



The Power of the API Economy

Stimulate Innovation, Increase Productivity, Develop New Channels, and Reach New Markets



Redguides

for Business Leaders



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- Gain insight into the business opportunities and benefits of the API Economy
- Discover an API adoption model and benefits
- Learn how APIs enable companies to improve business performance





Executive overview

The API Economy is not just a catch phrase, it is key to accelerating value, improving business performance, and extending your business services and goods to the widest possible audience. Making sure that your company is easy to do business with and creating paths to new business opportunities is why the API Economy signals a new business reality. Companies that seize this opportunity will differentiate themselves and grow.

This IBM® Redguide™ publication has the following objectives:

- ▶ Explore the business opportunities and benefits accrued by embracing the API Economy.
- ▶ Offer an adoption model illustrating the use of application programming interfaces (APIs) for experimentation, platform building, repurposing business processes, or becoming a digital enterprise.
- ▶ Illustrate the relationship between APIs and service-oriented architecture (SOA).

Companies born during the Internet and cloud era share a common practice: They embrace and live in the API Economy. One such company mandated that all teams expose their data and functionality through service interfaces; applications must share using APIs¹, creating agility on steroids. This approach allowed the company to easily expand its business model from selling books to a global retailer to selling IT services, also known as *cloud services*. Fully API-enabled organizations see agility and innovation as reality. This is the effect of the API Economy allowing actively engaged businesses to turn on a dime to reach new markets, new customers, and new sources of growth. APIs can emancipate business processes and data from siloed, hard to change applications.

Most companies are on a journey to remove the barriers of legacy applications, which constrain change to business models or business performance. A new era of IT computing, powered by the API Economy, allows companies to reimagine their business processes, customer experience, and innovate new products and services. Legacy transformation and application modernization efforts can be replaced with new and innovative ways to engage and experience business services powered by APIs.

¹ *The Secret to Amazon's Success Internal APIs*, found at the following site:
<http://apievangelist.com/2012/01/12/the-secret-to-amazons-success-internal-apis>

The API Economy is the commercial exchange of business functions, capabilities, or competencies as services using web APIs. APIs drive the digital economy² and companies that do not embrace the API Economy will be left behind.

This IBM Redguide publication illustrates how to get started and gain value with the API Economy. It is about creating a digital platform that allows your company to improve its brand loyalty, reduce customer churn, improve business performance, increase revenue sources, but most importantly increase client value.

The API Economy: Why does it matter?

For many companies mission critical applications and legacy systems have reached the point of diminishing return; they are no longer driving significant business growth. This is not a statement about the obsolescence of legacy systems or stating that companies will not maintain existing applications or continue investing in them. The point is that many applications or systems (as currently structured) are no longer producing significant value to drive new revenue, retain customers, or acquire new customers.

Companies embrace the API Economy to make adoption of their value propositions incredibly simple, using APIs to ensure that they are easy to do business with and enabling open platforms allowing others to innovate.

There are five main reasons why companies should embrace web APIs and become an active participant in the API Economy:

- ▶ Grow your customer base by attracting customers to your products and services through API ecosystems.

Use API ecosystems to extend your business capabilities and products to the widest possible audience. Amazon, Facebook, and Salesforce.com are examples of companies who created platforms for their capabilities while promoting third parties, accelerating loyalty, and customer growth. Industry-specific API ecosystems are growing rapidly in several industries such as retail, financial services, telecommunications, and healthcare. API ecosystems allow companies to expand into new customer bases and niches that they may not be able to reach on their own.

- ▶ Drive innovation by capitalizing on the composition of different APIs, yours and third parties.

The merging of capabilities using APIs offers companies opportunities to take advantage of emerging trends and convergence of mobility, social platforms, analytics, contextual aware computing, Internet of Things (IoT), and wearable computing. New business opportunities can be created from APIs and business benefits can be derived from open innovations of crowd sourcing and expert sourcing unlocked by using APIs.

- ▶ Improve the time-to-value and time-to-market for new products.

The API Economy has changed how we think about building applications (think apps) and how we deploy software (think cloud). The largest impact of this change for business is speed: Business processes and data are no longer locked inside applications. The result is the death of data and application silos.

² *Ready for APIs? Three steps to unlock the data economy's most promising channel*, found at the following site: <http://www.forbes.com/sites/mckinsey/2014/01/07/ready-for-apis-three-steps-to-unlock-the-data-economy-most-promising-channel>

In addition, opening innovation and development beyond the four walls of your organization allows your organization to take advantage of the growing shared economy³ while using third parties to both innovate and accelerate the introduction of new products.

- ▶ Improve integration with web APIs.

The modern user expects to work in context plus have an omni-channel experience and not jump between apps and systems. This requirement drives the need for more API integration. Integration may be in the form of connecting business functions between endpoints or using API mashups, which is a rapid way of integrating API services to compose a new service through a single API. Using APIs for sharing data and business functions between endpoints (such as applications, devices, and websites) creates the opportunity to lower the cost and time for integration for both present and future scenarios.

- ▶ Open up more possibilities for a new era of computing and prepare for a flexible future.

The API-centric, as-a-service delivery, is disrupting the consumption of business services as cloud disrupts the IT consumption model. Embracing the API Economy allows companies to both prepare and take advantage of the next generation platform, building apps at the edge of the enterprise, and positioning companies to open up possibilities. This approach enables companies to take advantage of present and future developments in social platforms, wearable computing, mobility, and an ever-increasing shared economy.

In addition, companies, born in the Internet or cloud era are the new competitors for incumbents in most industries. They leverage the cloud for product delivery and IT consumption. They are unencumbered with legacy systems and legacy thinking. They embrace APIs for consumption, integration, innovation, product development, and delivery of business services and processes. More often their APIs have self-evident value. These new companies attack value chains of incumbents and then expand. They do not recognize industry boundaries and often blur the lines between B2B and B2C. A great example is the bookseller, turned retailer, grocery store, and now IT cloud provider in its ever-expanding value chains. The most recent example is ride-sharing companies competing with incumbent limousine and taxi providers. Now the ride-sharing companies expand to package delivery.

Examples of APIs are abundant in almost every industry. Retailers use public APIs providing real-time availability of products. They use partner and private APIs for internal teams, third parties, and partners to build innovative shopping experiences around the business services or unique data of their companies. This approach enables retailers to take advantage of trends in mobility.

Several banks expose APIs for ATM and branch office locators, foreign exchange rates for travel apps, deposit and lending rates, loan eligibility calculators, bill presentment services, and, of course, access to account data and payments. The Open Bank Project⁴ is an open source API and app store for banks; the objective is to accelerate the adoption of digital products by banks in the API Economy.

Mobile health and wearable computing health devices, which monitor and report a plethora of health data using APIs, are on the rise. A pill bottle that stays locked until remotely ordered to dispense the medication, mobile apps improving the experience between doctors and patients, daily electrocardiograms are examples of new applications fueled by APIs. Healthcare companies looking to improve patient care create interchanges allowing developers to pull in self-tracking data, where the data can be shared back to a health provider. Individuals benefit from their wearable or mobile devices to make healthier choices throughout the day. Third-party developers using APIs available from the interchange can

³ Airbnb, Snapgoods and 12 More Pioneers Of The 'Share Economy':
<http://www.forbes.com/pictures/eeji45emgk/airbnb-snapgoods-and-12-more-pioneers-of-the-share-economy>

⁴ Open Bank Project: <http://www.openbankproject.com>

create apps allowing care providers improved insights into the health habits of a patient. Several healthcare providers seek to create a mobile health experience in the future that is geared at improving patient health taking advantage of the convergence of trends in social platforms, mobility, analytics, and cloud computing.

Open mHealth⁵ intends to bring data scientists, developers, and clinicians together to build products that transform the way we use digital data in healthcare. In this scenario, the API Economy (open API platform) is essential to building the ecosystem and ensuring that data is not trapped in silos.

An application programming interface (API) is a public persona for a company or a product, where the API exposes business capabilities and services. Web APIs can be easily invoked using a browser, mobile device, app, or any Internet-enabled endpoint. There are few if any limits on what can be offered as a service and exposed as an API. Most limits are self-imposed or temporal because of current limitations or constraints such as security, data transfer speeds, or performance.

Embracing the API Economy is a mandate for embarking on digital adoption. If you care about rapid customer acquisition, reducing customer churn, seizing new business growth opportunities, and improving business performance in a difficult economic climate, this paper provides a prescriptive guide on getting started and sustaining your company's impact in the API Economy.

Lifecycle of the API Economy

The API Economy has changed how we think about building applications. This is most evident when examining the lifecycle of the API (shown in Figure 1 on page 5).

⁵ Open mHealth: <http://www.openmhealth.org/about>

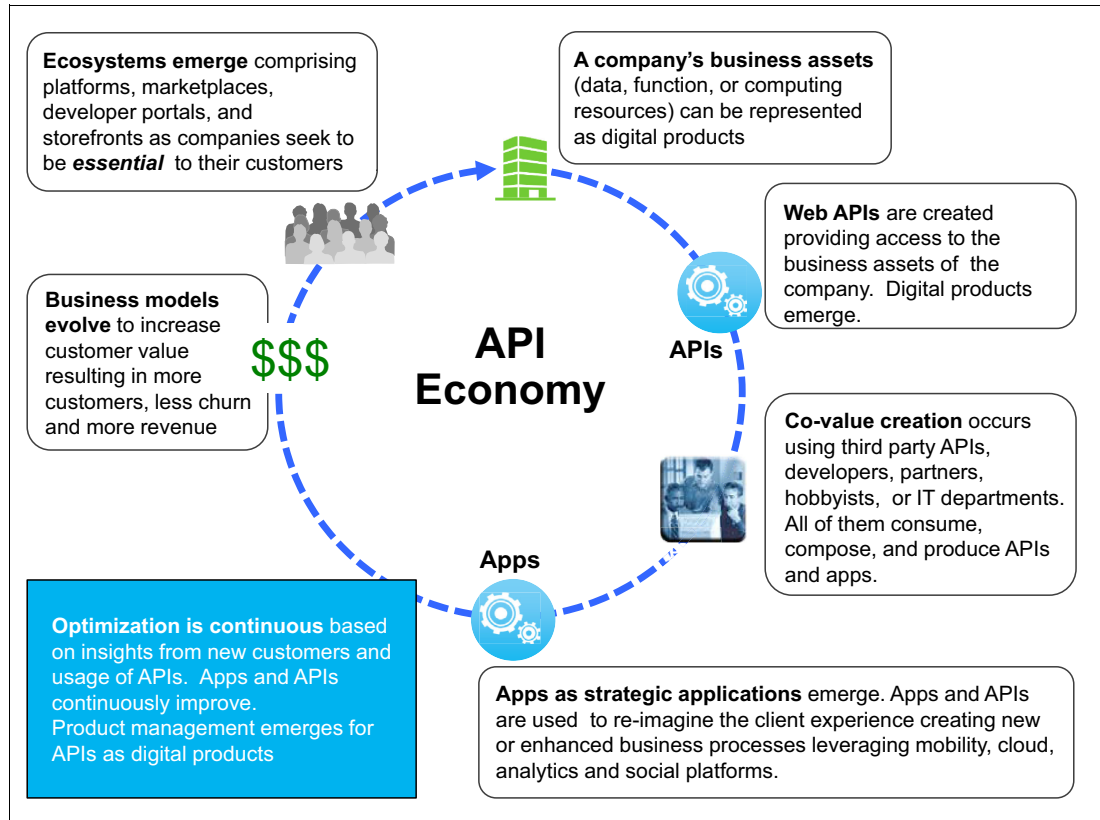


Figure 1 Lifecycle of the API Economy

Figure 1 illustrates the lifecycle of the API Economy. The lifecycle reflects continuous actions, which keep the wheel of innovation and business value a reality. This is not a governance model. Governance models vary by organization, culture, and domain. The API lifecycle model reflects the stages necessary to thrive in the API Economy. It reflects the major aspects organizations should examine for their role, participation, strategy, and success. Let us review the lifecycle of the API Economy.

A company's business assets

An enterprise participates in the API Economy when it unlocks the distinct value of its data, unique algorithms, competencies, or business services by making them accessible via APIs for access by third parties and within their enterprise. Unlocking data and services is good, however enabling a network effect is better, hence web APIs.

Exposing business assets provides a wider reach (for example, the brand of a company), facilitates open innovation with external parties and can provide new business growth by expanding business models through co-creation of new capabilities with third parties.

The traditional approach of IT may not enable the growth wanted by many companies. For example, relying solely on the organization's own IT department may not allow the enterprise to innovate with speed and scale. Enterprises do not have unlimited resources. They do not have a lock on the best ideas, and they are learning that they must tap the larger world of developers. The developer channel is unlimited when IT delivery is viewed beyond the walls of the company's own IT organization.

Innovating requires lower barriers (for example, infrastructure setup, middleware acquisition, and others), which means using cloud for IT consumption, APIs for consumption and delivery

of business services, and mobility for an engaging, magical, and contextual customer experience.

Web APIs

APIs are proliferating rapidly⁶ and the traditional route of IT is not viable for companies to remain essential. IBM has been a primary supplier of IT products and services for over 100 years and knows that to become an essential company requires to think differently. IBM Bluemix™⁷ and Softlayer⁸ for cloud demonstrates that IBM is embracing web APIs and the API Economy.

APIs traditionally have been used as glue, that is, as a means for improving integration. Royal Mail (one of the most trusted letter and parcel delivery companies in the UK) leverages APIs to improve software integration⁹. The use of APIs for integration infuses a level of flexibility into application management making it easier to connect and interface with other applications. Of course, APIs can be used for a lot more than integration or data access. Web APIs are used heavily in mashups today as an effective way to rapidly compose new APIs and expose new business functionality. API mashups will become more prevalent as the API Economy grows and matures.

The list of startups and Internet era companies disrupting established brick and mortar companies is endless. These competitors are different. The incremental cost to attack established businesses is lower than in previous decades. They create innovation platforms, where they continuously learn how people engage and work while doing the same with IT. Understanding API consumption patterns, by whom and how APIs are used, allows for continuous innovation of APIs and apps.

At the same time, we are witnessing the rise of the open data movement in the public sector, where more and more public data is being annotated and made available on the web for anyone to use. This data, usually free of cost, can be used in analytic scenarios or for creating new and interesting applications by mashing up data from different sources. APIs are core to consuming the open data. Governments are increasingly creating their own API management services.¹⁰

APIs are business products, which when designed carefully are easily consumed by any device or system whether that is a website, car, home appliance, or wearable. Anything Internet accessible can consume an API. Web APIs like software products have policies to govern their usage, ensure their care and feeding, and place limits on the amount of usage from a given consumer, based on time of day, tiered consumption, or monetization models (for example, subscription or no-charge). Web APIs have self-evident value unlike the purely programmatic APIs (for example, Java APIs). Self-evident in terms of data or consumable function, instant gratification, and no sales or professional services are necessary for the value to be understood or perceived. Web APIs can be solely used within an enterprise, privately, or they can be public products, or a hybrid where they are products available to selected partners.

⁶ *Ready for APIs? Three steps to unlock the data economy's most promising channel*, Forbes, January 2014: <http://www.forbes.com/sites/mckinsey/2014/01/07/ready-for-apis-three-steps-to-unlock-the-data-economy-most-promising-channel>

⁷ IBM Bluemix: https://ace.ng.bluemix.net/?cm_mmc=IBMBBlueMixMarketing_-_Redirect_-_Perm_-_ibmcom-bluemix

⁸ IBM SoftLayer: <http://www.softlayer.com>

⁹ *Royal Mail launches new API in bid to improve software integration for e-retailers*, found at the following site: <http://www.computing.co.uk/ctg/news/2362928/royal-mail-launches-new-api-in-bid-to-improve-software-integration-for-e-retailers>

¹⁰ API.DATA.GOV: <http://api.data.gov>

The explosion of devices and channels requires that organizations plan for supporting delivery of their business services and products on an unlimited number of devices, some not even conceived. How does an organization keep pace with this rate of change? Competitive pressure is forcing companies to innovate faster. It is not enough to change a business process. A business process change must produce a business outcome that matters, one that can be easily tracked and updated continuously. APIs enable companies to cope with this rapid change. Decades ago companies used to ask, “Why do we need a website?”. A few companies are asking this question today about APIs, but many when asked will say, “Of course we have APIs”. The enterprise is becoming more engaged, more extensible.

Co-value creation

Executives are not as reliant on their IT departments as in the past. IT control of technology spending is shifting from control of the CIO to other C-suite executives. These executives and their staff bring their own data, their own devices, their own software. They are enamored with the agility and speed of product innovation realized at companies born during the cloud and web eras.

The API Economy accelerates co-creation of value through collaborative consumption, between service providers and consumers who are building novel capabilities. APIs reflect a new way of work for IT departments, software companies, and service firms. The adoption of APIs challenges every facet of IT from how requirements are born and captured, how solutions are developed, to how value is created. This is not about a radical change. The adoption of APIs is evolutionary, that is, the way companies leverage technology for competitive advantage is simply shifting. APIs are product change agents.

IT is bifurcating in many organizations. That is, one part of IT is building systems at the edge of the enterprise using a platform built on open source, cloud, APIs, and where acquiring software with a software as a service (SaaS) model is a given. *Prosumers* (producers and consumers) are the new developers in this bimodal IT. Prosumers are API-driven and taking over their companies with open source. This fork in the road of IT reflects a bimodal IT: Digital and non-digital IT. In the digital IT department, third-party co-value creation is a given.

Apps as strategic applications

The application landscape of the enterprise is changing. The app industry has matured and an app industry has emerged.¹¹ Monolithic applications’ features and functions are being replaced with mobile self-service apps. Digital banks are on the rise¹² making available various mobile apps for opening accounts, deposits, funds transfer, and payments.

Multi-year transformation projects, application modernization efforts, or legacy transformation projects are less attractive as initiatives or programs because of cost, high risk of failure, and the fact that the business landscape is constantly changing. These factors are making projects that span multiple years less likely to meet business needs.

Executives recognize the potential of technology to differentiate and change their business. They are often dissatisfied with the pace of innovation in their organization. They often see their current application portfolio as an inhibitor to change and agility, and their applications as roadblocks to making quantum leaps forward in expanding their business models.

¹¹ *Apps Rocket Toward \$25 Billion in Sales*, found at the following site:

<http://online.wsj.com/news/articles/SB10001424127887323293704578334401534217878>

¹² *The rise of digital banks*, found at the following site:

http://www.mckinsey.com/insights/business_technology/the_rise_of_the_digital_bank

Apps and APIs allow companies to think differently. Instead of transforming the business process why not reimagine the client experience using APIs and apps while at the same time positioning the new experience and process to take advantage of trends in mobility, social platforms, cloud computing, and analytics.

Apps, when done well, are designed to dramatically simplify how a task is performed, eliminating and collapsing unnecessary steps. Apps are not consumed over large contiguous chunks of time. Instead, users prefer short bursts of activity. A mobile app is generally optimized for performing a limited set of tasks. Mobile sessions are therefore often composed of sequences of apps, manually *integrated* by the user. Apps are used to perform a single task based on the user's context that could, for example, be their role or location.

More than 60% of consumer and enterprise apps today do not resemble those used nearly two years ago¹¹ illustrating a rapidly changing landscape and maturity of apps. Incumbents have an advantage as users increasingly demonstrate a preference for apps that are downloaded from trusted sources.

Traditional approaches are not equipped for the rapid production of strategic applications. The emergence of new devices and delivery channels puts continuous demand on organizations to extend their support and delivery functions. Applications are getting smaller, more focused; apps arrive and depart quickly. The competitive environment calls for faster innovation, a reason for the proliferation of apps and APIs.

Bring your own device, bring your own data, and bring your own applications is prevalent in many companies. The new user has emerged where mobile is more dominant than personal computers and search has moved to social platforms. People prefer to travel light and they want contextual insight. Apps have moved from *toy* status to providing business-level capabilities.

Another trend is the move away from browser-initiated services and consumed services, as the app paradigm provides an active, unattended medium for consuming services. The app paradigm allows the mobile customer to experience a disconnected mode of operations that move process execution across communication paradigms. For example, a user can start the experience on a smartphone, get interrupted by a voice call, and resume later in the day on a tablet at the point of interruption.

Disconnected choreography, web APIs, and push notifications bring a whole new context to process execution. For example, a loan application could be initiated without connectivity on a tablet. A series of scalable business services using APIs could be executed to look for suitable loan service providers via home, restaurant, or office WiFi connectivity. The loan service providers then initiate a Short Message Service (SMS) or push notifications. The process choreography started by the app now moves to multiple executors that come back with attractive offers that are tailored to that specific consumer. The session can then move to a browser-based process step for completion (for detailed information needs), and move back to a disconnected mode of operations where the consumer is notified on the application status when connected. This scenario creates the need for the next evolution of process execution engines that work on the mobile devices and move process segments back and forth from the app to back-end choreography engines.

Business models evolve

Defining API business models requires planning outcomes, development, and a value strategy for API creation and consumption. Business assets must be transformed for value generation through API development, metering, and analytics. APIs must be communicated and evangelized enabling a network effect.

API business models are categorized into distinct models:

- ▶ *Free model* drives adoption of APIs and brand loyalty. Facebook is the most prominent example of a *for free* model.
- ▶ *Developer pays* which breaks down further into pay-as-you go (for example, Amazon enables developers to pay for only what they use), transaction fee (such as PayPal), or unit-based (such as Google AdWords).
- ▶ *Developer is paid directly*, using affiliates or a revenue sharing model.
- ▶ *Indirect* where, for example, Salesforce.com offers APIs for third-party developers to extend their platform. eBay APIs support sellers with content population that indirectly results in revenue.

Business models are not limited to monetization models; a company can exist where its core business model is APIs. Today, we see the arrival of digital companies whose only products are APIs. Stripe (for payments), Twilio (for telephony services), and SendGrid (for email) are examples of companies providing API equivalents of PayPal, Skype, and Gmail.

Ecosystems emerge

Ecosystems (communities) emerge where companies seek to nurture and support partners in developing APIs or apps that advance their value propositions. Successful ecosystems comprise not only partners but developers (API and apps), industry analysts, journalists, merchants, bloggers, and everyone who can advance the ecosystem: getting out the word, creating content, or creating APIs and apps. Amazon and Google are just a few examples of companies with rich ecosystems, which advance their company's value propositions, competencies, and business services. Low friction growth is the goal where vast ecosystems of partners grow and advance.

API-centric ecosystems enable businesses to co-create value with speed and scale. Examples are plentiful, Amazon's product advertising API¹³ or Google's AdWords API¹⁴. In each case, the API provides programmatic access to business competencies of Amazon and Google. The continuous and emerging use of services and a wider ecosystem drives company relevance, which in turn increases customer value and improves brand loyalty. Ecosystems arise when companies move toward creating an API-centric, cloud powered, agile, consumable as-a-service enterprise.

APIs should be supported through an ecosystem. API platforms enable publication, promotion, and provision of APIs by providers and identification, selection, and consumption of APIs by consumers. Access to API keys, code examples, and communities where opinions and experiences are shared are common elements. Which APIs to expose and promote is a decision that is not only technical, it must also take into account business objectives, in terms of who is the target consumer group and what are the anticipated benefits (for example, new capabilities and new business models).

Optimization is continuous

In the API lifecycle using API management software, the consumption of APIs is understood and monitored as an ongoing activity. Choosing who gets free access to your services and who has limited access (or who is charged and who is not) are features of API management software. In addition, this type of software supports rapid deployment and chaining of APIs to combine them and to expose them as yet new APIs, as demanded by the ecosystem.

¹³ Amazon Product Advertising API:

<https://affiliate-program.amazon.com/gp/advertising/api/detail/main.html>

¹⁴ Google Developers AdWords API: <https://developers.google.com/adwords/api>

Analytics are embedded in API management software enabling a variety of metrics to be captured allowing for continuous improvement of the API and client experience.

API product management is a continuous API Economy lifecycle activity. Product managers often are guided by a product strategy that defines expected business outcomes, metrics, and partners. API product managers must also understand the needs of developers and app users of the API products. Product managers should use the apps that consume their APIs.

Product management is all about designing, building, and operating a good service, that is one that will be used. Producing the product, the API, product development requires a multi-disciplinary team of engineers, developers, program managers, and others. Product managers lead this cross-disciplinary team.

API product managers do any or all of the following:

- ▶ Engage and work the client experience for managing the usage and consumption of the API.
- ▶ Define API enhancements.
- ▶ Set direction for developer.
- ▶ Define customer needs.
- ▶ Branding.
- ▶ Define partner and affiliate relationships.
- ▶ Ensure that the API can reach the largest audience possible.

API product managers are not program or project managers. They are not marketing. They are not engineers or software managers. Product management is not governance. API product managers do the care and feeding of APIs, manage the lifecycle of APIs as first class products, and decide when an API must be retired.

Emergence of purpose driven platforms

Many things are called *platforms* and what we are describing as *purpose driven platforms* are digital foundations (comprising products, services, and technologies). They are business platforms that extend a company's business capabilities to the widest audience possible. And they provide a foundation allowing third parties to build complimentary products, services, and technologies. Platforms have many characteristics further making a definition challenging.

In the publication *The Elastic Enterprise: The New Manifesto for Business Revolution*,¹⁵ Nicholas Vitalari and Haydn Shaughnessy in discussing elastic enterprises describe the challenges in defining a platform but they describe several features of platforms:

- ▶ They enable others to create and produce.
- ▶ They tend to be tightly coupled to ecosystems.
- ▶ Many are about marketplaces.
- ▶ Platforms can be a powerful construct for internal reorganization.

Platforms enable production and transactions. They facilitate the sharing, exchange, and co-development of services.

¹⁵ Nicholas Vitalari, Haydn Shaughnessy, *The Elastic Enterprise: The New Manifesto for Business Revolution*, Telemachus Press, 2012, ISBN 978-938135-34-7

Purpose driven platforms enable creation and growth of digital products for an enterprise without your company being the creator. Platforms allow thousands or millions of developers to build products (for example, Apple App Store), or thousands of partners (for example, Amazon.com). Platforms improve brand and add value for your clients and partners. A network effect occurs as more users, developers, or companies join. Platforms enable economic activity.

API platforms represent an important new dimension of focus for companies. API platforms allow companies to consistently deliver APIs as building blocks for customer, partners, or developers. This newly created, evolving, and diffused network of API enables creation of new capabilities and business models. It also results in newly created partnerships between providers and consumers.

Traditionally, companies thought about platforms as a set of technologies. Internet and cloud era companies expanded such thinking where platforms exist for various purposes, such as enhancement of their brand, accelerated time to market for new products, creation of new channels for business model expansion, or to become an essential aspect of a society.

Apple, Google, Facebook, Salesforce, and Amazon provide examples of platforms. The platform promotes an ecosystem for business. The characteristics of their platforms include:

- ▶ Platform software development kit (SDK) for developers promoting the use of APIs for co-innovation or adoption of platform capabilities.
- ▶ Community capabilities that enable an ecosystem of partners and developers using partner and public APIs.
- ▶ Marketplace, where newly developed or co-developed services and apps by partners and developers can be offered and monetized.
- ▶ Multi-channel interaction patterns that enable creation and delivery of services and apps for different target devices, such as mobile or wearable, creating a customer experience that motivates and attracts.

Platforms rather than websites increasingly are becoming strategic control points to attract and retain customers and provide for an expanding business model making their companies continuously relevant and essential to their customers and partners. The platform is the long tail to encourage co-innovation.

Platforms require a move beyond the boundaries of the enterprise where organizations must become more active in influencing activities across a broader and wider value chain. Platforms not only enable marketplaces to connect buyers and sellers of products and third-party developers to create products (APIs), but also they serve as knowledge brokers leveraging a deep understanding of individual customer needs. Increasingly, these insights about the consumption as well as the wanted capabilities are a differentiator and added value, allowing companies to provide increasing value or enhancing customer loyalty.

Engaging apps

Geoffrey Moore coined the term *systems of engagement*¹⁶ a few years ago reflecting on the growing change in IT innovation, a change in the mental model of IT. This is a big change from the past in which the focus was on systems of record (technologies that rely on a database). The insight is: Many existing systems necessary for doing business (for example, travel reservation, ATM, teller, order processing, authorization switches, claims processing, and others) are no longer a source for differentiation or a way to grow your customer base,

¹⁶ Geoffrey Moore, *Systems of Engagement and the Future of Enterprise IT: A Sea Change in Enterprise IT*, found at the following site: <http://www.aiim.org/futurehistory>

improve brand loyalty, or reduce customer churn. That is, new application types, systems, and models for development have emerged making the application, app, or API experience more engaging in some cases, even magical.

What many describe as modern development, the development of systems at the edge of the enterprise, apps as an example, are often built using open source. Modern development favors the SaaS model for software usage, cloud for consumption of IT services (for example, storage and compute), and of course, APIs for the consumption and delivery of business services. The result is what some people describe as *bimodal* or *two speed* IT where IT departments see a bifurcation between modern development and its predecessor. Some even go as far as to describe the distinction as two speeds where in modern development apps are built and deployed into production in days and weeks.

Technology vendors, analysts, and others use the term, *systems of engagements* to describe application types, systems, models of development, and more. This broad use of the term has resulted in both confusion and fragmentation as to what is a system of engagement. Applications, systems, apps, do not neatly fit into such simplistic labels. Labeling things is often the beginning of creating misunderstanding, hence we will not use the label *system of engagement* in this guide.

Apple, Google, Amazon, and others have reset the expectations of what constitutes a great application or app experience. More and more systems use social platforms or data to create an engaging customer experience. Modern applications empower customers, employees, and partners with context rich apps, increasingly in real time, to help them decide or act in their moment of need.

Business growth depends on expanding the relationship with existing customers, customers who know and increasingly love your company, its products, and its service. With the continuing explosion of the apps market to over \$2.2 Billion¹⁷, as we entered 2014, the importance of APIs is rising. Mobile app development is part of a larger structural change in the way we build applications. We are entering a new age of application development that creates modern, compelling systems. Engaging systems, applications, or apps share the following characteristics:

- ▶ Empower, assist, or enable the user to make better decisions, and complete transactions at the point of contact.
- ▶ Analytics are used to continuously improve and to provide insight.
- ▶ Mobility, when used, leverages the unique functionality of the device (for example, sensors, camera, and GPS).
- ▶ Transform a process, value chain, client experience, or unlocks significant value creation.
- ▶ Solve a clear industry pain point or creates an innovation that matters.
- ▶ Leverage the API Economy as building blocks that is the glue for integration or as the core basis of the app.
- ▶ Transform the client experience by leveraging cloud for consumption of IT services, APIs for business services, mobility, analytics, and social platforms for richer data fidelity and contextual experience.

¹⁷ *Ready for APIs? Three steps to unlock the data economy's most promising channel*, found at the following site: <http://www.forbes.com/sites/mckinsey/2014/01/07/ready-for-apis-three-steps-to-unlock-the-data-economy-most-promising-channel>

These engaging systems, apps, or applications take an API-centric approach for business services. A key benefit of an API-centric approach to externalizing business capabilities is time-to-value. *Time-to-value*¹⁸ is the time from when the effort starts until it achieves its business outcome (for example, sales, revenue, and subscriptions) goals.

An API-centric approach allows solutions, apps, or APIs to be composed, stitched, or mashed up. Third parties of developers or partners accelerate innovation. Companies with business platforms gain an advantage of the network effect where their inventory of digital products is co-created.

The underlying technological capabilities accelerate delivery of innovative solutions. Internet and cloud era companies engage in this new, networked services economy, the API Economy. This approach allows them to monetize on the capabilities derived from their core offerings, as is the case for BestBuy or Aetna, as well as offerings that are a result of composition with third-party capabilities, such as AT&T and Telefonica. Recent research examined the positive correlation between Netflix's share price growth and the number of API calls that it receives¹⁹.

The shift in the consumption of services to the web opens up challenges in exposing existing business capabilities that are delivered in the back-end, or through integration with other enterprises. Moreover, companies must ensure integrity and quality of services that are composed from core business functions and delivered by third-party developers.

Technological underpinnings to drive enterprise-level adoption of API-centric models, to quickly deliver new solutions, requires three key enablers:

- ▶ Externalization
- ▶ API management
- ▶ Services fabric

Enterprise externalization is a foundational capability that facilitates creation of business as-a-service model. It is concerned with API definition and integration of right-scaled core function infrastructure, which includes robust security mechanisms. API definition consists of planning the API specification for reusability and involves careful analysis of the existing back-office application and data inventory. Technical challenges include deciding when to build a new API from scratch or to leverage existing back office and legacy services if any. Creating APIs often includes deep dives into enterprise applications and data models, coupled with usage and access requirements specifications. It is critical that the APIs are designed with consumability and flexibility in mind to support further composition that is likely to be through a third-party developer.

Discovery of data objects and flows helps determine which systems to tap when mapping an API to a backend system. From a data perspective, traditional data analysis and design tools will uncover the schemas and relationships in the data. When this static approach is not sufficient, it may be necessary to analyze the data itself and predict its source and likely mappings that transform the data as it moves through the systems. Similarly, understanding the process flows will indicate what systems are involved when transactions flow end to end.

This service-driven composable approach impacts business engagement models in development and delivery. At this stage, the focus is on identification of APIs and their composition. At the same time, the requirements for federating control, security, and privacy of the composite capabilities enabled through iterative development and deployment must be addressed.

¹⁸ *Apple's Most Obvious Secret: Reducing Time-to-Value*, found at the following site:

http://www.workingwider.com/strategic_innovation/apples-obvious-secret-reducing-time-to-value

¹⁹ Daniel Jacobson, et al., *APIs: A Strategy Guide Creating Channels with Application Programming Interfaces* O'Reilly Media, 2011, ISBN 978-1-449-30892-6

Once the APIs are defined and developed, the API management layer provides security, governance, and monitoring. Metering of API invocations enables rate limiting to be applied, API use to be charged, and to provide security for business data.

New incoming workloads can be unpredictable. API management throttles access to ensure that variable traffic does not affect system stability. Understanding the new workloads can set off new efforts within the enterprise to revamp the back-end systems to become more elastic. Migration and consolidation of existing systems and use of private clouds are available options. API management provides the underlying technology to support message-format translation, usage, and access policy management, and service throttling and version and change management.

A services fabric further enables an API-centric service-computing model, which facilitates the creation of novel capabilities based on existing APIs to deliver added value capabilities. A services fabric component supports this innovation at scale by providing a framework for composing innovative solutions using a collection of service patterns, business models, and delivery models. Service patterns define how services are composed and their deployment dependencies, where applicable. They abstract the business logic to create *reusable apps*, which when instantiated can replace one or more APIs depending on the performance and legal requirements.

In summary, sales and development cycles are rapidly decreased using an API approach. Development happens at micro scale, with continuous innovation happening in weeks and months, making the business engagement model more agile. Finally, consumption is changing to pay-per-use and other custom models, enabling service providers to build their own ecosystems and attract new customers rapidly.

Business agility and innovation with SOA and APIs

Service-oriented architecture (SOA) illustrates the separation of the interface from implementation and that implementation can be divided into several layers. One layer is a more abstract specification of where the endpoint for the service implementation may reside. Often, an enterprise service bus (ESB) is used to virtualize endpoints so that the optimal endpoint can be selected based upon configurations or input parameters or more pragmatic considerations pertaining to security, scalability, or performance.

Implementation is separated into a realization decision and a deployment set of options. The realization decision is primarily governed by the questions:

- ▶ How am I going to implement the service?
- ▶ Which component is going to be used to implement the service functionality?

The component can be anywhere from a .net component and enterprise JavaBeans or a legacy application interface or even a package application. The deployment option includes not only the protocol by which the implementation is realized but also the configuration options pertaining to the infrastructure or platform used to ultimately operationalize the solution.

Representational State Transfer (REST) is a protocol created to support a very lightweight mechanism to replace the more complicated SOAP protocol and therefore can use HTTP or HTTPS. Therefore, the verbs that can be used are the get and put actions familiar to web programmers.

RESTful APIs are APIs that extend enterprise capabilities hitherto reserved for webpages into the ecosystem. This ecosystem of partners who are now able to interact using RESTful APIs, create the opportunity for an API Economy.

APIs need to be called directly from the browser (for example, HTML5) and consumed directly by the database (for example, Cloudant). There may not be a need for things in between, such as the web servers or application servers. Often, it is not the fastest API that is the best to develop to, it is the most predictable (such as the one with fewer failures). Many APIs will require cloud computing to address streaming, high velocity, and low latency processing.

The industry continues to bifurcate in defining SOA, where SOA is viewed as a technology initiative to normalize systems integration problems versus a foundation on which to enable business agility and improving business effectiveness. IBM contributed substantially to the open standard Open Group Service Integration Maturity Model (OSIMM)²⁰, which describes an ever-increasing maturity of services and their value propositions. OSIMM was based on work done by IBM, the Service Integration Maturity Model^{21 22} (SIMM). In SIMM and OSIMM the term-virtualized services are APIs. The dynamic reconfigurable services described in the models are akin to what is currently being described as predictive or contextual APIs.

Although at times overhyped, as the next silver bullet of IT, SOA largely delivers on its value creation potential for companies that are willing to invest and that fit a certain architectural profile. For others, SOA has not delivered on its promise. APIs, like SOA, are not silver bullets and each has value on its own. APIs and the architectural style of SOA are naturally synergistic and best when done together in support of engaging systems and composable business.

The architectural profile of companies where SOA has the greatest impact hinges on business and IT relationships. APIs are a service, though they are different as they are also products that have a natural affinity to business stakeholders. Those stakeholders actively see APIs as the key to extending a company's business capabilities to the widest possible audience while ensuring they are easy to do business with in consumption of their products. APIs for most businesses are a key to accelerating value, volume, and adoption by enabling open platforms for innovation and competition. This value proposition coupled with modern development makes APIs distinctly different but complementary to SOA for increasing business agility.

APIs should not be viewed as an alternative to SOA, but as a part of a well-architected service-oriented enterprise. While early SOA was largely confined to the enterprise and focused on interoperability, APIs are about consumability and extending the network of providers and consumers. APIs are simply the way that an enterprise chooses to expose business services to a broader audience in a controlled fashion.

APIs, however, are a specific genre of services with a lifecycle that focuses on consumption by developers separate from the API provider (whether internal developers in another department or developers external to the enterprise). This aspect is more than just a nuance. It drives focus on simplicity, security, and compatibility with standards-based external systems. The focus on APIs by companies is largely to increase the pace of innovation or to allow business model adaptations (for example, move into new industries or markets). In contrast, the focus for SOA is often on agility and effectiveness of application management, delivery of IT systems, or business processes.

²⁰ Open Group Service Integration Maturity Model (OSIMM): <http://www.opengroup.org/soa/source-book/osimmv2>

²¹ Ali Arsanjani, Kerri Holley, *The Service Integration Maturity Model: Achieving Flexibility in the Transformation to SOA*, IEEE Computer Society, 2006, ISBN:0-7695-2670-5, found at the following site: <http://dl.acm.org/citation.cfm?id=1174253>

²² *Increase flexibility with the Service Integration Maturity Model (SIMM)*, found at the following site: <http://www.ibm.com/developerworks/library/ws-soa-simm>

Web APIs are different from classical web services in their focus on simplicity, meeting the needs of modern app developers, and leveraging Internet technologies (for example, HTTP, REST, and JSON) for scalability. Details depend on what the API is for, who is going to use it, and how it is connected to the systems of record of an enterprise. In other words, APIs do not come in one size fits all.

From an architectural perspective, APIs as services have a defined interface and there is defined expectation of what happens when you interact with that interface. REST APIs done well are establishing a simple, completely defined, non-negotiable contract between the API provider and the developer using the API, thereby maximizing the separation of concerns.

APIs as the external interface of a service have certain characteristics, such as security, that are managed as part of an API management solution. There are also specific operational and quality of service concerns associated with the implementation of the API, such as availability and performance. These characteristics are related to the notion of an API being considered and managed as a product. Given the growing number of APIs and their consumers in public API ecosystems, expectations on their availability, performance, and throughput will be harder to predict.

The architecture of API consumption is an important consideration due to the intrinsic separation, organizationally and practically, between API provider and API consumer. From an API provider perspective, how do you get people to try out your APIs, how do you control that consumption, and how do you get feedback, good or bad, on the value and practicality of your APIs? From an API consumer perspective, how do you easily sign up to try out an API, how do you practically try it without a lot of development required, and how do you make the use of an API a natural and transparent part of the way you develop apps in general?

Controlling the relationship, from a provider side as well as from a consumer side, is an important part of API consumption. Good *contracts* on API consumption address several considerations:

- ▶ Usage: How much, when and for what purpose?
- ▶ Branding: At development time as well as runtime, what are the branding objectives or requirements for use of the API?
- ▶ Liability: Reduce operational and legal risk as appropriate, but be prepared to back your APIs, ensuring availability and performance or there is a monetary fee involved with using them.
- ▶ Geographic: Are there legal or practical constraints on where the APIs may be used?
- ▶ Data ownership: Clarify who has the right to, not only the data flowing through the API, but also any business insight derived from the traffic.

Each consideration applies to any channel consuming an API, whether mobile, which is currently the predominant API consumption channel, web, anything (for example, connected car), or the present and emerging things in the Internet of Things. All channels, including mobile, come with their own de facto adopted standards on protocols for API consumption.

An appropriate contract should be in place before an API is used in production, but trial environments may be established that are *free of use* in order to entice new consumers to try out the API before committing. Do not force a potential API consumer to go through any kind of legal, technical, or process hurdles just to try the API. That hurdle will prevent many potentially beneficial uses of your API.

API adoption models

This section describes four API adoption models. These models (Figure 2) reflect four adoption models emerging in API usage, which vary in complexity and their required investment.

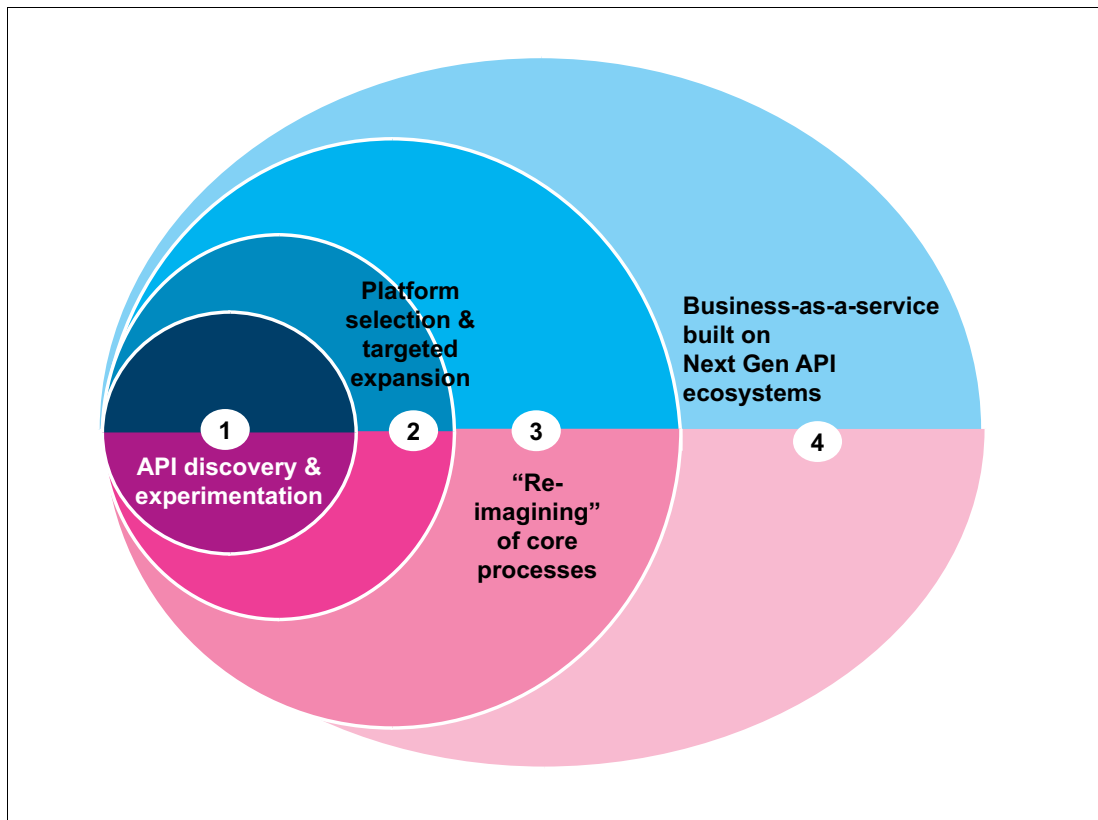


Figure 2 API adoption model

Figure 2 shows the API adoption models, which reflect four distinct models of adoption. The API adoption model is not a maturity model as organizations may find themselves adopting one or more adoption models based on products or the business becoming digital. Line of business may decide it must make its operating model (people, processes, and technology) digital to compete, to innovate, or to adapt to the unknown future but certainty in change and market shifts.

API discovery and experimentation is often the first step towards adopting an API strategy. It targets experimentation with one or more API services. The most common approach involves development of customer facing mobile applications with limited integration into core systems and experimenting with multiple API management platform providers. Organizations build tactical API gateways on existing technology stacks to expose REST services to a new app or channel. Then, they assess vendor capabilities and select a strategic capability. Given its experimental nature, this model does not require significant investment and typically can be enabled in a short term (such as couple of months). This adoption model is also evident with product campaigns often promoted on social platforms such as YouTube, where public APIs from FourSquare are used to locate the user and present them the promotional offers in their area.

Companies use FourSquare to alert the customer of a promotion incenting them to visit and make a purchase at the merchant²³. In this case, promotion management to increase brand value and improve customer or merchant loyalty is the goal.

Platform selection and targeted expansion goes beyond the testing the waters phase and seeks to expand the adoption of APIs into additional business use cases. At this stage, enablement occurs and the organization seeks to perform reasoned prioritization of core systems to expose and externalize APIs. Businesses taking this approach are seeking revenue growth-oriented efforts, new products and services, and simply new customer value to extend their business capabilities to a wider audience. The core step in this approach is identification of core competitively differentiated APIs central to its business, while creating a sticky ecosystem experience through consumable APIs. This model requires a medium level of investment. Humana²⁴ or Aetna²⁵ entry into APIs provides good examples.

Re-imagining of core processes occurs as a broader strategic adoption by executives of API-based scalable services, as the business-centric approach for transformational thinking to transform core business processes. This adoption model is especially applicable for clients with legacy systems, which constrain business model or major business process changes. In this scenario, the cost to shift or transform legacy systems is often cost prohibitive and hence requires new thinking on the *how*, which requires a focus on business outcome thinking versus the traditional approach of requirements thinking. It also requires thinking about how to transform a client experience to make it *magical* where the process takes advantage of the unique aspects of, for example, a mobile device or social platform capabilities.

Business-as-a-service built on Next Gen API Ecosystems is where web era companies begin and often have an advantage in enabling novel capabilities, turning clients into partners, and embracing new business models. Companies with fewer legacy systems can leapfrog to this model.

Organizations moving toward the business-as-a-service built on Next Gen API Ecosystems model adopt all the other three models. They seek growth without massive management complexity. In the business-as-a-service built on Next Gen API Ecosystems adoption model, companies develop and evolve business platforms. Their leaders know how to grow ecosystems and attract resources to their ecosystem, platform, and enterprise.

When companies embark on becoming *digital*, business-as-a-service using APIs is one of the foundation adoption aspects. Maximizing your company's growth potential is the primary reason for this adoption model and participating in the API Economy. Music and gaming are industry examples of primarily digital. Companies become more digital to extend, enhance, or redefine the customer experience or app or business process.

The motivation for the business-as-a-service built on Next Gen API Ecosystems model is to make adoption of a company's products and services (its value propositions) simple while minimizing the incremental change necessary to adapt to a continuously changing economic, market, and technology landscape. In this case, companies do not trash and burn their existing legacy systems or business model but they embrace the need to remain essential with their customers, expand their value, and prevent the churn of their customers to new competitors. As the API ecosystem grows, it is important to nurture it and evolve the APIs in a manner that is consistent with the use that is observed, maintaining compatibility and optimizing for those scenarios that offer sound business value.

Incumbents can look to start-ups as examples of API-enabled disruptive business models. Traditional enterprises, such as banks, see disruptions in loans and payments as examples:

²³ FourSquare video: <https://www.youtube.com/watch?v=ihkGwodihJ4>

²⁴ Human APIs: <http://humanapi.co>

²⁵ CarePass: <https://www.carepass.com>

- ▶ Zopa is the leading peer-to-peer lending service in the UK. Since Zopa was founded in 2005, it has lent more than £651 million in peer-to-peer loans²⁶.
- ▶ Stripe is a company that facilitates individuals and businesses to accept payments through Internet and mobile devices using APIs. Stripe enables frictionless payment transactions through a feature-rich API creating a developer friendly way to accept payments online and in mobile apps. Stripe processes billions of dollars a year²⁷.
- ▶ Mint.com helps individuals get a handle on their finances by organizing and categorizing spending. Mint's service pulls all the individual's account information into one place. Using Mint's free mobile app allows individuals to track their money whenever they are in the world²⁸. Imagine the possibilities for Intuit (they own Mint.com) for creating new mobile apps and digital products (also known as APIs) that serve their customers leveraging the vast amount of accumulated data.

Examples abound in every industry with Amazon and Salesforce being poster children for leveraging the API Economy, companies building with a next generation platform, moving beyond enterprise IT to an API strategy²⁹. These companies leverage social, mobile, and analytics for a richer experience with their customers. Their apps and applications are built using next generation platform. They leverage the web, cloud, SaaS, APIs, social platforms, and mobility. Incumbents are prudent to look at Internet and cloud era companies, the digital companies versus their traditional competitors for compelling case studies on how to leverage the API Economy.

Conclusion

Technology in its widest sense has progressively risen on radar of CEOs. Technology ranked as the number one factor impacting organizations³⁰. Technologies continue to accelerate, evolve and intersect impacting markets, business models, and spending priorities. This intersection is fueling the rise of apps and digital products, that is APIs. Ensuring your services will be accessible in any context with any device, present or future requires adoptions of APIs and participation in the API Economy.

The age of the customer³¹ requires both new kinds of systems and faster responsiveness by IT stakeholders to evolve systems to keep pace with customer expectations. New IT systems to satisfy the new expectations, will be apps, applications, and systems that support collaboration and contextual experience, personalized with customers creating composable business systems.

Both consumers and B2B buyers are empowered with information, applications, networks, and devices. Customers may hold a technology advantage over you as they demand value and personal attention, quick responses, fun and direct online experiences, and the ability to help and serve their needs. Customers (consumers and businesses) can easily switch to a competitor if your enterprise does not live up to their expectations.

APIs are all about ensuring your company is easy to do business with while extending your capabilities to the widest number of customers available. Customers must be able to access the products and services they want. Their demand for individual attention and the needs of

²⁶ Source: <http://www.zopa.com/about>

²⁷ Source: <https://stripe.com/about>

²⁸ Source: <https://www.mint.com/what-is-mint>

²⁹ *Move Beyond Enterprise IT to an API Strategy*, found at the following site:
<http://blogs.hbr.org/2013/08/move-beyond-enterprise-it-to-a>

³⁰ *IBM CEO Study 2012*, found at: http://www-935.ibm.com/services/multimedia/anz_ceo_study_2012.pdf

³¹ Doc Searls, *The Intention Economy: When Customers Take Charge*, Harvard Business Review Press, 2012, ISBN 978-1-4221-5852-4

the B2B buyers for self-service can only be satisfied through contextual customer interactions fueled by APIs.

APIs as a public persona to be successful from a business perspective, must:

- ▶ Be simple in scope.
- ▶ Be pervasive throughout multiple architectures (that is, support multiple protocols and programming models for service and data access).
- ▶ Provide controls in the form of policies (such as a quota, limiting the number of calls to this API from a given user during a specific period).
- ▶ Be personalized for target audience and business need.
- ▶ Be easily consumable.

Many organizations are working with jStart, IBM Emerging Technology's client engagement team, developing emerging technologies solutions to address immediate business needs³². IBM Bluemix³³ allows companies to rapidly build, deploy, and consume next generation web applications, services, and APIs. IBM API Management³⁴ provides companies with the tools for creating, proxying, assembling, securing, scaling, and socializing web APIs. A more detailed understanding of API creation, management, and developer portal can be found by reading the IBM Redbooks® publication, *Exposing and Managing Enterprise Services with API Management*, SG24-8193.

As we usher in a new era of computing from programmable systems to cognitive systems, IBM Watson™ is a breakthrough technology. Watson represents a first step into cognitive systems, a new era of computing. It uses programmatic computing plus the combination of three additional capabilities that make Watson truly unique: natural language processing, hypothesis generation and evaluation, and dynamic learning. While none of these capabilities is unique to Watson by itself, the combination delivers the power to move beyond programmatic computing and unlock the world of global, unstructured data. With Watson technology, we can move from a keyword-based search that provides a list of locations to an intuitive, conversational means of discovering a set of confidence-ranked responses.

Advancements in platform as a service (PaaS) continue to accelerate the adoption of APIs and apps. Opportunities exist to simplify traditional middleware functionality and to accelerate development (DevOps lifecycle). IBM researchers tackle these issues in the paper, *Don't Call Them Middleboxes, Call Them Middlepipes*. The authors propose a new network function abstraction to PaaS clouds called *middlepipes* where traditional middleware or PaaS services are moved closer to the point of invocation.

IBM Watson participates in the API Economy through the Watson ecosystem, a community of content providers, developers, and organizations, who collaborate and create the next generation or era of cognitive apps.

In conclusion, embracing the API adoption models will be a key differentiator for successful enterprises in their drive towards business agility and growing in this new era of IT. Leveraging the Watson ecosystem and Bluemix will accelerate companies' adoption of APIs.

Other resources for more information

For more information about the topics discussed in this guide, see the following resources:

- ▶ *Exposing and Managing Enterprise Services with API Management*, SG24-8193

³² jStart, <http://www-01.ibm.com/software/ebusiness/jstart>

³³ IBM Bluemix, <https://ace.ng.bluemix.net>

³⁴ IBM API Management, <http://www-03.ibm.com/software/products/en/api-management>

- ▶ *The Era of Cognitive Systems: An Inside Look at IBM Watson and How it Works*, REDP-4955-00
- ▶ *Don't Call Them Middleboxes, Call Them Middlepipes*
<http://dl.acm.org/citation.cfm?id=2620760>
- ▶ The Watson Ecosystem
<http://www.ibm.com/smarterplanet/us/en/ibmwatson/ecosystem.html>
- ▶ Kerri Holley, *The Power of the API Economy: Rethinking Disruption and Becoming a Digital Business*, ISBN: 0134136969 / 9780134136967, IBM Press, June 2015

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