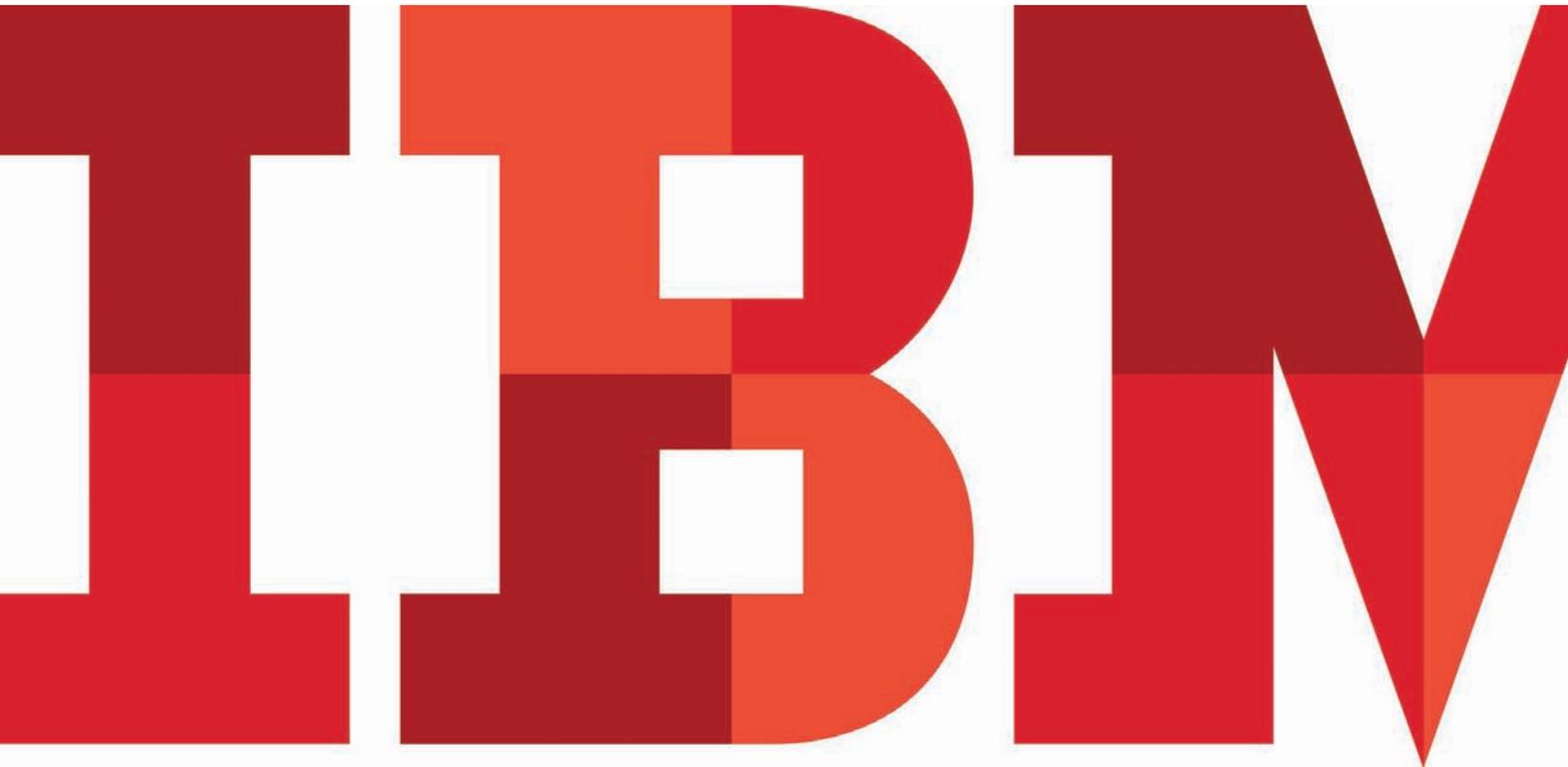


The new innovation economy of data, APIs, mobile apps and the Internet of Things

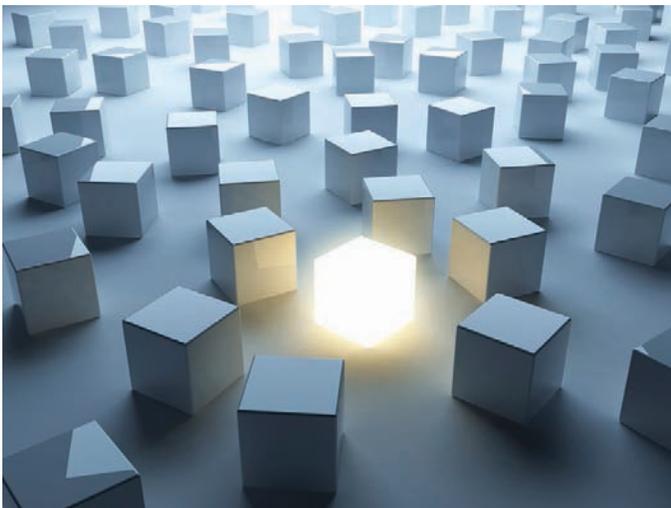
Build and manage apps more effectively at reduced costs



Today, something profound is happening to the world economy. The traditional understanding of the **information economy** is giving way to a new variation that will have an enormous impact on jobs, wealth and entire industries. This new economy has its roots in data, but of equal importance are Application Programming Interfaces (APIs) and mobile apps. A fourth factor is also working as an accelerator on the other three: the Internet of Things.

The business entry point for this new economy is low. All you need for success is a good idea and the will to take it forward. The result is a vast surge of human creativity. For this reason, perhaps the most appropriate name for it is the innovation economy. The innovation economy is being made possible through new tools that make it easy to connect data sources and monetizable application components accessed through published interfaces called APIs. These APIs enable applications to be composed with other APIs to develop completely new application solutions. A catalyst for the development of these new applications is the emergence of cloud-based platform as service (PaaS) offerings such as IBM® Bluemix™.

The new innovation economy



The global innovation economy

It might seem cliché to say something profound is happening to the world economy, but something profound is indeed happening and the business community must pay attention. The agricultural economy, the industrial economy and the information economy have had a major impact on this world. The new economy of today and tomorrow might just be a new phase of the information economy, but if so, it is very different from what people have experienced thus far. The participants are different. The impact will be different and therefore, the new economy deserves a different name.

The new economy has its roots in **data**. You could call it **the data economy**, but it would be insufficient. Data is central, but the new economy is characterized by other elements also. The term the API economy is also popular, which is important, but represents only part of the picture. Mobile applications and the Internet of Things also play a role, as does a new class of programming tools.

What is singularly different about this new economy is the impact it will have—indeed is already having—on human creativity and innovation. As a result of the ability for an everyday programmer to easily incorporate advanced technologies into his or her app, business people can rethink how applications and business processes can be recreated. You are already beginning to see a profound impact on almost every industry. New ideas are easily shared, which serves to accelerate the further stimulation of yet more new ideas. Because barriers to entry are low, virtually anyone can build new business offerings and services at a much lower entry cost. All you need to participate is a good idea and the will to build a business around it. As a result, this accelerated generation of ideas will grow and unleash innovation on a scale the world has not previously witnessed. Because of this impact, perhaps the best name for this new phenomenon is the innovation economy.

It all begins with data



Data is the new oil

The industrial economy has been fueled for decades by a specific natural resource: oil. Take oil away and as the world has witnessed, economic activity slows. The innovation economy is similar but the fuel is different; the fuel is data. Take data away from today's economy and activity slows.

But data has a different property from oil that changes how it impacts economic activity. Physical resources are finite in their reusability; data is not. Data is infinitely reusable. While both natural resources and data can be mined and processed for value—that is the creation of insightful information—data is different in that it can be combined with other data and then mined and sold over and over again. In the innovation economy, you do not run out of fuel. The fuel generates more fuel.

It is important to note that there is a distinction between data and information. Data is typically raw information; it is not necessarily meaningful. Information is data that has been processed and has value. In the context of this article, when the word data is used, it could be either.

Almost every major industry is being remade by data; from healthcare, to agriculture, to manufacturing, to insurance, to banking, to retail. Data is having a massive impact.

Look at healthcare, one of the largest segments of today's modern economy. In many respects, the healthcare industry is still in the dark ages. Yes, doctors know a lot about how diseases work and have wonderful medicines to target them, but doctors still use a lot of guesswork. They do not have a great way to capture and compare symptoms, diagnoses, treatments and outcomes across the population. Whenever a doctor is presented with symptoms, he or she has to reach back individually into his or her experience to make an **educated guess** as to what the problem is. Doctors do not have enough information to say for sure what is going on. Treatments similarly are also driven by best guesses based on individual experience.

But what if doctors had a massive amount of additional data at their fingertips upon which to formulate both diagnosis and treatment? The effects would be different. That day is fast approaching. You might see it happen as more and more people begin using wearables, portable sensor technologies that measure everything from blood pressure to glucose level to muscle fatigue. Right now, **wearables** are used by only a small portion of the population. But mobile phones started that way too and look at how ubiquitous they are today. People care enormously about their health; they have huge vested interests in monitoring and maintaining it. The problem with wearables is the hassle factor, but if the devices were non-intrusive and tracking were easier and users received massive benefit from wearing them, almost everyone will wear them.

Big things happen when you get enough data to see what is going on in a whole system. When a sizable portion of the population begins using **wearables** and sending real-time anonymized data to the cloud, big things can happen to the healthcare industry. Certainly the effect on individuals might be great in itself, but the best insights will be achieved when you can compare information across the population. With such a transition, doctors will be able to capture much better information upon which to base both diagnoses and treatments.

People get nervous about having their medical information put up in the cloud and potentially misused. With the rash of breaches of confidential information, it would be naïve to say these concerns are not justified. But at the same time, there are techniques to protect information and prevent abuse. Client-doctor confidentiality can be put in place so that diagnoses and treatment cannot be linked to a specific individual. Data anonymization techniques can mask the identities of individuals but preserve the characteristics of overall populations. When large quantities of anonymized health data are analyzed, the value for all can be amazing. Such analysis can lead to commercial opportunities for the data—both raw and analyzed. With this analysis, people can drive great innovations in healthcare, enabling improvements in efficiency and effectiveness on a large scale.

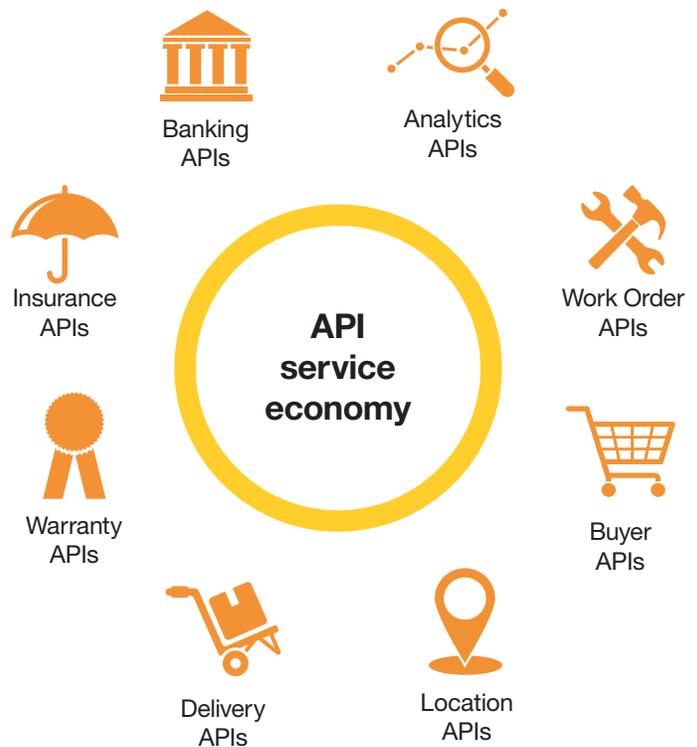
The benefits of anonymized data can be tremendous across industries. Bankers can sell anonymized data to marketers and policy makers to better understand the characteristics of a population and help target businesses better. Telecom executives can do the same.

For some industries the use of data can remake the industry. For instance, the business of insurance is built on the idea of measuring risk; the more accurately people at an insurance company can measure risk, the more accurately they can price a policy. As of now, the insurance industry tends to focus on averages. More and more they will focus on targeting based on individuals.

The retail industry is also becoming data-centric. The more a retailer knows about what a specific customer wants, the better he or she can target offerings. There is a reason why Google makes so much money while giving away so much for free. Google executives have data about you that retailers are willing to pay for, handsomely.

Data is a core fuel for this new economy. If one can access large amounts of data and analyze it and offer insights, people will pay for it. More and more people at organizations are realizing the economic value of data. Entrepreneurs will set up companies that will act as data brokerages in the data economy.

APIs as the mechanism of trade



Services can be implemented as APIs

If data is the raw material for the innovation economy, APIs are the machines used for getting at and consuming the data. You can use APIs to access commercial application components that can be bought and sold in their own right.

What are APIs? In computer programming, an API specifies how to interact with a particular software program. An API is an interface to a service. You send messages to an API, or ask for something through an API and a program executes a function or returns a specified result. APIs are not new and the term can be applied to a broad set of callable functions.

But in the context of the innovation economy, APIs often refer to a specific type, REST APIs. Representational State Transfer (REST) is a mechanism that enables two applications to interact over the Internet using tools similar to that of a web browser. The way a web browser works is that when you type in a URL, you are pointing to an address of a resource, in this case a specific set of data. A URL is like a GPS coordinate for information. The browser grabs the data found at the coordinate and formats it for you as a web page. The web page itself is just a representation by the browser of the resource.

REST APIs work similarly in that they use URLs to identify the location of a resource. But rather than representing the resource through a browser, the resource is represented in a manner that is suitable to the particular application program. Another dimension is added with REST. It uses additional verbs to do things with the resource. The resources can be data or whole applications, or even parts of applications.

An example of a REST API most people can relate to is the API used to call Google Maps. As a user, you typically think of Google Maps as a web or mobile application. But Google also provides Maps as an API. Google allows third-party programmers to call Google Maps functionality and to incorporate that functionality into their own applications.

Many apps, today, are assembled from APIs from multiple sources. For instance, cars.com is a website that provides a single point of service for buying, selling, researching, financing, or repairing cars. The company has effectively composed a business that uses APIs from several sources—auto dealers, banks, insurance companies, map providers and an analytics provider.

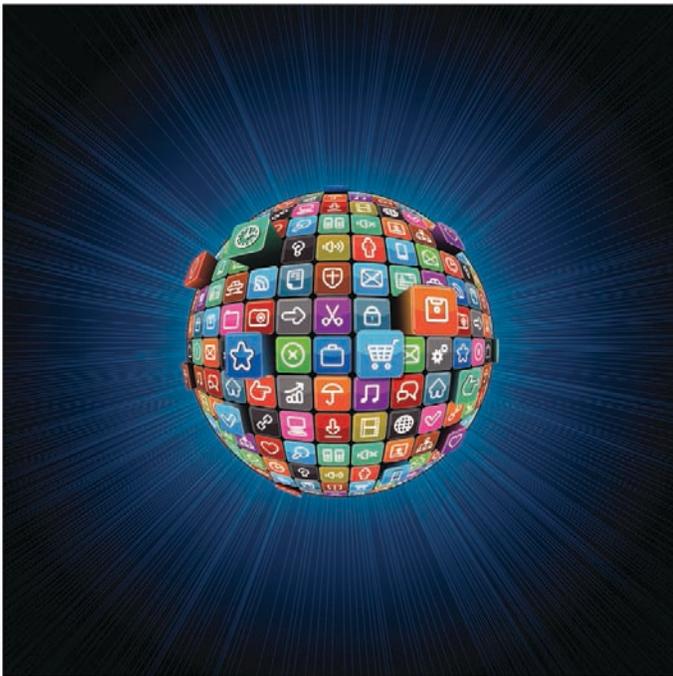
Vendors can choose to make their APIs available for a fee or free. Google Maps are available to the general public free of cost, or at least you might think the app is free. The reality is that Google has made a deal with you. The deal is that you have given Google the right to your information and in return the Google team is giving you all kinds of free app functions. Check the fine print on any Google application. Therefore, Google Maps is not really free of cost; advertisers are paying for it. It is a similar business model to television or radio.

But Google Maps is not free for everyone. When a third party incorporates Maps into its own app, the Google team charges for the privilege. APIs that access data are therefore essentially commercial building blocks for the new economy.

APIs that access data can be bought and sold; the role of data and APIs are therefore interrelated. APIs provide a mechanism for accessing data and packaging it up for commercial purposes. Data can be presented in many different ways using various APIs. Raw data can be accessed as a simple query API.

Analyzed data for providing specific insights can be presented as a more advanced API. You can also aggregate data from different points, run new analysis on it and produce new consumable APIs.

Apps usher in the era of the composable business



Proliferation of apps

According to Portio Research, the global market for mobile apps will be worth USD63.5 billion by 2017.¹ That is just for **paid** mobile apps primarily off the Apple App Store and Google Play. **Free** apps account for 94.5 percent of all downloads.² When you factor in the free apps and consider the fact that most free apps make money using alternative business models such as the Google Maps example, the size of the total market driven by apps is enormous—bigger than the economies of many countries.

In the late 1990s, IBM's marketing team coined a term and ran an ad campaign around **e-business**, betting that company websites would become as necessary to every company as a logo. Today, the prediction is that mobile apps will become as commonplace for every company as a website. In fact, given the more focused nature of mobile apps versus web apps, developers at companies are more likely to build more mobile apps. Having mobile apps is becoming table stakes for running a business.

Just as cars.com has fashioned a differentiated business by aggregating various APIs into a useful new consumer service, executives at other companies are realizing the power of APIs too. The new apps being developed are not just coming from startups. Traditional business professionals are realizing that they can dramatically refashion their own existing businesses with mobile apps.

The two most differentiating features about mobile apps are:

1. Mobile phones are almost always with people
2. Mobile phones enable a new class of apps that are based on context awareness

On the first point, 91 percent of people keep their phones within an arm's reach 100 percent of the time.³ So executives at companies are realizing that if they want to reach their customers, the most important channel for them is the mobile phone. On the second point, mobile devices come with all kinds of sensors—GPS and WiFi for understanding location, accelerometers for understanding the direction you are going and how fast you are moving. In addition, mobile devices also include cameras and QR scanners to help you provide feedback about the immediate

world around you. All of these features give app owners a better picture of the context of the user. Business leaders are realizing that they can dramatically improve their business processes by reshaping themselves with context-aware mobile apps.

Although there are many context-aware apps available, the reality is that the market for new context-aware apps will explode once you consider the last input to the innovation economy story—the Internet of Things.

The Internet of Things as the accelerator



By 2020 there will be more than 50 billion things connected to the Internet

In 2000, IBM's marketing team ran a TV ad called **the refrigerator**. The ad opened with a doorbell ringing. A woman opens the door and a repairman says, "I am here to fix your refrigerator." The woman says, "My refrigerator? There is nothing wrong with my refrigerator." The man says "Not yet." The ad then flashes to a line that says, "Appliances that call for help before they break down—they are coming."

The ad was meant to illustrate that the era of machine-to-machine (M2M) communications was just around the corner. At the time, the IBM team even put together a **pervasive computing** organization. Unfortunately, the IBM team was a little ahead of the market on that one, but the prediction was accurate. The era of machines that report back when they need help is indeed coming and in many industries these machines are already here.

In today's market, people have largely stopped using the term M2M and have instead adopted the term **Internet of Things**. For years, Internet of Things or M2M had a relatively consistent level of media chatter. But near the end of 2013, that chatter started to pick up and by mid-2014 interest has increased exponentially. The top sources of chatter around the world are South Korea and San Jose—the centers of gadgetry and technology.

The Internet of Things is currently very popular. There are probably a few reasons for that. Mobile phones are maturing. You are seeing technology companies such as Apple move into new spaces. It is evident with technologies such as Continuity, available with Apple iOS8. Continuity helps to preserve state across devices. You start a task on an Apple Mac, move to your

iPad, later pick up your iPhone and potentially interface with Apple Carplay in your car. The point is that you can interact continuously with a number of things in your world.

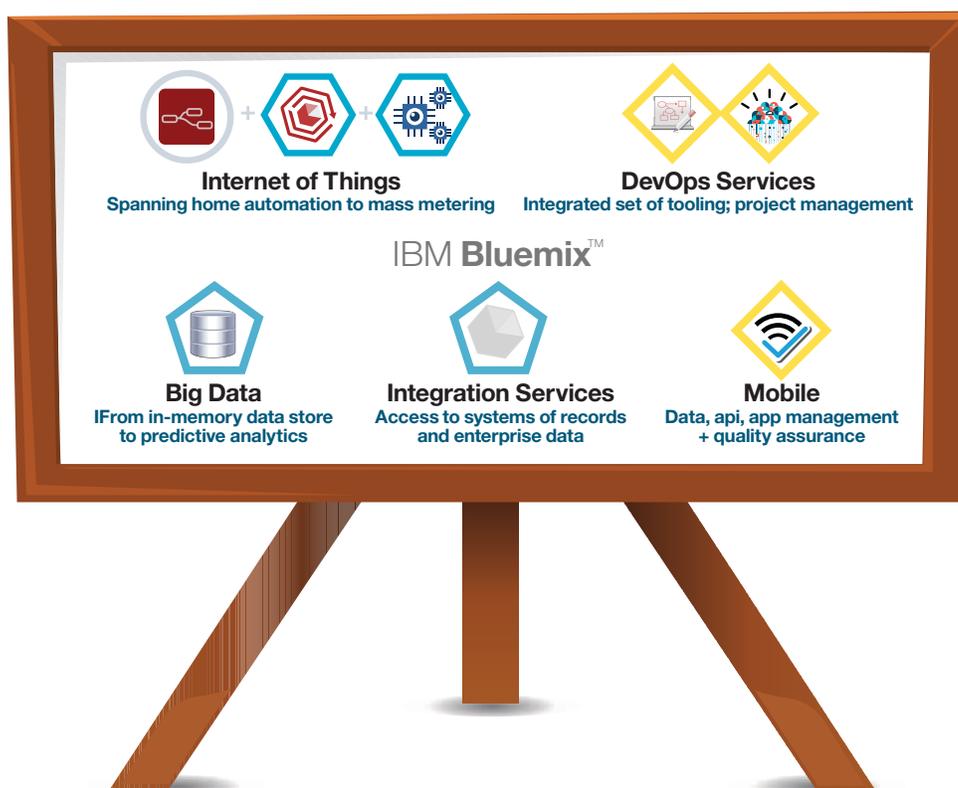
It is in this context that is best to view the Internet of Things. People want to be able to interface with their world so that their interactions with devices are not occurring in silos. Technology is supposed to make life easier not harder. The Internet of Things is really the beginning of a system for integrating technology more seamlessly into people's lives.

To make the Internet of Things work, you require open communications protocols that allow for the integration of devices from many sources. You also require the aggregation and analysis of data. Lightweight open protocols such as MQTT, supported by information technology standards bodies such as OASIS and open source proponents such as the Eclipse Foundation, are putting in place the standards for Internet of Things interoperability.

But the big advances for Internet of Things will come from the ability to access all of this data and to do analytics on it. It is estimated that by 2020 there will be more than 50 billion things connected to the Internet.⁴ Data from Internet of Things devices will eclipse all other data currently available. As these data sources come online, the potential for the innovation economy will accelerate. But it will be the revolution in developer tooling that will make it happen.

In this context, PaaS and particularly IBM Bluemix becomes relevant.

IBM Bluemix—the canvas for drawing the innovation economy



IBM Bluemix helps enable the innovation economy

The universal question line of business leaders always ask their IT organizations is, “how come you cannot build me a solution faster?” The pace of change in business is rapid and the window of opportunity is often short. When business leaders get an idea they want to be able to implement it quickly.

Bluemix is designed to help implement ideas for businesses much faster.

Bluemix is a PaaS built upon the IBM SoftLayer® cloud. SoftLayer is Infrastructure as a Service (IaaS), a remote datacenter where you can run your apps. Instead of buying a server, finding a place to run it and managing it, SoftLayer is designed to take the hassle away by providing and running the infrastructure as a service for you. You can run your software on a virtual machine on SoftLayer or you can choose a particular physical piece of hardware to run it on; what SoftLayer calls its **bare metal** service.

Bluemix is a higher abstraction than SoftLayer. Bluemix provides a middleware platform upon which you can build your applications. With this IBM solution, you can provision all the core services you need to run and build an app—the database, the application server, analytics systems, mobile backend services, development tools and more. Two of the most interesting services from Bluemix are an Internet of Things cloud service and an API marketplace, called IBM Cloud Marketplace. Together, they facilitate the innovation economy.

The value of Bluemix is that you can build applications much faster than you would otherwise be able to if you had to install and provision all the pieces yourself. Bluemix is also more cost-effective because as a developer you do not have to buy all the software. Instead you can rent what you need and pay for only what you consume. As a result, you can help eliminate some of the financial hurdles and more easily launch a project.

With the Internet of Things cloud service you can get access to data from various kinds of physical sensor systems. You can then turn the data into APIs and do analytic processing on it. Finally, you can compose APIs into a mobile app. With the IBM Cloud Marketplace, you can consume third-party APIs as a service or create your own APIs that others can consume.

In short, Bluemix provides you with a toolset that can help accelerate the creation of APIs, the consumption of data and third-party APIs and the development of totally new mobile apps. Bluemix is the single canvas that lets developers build composable business apps that will drive the new innovation economy.

Moving toward an economy driven by innovation

All economies need some sort of fuel. The industrial economy fueled itself with oil. The innovation economy is fueled by data. Like oil, data can be mined and processed for value—value being insights. But data also has different properties from oil. Unlike oil, data is infinitely reusable. Data can be combined with other data and then mined and sold over and over again.

With data, you do not run out of fuel. You generate more fuel. APIs, like data, can be bought and sold and the role of data and APIs are interrelated. APIs provide a mechanism for accessing data and packaging it up for commercial purposes. APIs can also be bought and sold as applications and application components in their own right. Both can be used to usher in a new class of mobile apps focused on context awareness.

The accelerator for all this activity is the growing market of the Internet of Things. Put these pieces together and you have all the ingredients to drive an explosion of new economic activity.

But there is still one thing required—a canvas upon which the innovation economy can be drawn. In this context, PaaS solutions such as IBM Bluemix are suitable. With IBM Bluemix, you can help lower the business entry point. All you need for success is a good idea and the will to take it forward.

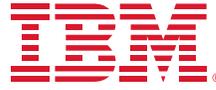
When all of these pieces are put together, you can potentially unleash a vast surge of human creativity. That is when you can start seeing the real results of the innovation economy.

For more information

To learn more about the IBM Bluemix, please contact your IBM representative or IBM Business Partner, or visit the following website: ibm.com/software/ebusiness/jstart/bluemix/

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IBM Corporation
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Route 100
Somers, NY 10589

Produced in the United States of America
December 2014

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¹ *Mobile Applications Futures 2013-2017*, Portio Research, 2013

² *Gartner Says Less Than 0.01 Percent of Consumer Mobile Apps Will Be Considered a Financial Success by Their Developers Through 2018*, Gartner, January 2014

³ *Fifty Essential Mobile Marketing Facts*, Forbes, November 2013

⁴ *Internet of Things*, Cisco



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