Business users should be the primary users of the tools, with support from the IT organization in the areas of instrumentation, data integration, process management and complex report generation. A business executive champion is important to drive the analytic culture. Ensure there are sufficient skills, create a training program that teaches employees how to use the products in their role, promote success and use consultants (external or from a vendor) to overcome technology hurdles in using the tools. If still using log files rather than JavaScript tags for instrumentation, explore the value of tagging, mindful of user and data privacy issues. If not already doing so, start using the tools to analyze the impact of a/b or multivariate testing. Analyze users by segments, including those using mobile devices and social channels. Find opportunities to integrate cross-channel data, such as online data with the call center or point of sale. For advanced enterprises, start building a user-experience management ecosystem that blends analytics with search, context, social networking, content management, CRM master files and automated outbound marketing.

Business Impact: Investing in Web analytics is becoming more indispensable to a digital oriented strategy, because of the significant implications for marketing or service delivery oriented enterprises, and anywhere the Web channel is strategic. The core process is to collect, analyze and monitor customers' behavioral activities on websites, and social and mobile applications. A view into what is working, or not, helps to optimize the digital channels. The impact of search engine advertising, email campaigns, cross-sell or upsell targeting, and social media activity can be measured and refined through Web analytics. Customer data can be gathered and incorporated into personalized and context rich content for marketing campaign decisions (such as profitability analysis and segmentation), and leveraged for every interaction channel in a campaign management strategy. Subscriber behavior can be analyzed to identify satisfaction issues and potential churn candidates. It is not uncommon for the business metrics of Web channels to double over baseline benchmarks within six months of starting a Web analytics program.

It takes as long as three years to achieve advanced skills, at which point a continuous improvement process should be in place.

Benefit Rating: Moderate

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Sample Vendors: Adobe; AT Internet; comScore; Google; IBM; Webtrends

Recommended Reading: "Tag Management Systems Bring High Value to Online Channel Stakeholders"

"Web Analytics Market Update, 2012"

"Use Web Analytics When Defining a Mobile Internet Strategy"

"Tutorial: Web Content Product Recommendation Engines"

"Incorporating the Web Into Cross-Channel Customer Analysis"

Second-Generation Portlet Standards (JSR 286 and WSRP v.2)

Analysis By: Jim Murphy

Definition: Second-generation portlet standards include Java Specification Request (JSR 286) and Web Services for Remote Portlets (WSRP) 2.0. JSR 286 is an update to JSR 168, the standard governing the life cycle of a portlet within a Java-based container. JSR 286 extends the specification to support interportlet communication, dynamic resources, and portlet filters and listeners. WSRP 2.0 updates the standard mechanism for invoking remote portlets. WSRP proposes to allow interoperability of portlets among Java, .NET and other portal containers.

Position and Adoption Speed Justification: Portlets remain the primary components for integrating and building applications in portals. Portlet standards bring value to organizations by reducing the cost of development, facilitating code reuse, offering a simple means of integration for third-party applications, allowing interoperability among various portal software providers and reducing dependency on specific vendors.

Second-generation portlet standards have met with mixed results. Advanced features in some portal products often required a proprietary portlet approach. In addition, some portal providers have used proprietary approaches to exert control over customers and promote easily-integrated adjacent products. Regarding WSRP 2.0, some vendors have been more amenable to supporting a consumer versus a producer scenario so as to ensure a position as the primary portal front-end. Meanwhile, many organizations have often found portlet building and deployment overly complex — irrespective of the standards — and falling short of expected results.

While second-generation portlet standards offer some promise, their greatest inhibitor may be the burgeoning interest in widgets as enhancements or alternatives to portlets. Widgets are embeddable applications comprising simple code snippets that can be easily snapped into users' portal pages. As client-side components, widgets can be less taxing on server resources and, because widgets are less complex than portlets, they are easier to design for cross-platform use. In some cases, widgets will obviate the need for portlets.

However, widgets and portlets will likely coexist in most organizations. Complex forms of integration with sophisticated back-end systems will likely still require portlets. A feature like interportlet communication is not yet part of any widget specification and may be required in many situations. JSR 286 is designed to account for, and accommodate, widgets and other representational state transfer (REST)-based approaches. While second-generation portlet standards are relatively advanced and fairly stable in ensuring portal interoperability, widget standards are only beginning to emerge, with consumer and enterprise approaches, such as OpenSocial and iWidgets, still competing for adoption.

User Advice: Use portlet standards as the default starting points for portal-related custom development to contain portlet development costs, and as a means of federating different portals. However, don't plan on these specifications meeting all portlet development needs, and don't obsess over standards at the cost of business agility and value.

Leverage the JSR 286 standard if you are using a Java-based portal. JSR 286 provides enterprises with flexibility in portal deployment across different vendors' platforms that support the specification. However, there is reason to be skeptical about equivalent cross-platform compatibility. If you want to experiment with portal technology before engaging in procurement with a commercial vendor, start with a lightweight implementation using an open-source portal that supports JSR 286. If you use JSR 286 for custom portlet development, then you can transfer those portlets to more heavy-grade enterprise portal deployments, receiving full funding and based on another vendor's offering, if that vendor also supports the specification. JSR 286 supports interportlet communication, a key gap limiting JSR 168 use.

WSRP can be a useful standard, but in relatively rare cases; it is not a cure-all for heterogeneous (i.e., .NET and Java) portlet development. WSRP continues to provide a mechanism for portlet-level federation among different portals. However, WSRP production and consumption capabilities are required to facilitate federation among the different portals, and several vendors support WSRP as a consumer, but not as a producer. When it is desirable to syndicate a user interface (UI), WSRP is a useful standard. When plug-and-play syndication of the interface is not needed, providing well-structured, heterogeneous access to information via RESTful services or XML syndication is a better option for exposing information in a form that is easily accessible by portals, whose developers can recreate the UI of the portlet to meet their needs.

Business Impact: JSR 286 can help reduce the cost of development through ease of integration, reuse of components, and portability or interoperability among portal frameworks from various providers. WSRP v.2 is a useful standard for syndicating or invoking a UI component, but is not suitable as a mechanism for heterogeneous portal development.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Sample Vendors: IBM; JBoss; Liferay; Microsoft; OpenText; Oracle; SAP; Tibco Software

Recommended Reading: "Second-Generation Portlet Standards Should Be Used for Portlet Development but Aren't the Whole Story"

B2B Web Services

Analysis By: Daniel Sholler

Definition: B2B Web services refers to the IT usage scenario where a form of Web services — SOAP, WS-* or Web-native implementation, such as representational state transfer (REST) or plain old XML (POX) — is deployed in some combination of cloud and B2B (multienterprise) integration

projects. Web services are used as a multienterprise extension of internal service-oriented architectures (SOAs), or in lieu of more traditional approaches to multienterprise integration, such as Applicability Statement 2 (AS2), electronic data interchange (EDI) and FTP.

Position and Adoption Speed Justification: Web services facilitate B2B communication in various scenarios, such as:

- Use by providers of platform as a service (PaaS) to access service capabilities, and as frameworks for the construction of customer designed services.
- The use of B2B Web services as an alternative to B2B process and data integration for traditional e-commerce projects, such as retail/consumer-packaged goods, and the manufacturing and automotive industries.
- Use by providers of integration brokerage (for example, GXS, IBM [via its Cast Iron and Sterling Commerce acquisitions], Hubspan and Liaison) as a protocol in their networks for process and data integration, as the interface into their customers' systems, and (in some cases) as a Web services interface for automating the provisioning of users on their networks.
- The emerging Web-services-based exchange of information and events to support vendor-managed inventories for complex, high-tech manufacturing supply chains.
- B2B Web services used by companies such as Amazon that enable third-party companies to leverage knowledge about buyers' preferences.
- Use by software as a service (SaaS) providers; for example, salesforce.com uses B2B Web services to implement its AppExchange Web services APIs.
- Use by cloud computing vendors; for example, Google uses B2B Web services to implement its Google App Engine (see "Who's Who in Cloud Services Brokerage").
- Use by emerging providers of cloud services brokerage (e.g., Strikelron and NetEDI) for supplying the near-real-time aggregation of business information from various content providers for consumption via Web services among many consumers.
- To access business information from internal and external applications (run by external business partners) to support portal-based applications.
- Use by B2B gateway software (BGS) providers (for example, IBM and Software AG) as an increasingly prominent connection protocol supported in their BGS products, and by companies implementing B2B integration projects.

Given the wide range of use cases in the definition, the position of B2B Web services is a compromise between the different rates of B2B Web services adoption. At one extreme, the rate of B2B Web services adoption for most well-established forms of e-commerce (such as order to cash in retail and manufacturing, and claims adjudication in insurance) is slow, due to the critical nature of the systems involved, and because most are systems of record, when considered from a pace-layering point of view (see "How to Get Started With a Pace-Layered Application Strategy"). Given the number of e-commerce transactions that occur every year (estimated at more than 100 billion),

even a small percentage represents significant uptake, and the pace of adoption for these forms has dramatically increased in the past year. At the other extreme, the rate of B2B Web services adoption for new forms of B2B projects, such as those involving SaaS and cloud computing, is a substantial, fast-growing user base.

B2B Web services are becoming ordinary capabilities for most B2B environments, although interest in mobile and other client types has shifted much of the attention to RESTful APIs, rather than toward traditional Web services protocols. This technology has nearly reached the Plateau of Productivity.

User Advice: Implementations of Web services using the SOAP protocol and asynchronous and reliable messaging techniques are not gaining much traction, and the trend is toward other technical patterns (such as Web-oriented architecture [WOA]; see "Best Practices for RESTful APIs"). Customers building B2B interfaces can still use the SOAP basic profile, but should consider using RESTful WOA designs (see "WS-I or RESTful Web Services: When, Where and Why"). Consider using B2B Web services as an alternative to traditional e-commerce protocols, such as AS2 and FTP, in IT projects involving SaaS, cloud computing and other "greenfield" B2B project scenarios in which Web services are a natural extension of and consistent with the development of Web-services-enabled internal applications and infrastructures.

Business Impact: Web services have been widely adopted by cloud computing/SaaS providers, and in most forms of e-commerce, including supply chains and demand chains, across all industries. Web services are increasingly leveraged by companies implementing B2B projects, using all forms of integration middleware and integration as a service (IaaS). As Web services become the norm, new models using Web technology are increasing in popularity.

Benefit Rating: Moderate

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Sample Vendors: Amazon; E2open; Google; GXs; Hubspan; IBM; Microsoft; Oracle; salesforce.com; Software AG; SOA Software; Strikelron; Tibco Software

Recommended Reading: "Secure B2B and Electronic Data Interchange"

"Gartner 2012 Research Outlook for Application Integration"

"Managed File Transfer Features You Will Need for Your Integration Projects"

Federated Portals Within Vendor Families

Analysis By: Jim Murphy

Definition: Portal federation allows portal components, applications and content, often in the form of portlets, to be produced in one portal environment, instance or server, and consumed in another portal framework or instance. Portal federation is a means of integrating portals, sharing resources

across portal deployments and providing a unified experience for end users. Portal federation within vendor families describes this interoperability among products from a single portal vendor or provider.

Position and Adoption Speed Justification: Vendors allow for portal federation within their product portfolios primarily using Web Service for Remote Portlets (WSRP). WSRP enables federation across distinct instances of a portal product that are built on the same vendor's technology.

WSRP-compliant portal components aren't always readily accessible without a good deal of work on the part of customers, system integrators or third-party providers. Federation may require directory entry replication and is often a function of server and server farm topology and replication, a particular concern for large, multinational and/or multibrand organizations. Such enterprises are particularly hampered by the manual work necessary to replicate content and access rights across multiple instances of the same vendor's portal product. Dependence on multiple, disparate systems and resources often hampers the performance and speed of federated portals.

While portal federation within vendor families is a challenge in itself, organizations face far more complex challenges when federating across vendor families. This is largely because many portal vendors have concentrated on federation capabilities in their own portals and related products, whether their intention is to urge customers to standardize on their portal, to lock out other portal providers or to exploit proprietary technologies to offer more advanced features than the standards currently support. Because certain portal providers are vital, compelling and, in some cases, undeniable, portal federation across vendor families remains a vital concern for organizations pursuing broader portal and user experience initiatives.

Federation at the portlet level is most useful for organizations that have standardized on a single portal vendor, and that must support a highly distributed environment with numerous, disparate back-end information sources and applications. Organizations that are after integration, rather than federation, should look to other approaches. Many successful portal implementations employ more-established mechanisms, such as enterprise service buses and SOAP-based Web services. Integration at these more foundational levels, such as in the data layer or process layer, can provide a more cohesive and versatile architecture for creating composite applications.

User Advice: Enterprises that have deployed multiple portals from the same vendor should investigate federation via portlet interoperability mechanisms, including WSRP. However, organizations can't rely on all portal vendors providing full federation among different instances of their software.

Business Impact: Most enterprises have multiple horizontal portal frameworks. Enterprise architectures supporting multiple portals within an enterprise can provide a more unified, cohesive user experience if they can federate these portals, rather than force users to move from portal to portal depending on the business interaction.

Benefit Rating: Moderate

Market Penetration: 20% to 50% of target audience

Maturity: Mature mainstream

Sample Vendors: IBM; Microsoft; Oracle; SAP

Service-Oriented Architecture

Analysis By: Daniel Sholler

Definition: Service-oriented architecture (SOA) is a design paradigm and discipline that helps IT meet business demands. Some organizations realize significant benefits using SOA, including faster time to market, lower costs, better application consistency and increased agility. SOA reduces redundancy and increases usability, maintainability and value. This produces interoperable, modular systems that are easier to use and maintain. SOA creates simpler and faster systems, which increases agility and reduces total cost of ownership (TCO).

Position and Adoption Speed Justification: SOA has been widely adopted as a means of creating leverage in the software portfolio, and its principles are used to develop integration relationships inside and outside the enterprise. SOA is the primary model for integrating cloud-based applications into an existing system portfolio.

Vendors of middleware, development tools and packaged applications have delivered SOA capabilities in most products, although the implementations are still superficial in some cases. Most user organizations are attempting to use SOA concepts as part of their system designs. However, the usual technology as a "silver bullet" way of thinking has largely been discredited. The near-term ROI in some SOA projects has been difficult to quantify, mostly because the benefits are spread over the lifetime of the solution. Most organizations have been pleased with the improved flexibility and long-term results. Compared with traditional monolithic or client/server applications, SOA applications are more likely to be spread across multiple computers in far-flung locations. They're more likely to be composed of parts that are developed and managed by disparate, semiautonomous IT groups (domains), often controlled by disparate business units inside and outside the company. They're also more likely to run on a mix of heterogeneous application servers, programming languages and OSs, and be subject to frequent changes, because of volatile business requirements.

SOA is part of the solution to these problems, because it clarifies system design, isolates modules from each other and increases the interface documentation. Some organizations have been disappointed by the low level of service sharing (reuse) they have achieved. In cases where value is measured, however, that value can be derived even with a modest quantity of shared services. Some SOA projects have encountered problems in governance, testing, configuration management, version control, metadata management, service-level monitoring, security and interoperability. This is to be expected, because changes in the fundamental structure of business processes and application architectures of this magnitude do not happen quickly or easily, and because the challenges are based on the heterogeneous and distributed nature of the systems, not on any characteristic of SOA. User migration to SOA began in the late 1990s, and continues. Most organizations have some commitment to it, and adoption is increasing throughout all types of organizations.

User Advice: Use SOA to design large, new business applications, particularly those with projected life spans of more than three years, and those that will undergo continuous refinement, maintenance or enlargement. SOA is well-suited to composite applications in which components are built or managed by separate teams in disparate locations. These components can leverage pre-SOA applications by wrapping function and data with service interfaces.

When growing SOA within the organization, develop federated governance methods to avoid centralization bottlenecks.

When buying packaged applications, rate those that implement SOA more highly than those that don't. Also, use SOA in application integration scenarios that involve composite applications that tie new logic to purchased packages, legacy applications or services offered by other business units, such as those found in software as a service (SaaS) and other types of cloud computing. Do not discard non-SOA applications in favor of SOA applications solely on the basis of architecture. Discard non-SOA applications only if there are compelling business reasons why they have become unsatisfactory.

Continue to use non-SOA designs for some new, tactical applications of limited size and complexity, and for minor changes to installed, non-SOA applications. There are multiple patterns within SOA — including multichannel applications, composite applications, multistep process flows, representational state transfer (REST) and event-driven architecture (EDA) — and each pattern has its own best practices for design, deployment and management.

Business Impact: Like the relational data model and the graphical user interface, SOA represents a durable change in application architecture. SOA's main benefit is that it reduces the time and effort required to change application systems to support changes in the business. Business functions are represented in the design of SOA software services, which help align business and technology models. The implementation of the first SOA application in a business domain will generally be as difficult as, or more difficult than, building the same application using non-SOA designs. Subsequent applications and changes to the initial SOA application will be easier, faster and less expensive, because they'll leverage the SOA infrastructure and previously built services.

SOA is an essential ingredient in strategies that enhance a company's agility. SOA also reduces the cost of application integration, especially after enough applications have been converted or modernized to support an SOA model. The transition to SOA is a long-term, gradual trend, and will not lead to a strategic realignment in vendor ranks or an immediate reduction in user companies' IT outlays.

Benefit Rating: Transformational

Market Penetration: More than 50% of target audience

Maturity: Mature mainstream

Recommended Reading: "Magic Quadrant for SOA Governance Technologies"

"Magic Quadrant for Application Infrastructure for Systematic Application Integration Projects"

"Magic Quadrant for Application Infrastructure for Systematic SOA Infrastructure Projects"

"Magic Quadrant for Application Infrastructure for Systematic SOA Application Projects"

"Pace-Layering Services Will Improve SOA Value"

"SOA Overview and Guide to SOA Research, 2011"

Mobile Application Development Platforms

Analysis By: William Clark; Ian Finley

Definition: Mobile application development platforms (MADPs) enable enterprise developers to design, code, integrate, test, publish, and manage mobile business-to-consumer (B2C), B2B and business-to-employee (B2E) applications. MADP vendors generally deliver either a native toolkit, a Web toolkit or a cross-platform suite. MADPs represent the evolution and convergence of mobile consumer application platforms (MCAPs) and mobile enterprise application platforms (MEAPs).

Position and Adoption Speed Justification: The predecessors of MADPs emerged in the late 1990s, growing and evolving with the mobile device market. In years past, the market was divided into MCAPs, MEAPs, rich mobile application frameworks and other smaller markets; each suited to specific needs. Increasingly, enterprise IT organizations are looking for a single development platform for their mobile application projects, just as they once selected an application server standard for their desktop applications. In response, vendors are building and buying technology to create broad suites that qualify as broad-spectrum MADPs.

MADP penetration is significant and accelerating. In Gartner's 2011 and 2012 CIO surveys, mobile technologies ranked among the top three technology priorities. Most Type A (leading-edge) and many Type B (mainstream) organizations use an MADP and many more are evaluating them today. Customers generally report that MADPs are mature toolsets that deliver on their promises. The most popular MADPs each claim developer communities of over 100,000 people.

While today's MADPs provide good support for today's popular mobile devices, the continued demand for applications for PCs, and the potential demand for applications for new mobile devices, intelligent TVs, in-vehicle systems, etc. will likely fuel change and innovation. These demands may require only incremental enhancements to today's cross-platform MADPs or cause another step-change in the market. In which case, MADPs may be superseded by a new class of multichannel development platforms distinct enough to call a new technology category.

User Advice:

- Evaluate MADPs based on your needs over the next two to five years. The MADP market continues to evolve rapidly. Market consolidation and the evolving nature of mobile devices make it difficult to select a strategic MADP vendor with confidence. Look instead for an MADP that will satisfy short-term needs and set internal expectations that the choice should be evaluated regularly.

- Look for an MADP that supports your likely customer-, partner- and employee-facing needs. Most enterprises eventually look to develop a wide range of mobile applications and want to minimize the number of technologies required. Good options exist today that can deliver across the full spectrum of typical enterprise needs.
- Look for an MADP that supports different mobile device platforms (Android, iOS, etc.) and formats (phone, tablet, etc.). Cross-platform support is important when building applications for customers, partners, and even employees (many enterprises adopt bring your own device [BYOD] policies for employee mobile devices).
- Consider the match between the skills you have on-hand and those required by the MADP you select. Enterprises typically have a good supply of developers proficient in Java, .NET and/or Web technologies like JavaScript, HTML and Cascading Style Sheets (CSS).
- Consider selecting a Web-based MADP to take advantage of industry trends toward HTML5 support. HTML5, in conjunction with JavaScript 5 and CSS3, enables developers to build sophisticated mobile applications with many of the capabilities of native applications. Wrapper technologies, like Adobe PhoneGap, can extend Web-based applications to run as native applications.
- Consider the full mobile application life cycle, including design, development, integration, deployment, management and retirement. Most MADPs support only part of the full life cycle and must be augmented with tools from open-source communities or other vendors.
- Consider the cost and time savings provided by MADPs with prebuilt templates and applications.

Business Impact: Custom mobile applications developed with MADPs can transform relationships with clients, citizens, partners and employees, improving productivity and opening up new business opportunities. Smartphones and tablets will represent over 90% of the net new growth in device adoption from 2012 to 2016, and by 2013 mobile devices will overtake PCs as the most common Web access devices worldwide. As customers go mobile, enterprises follow. The huge financial potential of engaging customers through this new channel is causing many CMOs to demand new mobile applications to exploit this opportunity. The move to mobile devices also impacts employees. Many enterprise executives are pushing for mobile access to internal business applications for their staff to improve employee productivity and engagement. Organizations are also building new mobile applications to assist mobile employees in areas like field sales, field service and supply chain.

Computing has left the PC-dominated era and is entering a fast-moving, diverse, multichannel environment where the design point for client applications and user interfaces (UIs) is shifting to mobile devices. By 2015, IT organizations will need to reallocate resources, as mobile application development projects will outnumber native PC projects by a ratio of 4-to-1.

Benefit Rating: Transformational

Market Penetration: 20% to 50% of target audience

Maturity: Early mainstream

Sample Vendors: Adobe Systems; Antenna; Apple; Google; IBM; jQuery Mobile; Kony Solutions; Microsoft; SAP; Sencha

Recommended Reading: "Magic Quadrant for Mobile Application Development Platforms"

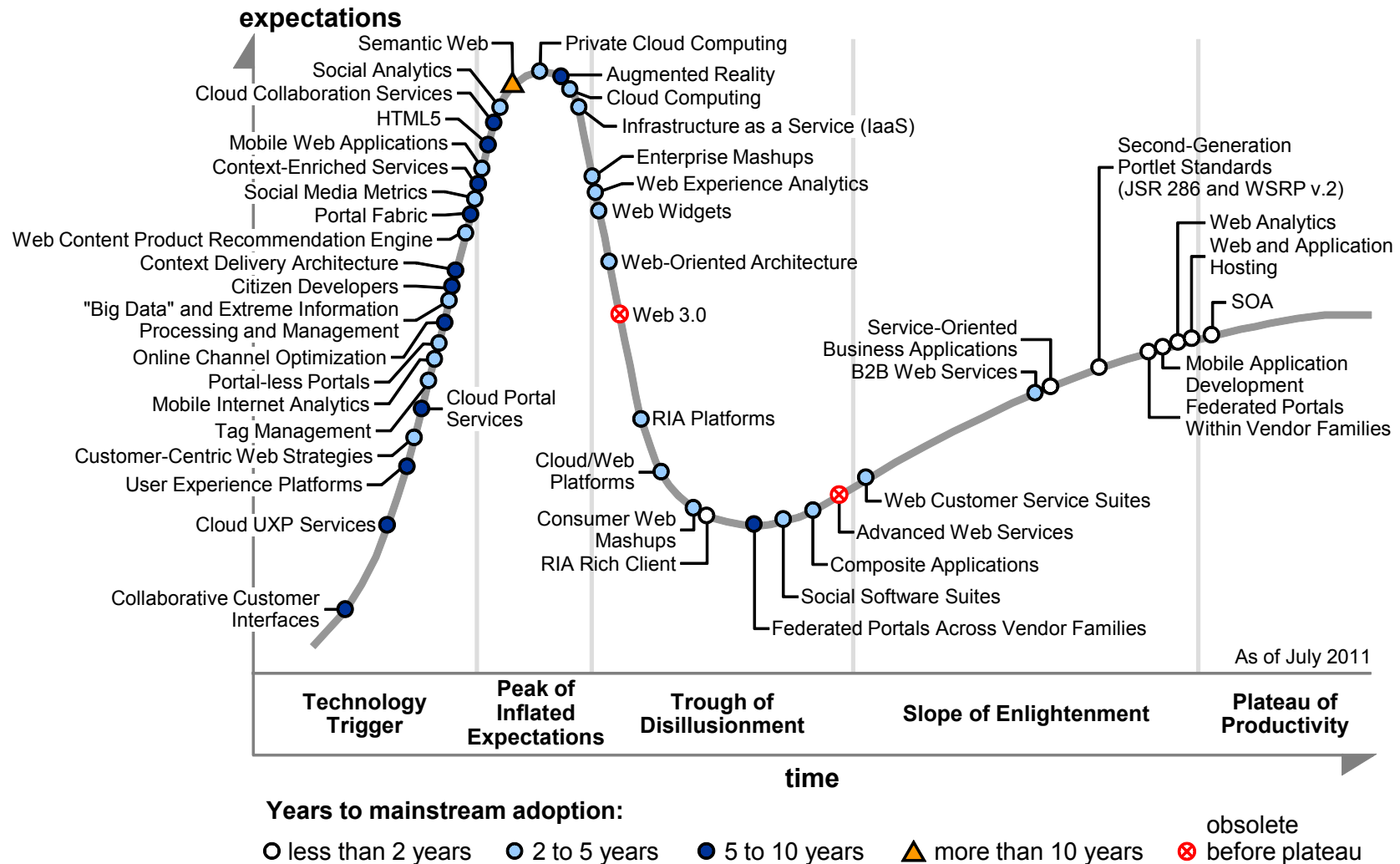
"Critical Capabilities for Mobile Application Development Platforms"

"Mobile Applications and Interfaces: New Approaches for a Multichannel Future"

"Guide for Mobile Application Development, Sourcing and Support, 2011"

Appendixes

Figure 3. Hype Cycle for Web and User Interaction Technologies, 2011



Source: Gartner (July 2011)

Hype Cycle Phases, Benefit Ratings and Maturity Levels

Table 1. Hype Cycle Phases

Phase	Definition
<i>Technology Trigger</i>	A breakthrough, public demonstration, product launch or other event generates significant press and industry interest.
<i>Peak of Inflated Expectations</i>	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.
<i>Trough of Disillusionment</i>	Because the technology does not live up to its overinflated expectations, it rapidly becomes unfashionable. Media interest wanes, except for a few cautionary tales.
<i>Slope of Enlightenment</i>	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.
<i>Plateau of Productivity</i>	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.
<i>Years to Mainstream Adoption</i>	The time required for the technology to reach the Plateau of Productivity.

Source: Gartner (August 2012)

Table 2. Benefit Ratings

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

Source: Gartner (August 2012)

Table 3. Maturity Levels

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

Source: Gartner (August 2012)

Recommended Reading

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

"Understanding Gartner's Hype Cycles, 2012"

This is part of a set of related research. See the following for an overview:

- Gartner's Hype Cycle Special Report for 2012

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