

Perspective

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**Designing the
Transcendent Web**
The Power of Web 3.0

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EXECUTIVE SUMMARY

The advent of Web 2.0 allowed users to go beyond the passive consumption of Web content, enabling them to participate fully in the actual generation of content on any number of new media. This shift has been a huge boon to businesses, allowing them to mine rich veins of data about the online behavior and activities of consumers, thus boosting both online sales and Web marketing efforts. Yet the next stage of the Web is already on the horizon, and it will offer an entirely new level of connectivity, communications, and information on customers, including their attitudes and preferences.

Web 3.0—what we call the Transcendent Web—has four key elements: The **Social Web** will greatly enhance the capabilities of social networking, allowing for more powerful search, location, recommendation, and similar services. The **Semantic Web** will connect all the Web's data and information much more closely, enabling contextually based search and research. The **Internet of Things** will let Web-connected machines of all kinds communicate with each other and with us, creating a rich flow of data about their location and status. And thanks to advances in **Artificial Intelligence**, all this information can be aggregated and analyzed to further refine search, recommenda-

tions, and other kinds of information filtering. The result for users will be a far more personalized online experience; companies will benefit through a much greater flow of data they can apply to product development, marketing and sales, daily operations, and more.

Fulfilling the promise of the Transcendent Web will take time. But every company should be planning for its arrival by opening business systems to the increased flow of data, investigating new data management and tagging techniques, and developing the skills and capabilities that will be needed when the Transcendent Web becomes a reality.

KEY HIGHLIGHTS

- The Transcendent Web will build on existing applications and services, creating more effective and personalized recommendation engines, search engines, and social media.
- For the Transcendent Web to operate effectively, stakeholders worldwide will need to address issues of technology, security, and scale.
- As these challenges are surmounted, the Transcendent Web will change how people work and play, and how companies use information to market and sell their products and operate their businesses.

THE WORLD OF WEB 3.0

Imagine a world in which a movie search on your smartphone turns up only the kind of movies you like, and only those playing in your neighborhood. In which your behavior, inputs, and interactions on social networks automatically produce lists of recommendations, potential friends, even job offers. In which searching and browsing the Web becomes vastly more interesting and efficient, with results and link suggestions tailored specifically to your interests, and in which your “virtual representative,” a kind of online personal assistant, keeps working to find you the best information even when you’re offline.

This is the world of Web 3.0, or what we call the Transcendent Web, and it will bring profound changes to people and businesses alike. The complete fulfillment of the vision for the Transcendent Web is still several

years in the future, but its outlines are clear. The benefits it will provide users include the creation of a much more personalized Web experience and the automation of many of the services already in use. Businesses, too, will benefit from vastly greater amounts of information about consumers and thus the opportunity to market and sell to them much more directly; they will also be able to take advantage of the greater operational efficiencies brought about by technologies that will keep people, processes, and products connected much more tightly. The Transcendent Web will play a critical role in enabling the rise of what we call Generation C—the always connected, always communicating digital natives who will come of age over the next decade¹—and in the digitization of industries as wide-ranging as telecom, financial services, and healthcare.

The Transcendent Web is still on the horizon, but it is critical that companies understand what’s coming, and how it will affect their businesses, if they hope to take full advantage of what it will offer.

THE WEB IN PERSPECTIVE

The Transcendent Web is the culmination of a number of trends in technology and culture dating back to the Web's beginnings in the early 1990s (see *Exhibit 1*). The first decade could be called the “readable web”—it featured essentially static text and photos posted by Web producers and passively consumed by users. Businesses learned the value of “having a website,” but the goal of such sites was primarily to provide information; indeed, at this stage, e-commerce was still in its infancy.

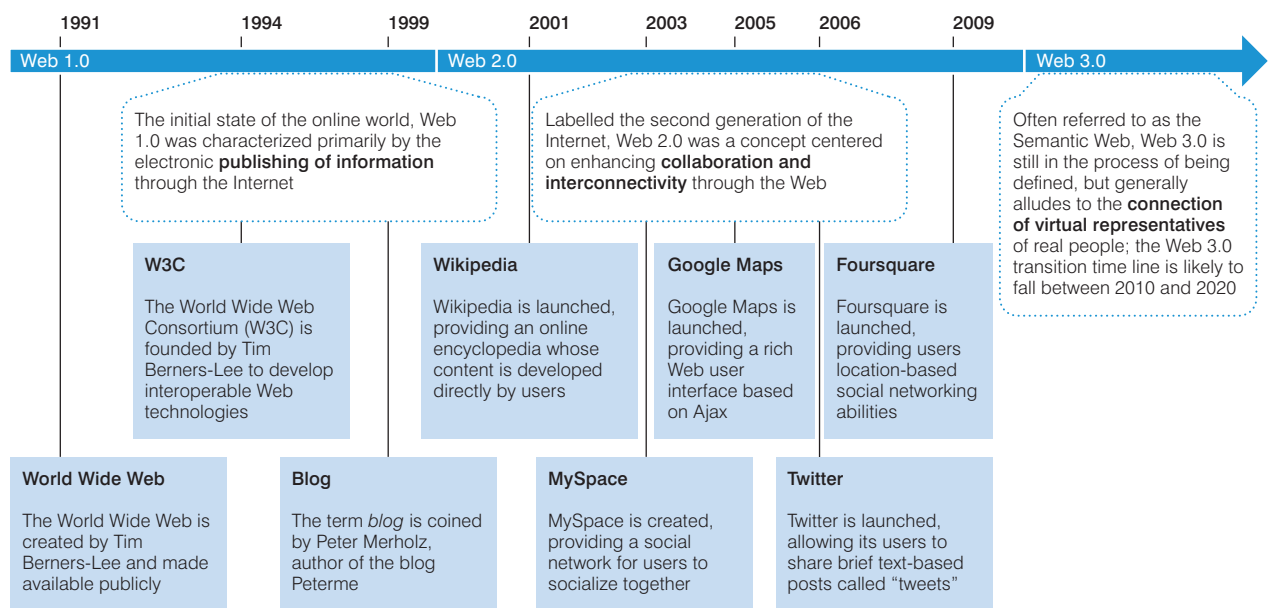
By the mid-2000s, however, the “writable Web,” commonly called “Web 2.0,” began to emerge. Thanks to new technologies, new front-end interfaces, and new business models, users began to participate actively in the creation of Web content, generating blogs, wikis, videos, and other interactive media. The spectacular success of a variety of social media—most notably MySpace, and then Facebook and Twitter—confirmed the role of the user as the effective center of the Web world. E-commerce and online advertising boomed, thanks to growing Web usage and successful new sales strategies.

At present, more than 1.4 billion people across the globe are connected to the Web. In 2010, according

to estimates from global market research firm IDC, 988 exabytes of information were created or replicated on the Web, a sixfold increase from just four years earlier. Worldwide e-commerce revenues will total an estimated \$680 billion in 2011, up from \$273 billion in 2006, according to JPMorgan Chase & Company.² And online advertising revenues will hit an estimated \$107 billion in 2011, compared to just \$65 billion in 2008, according to IDC.³ New Web technologies such as software as a service and Web-based supply chain management software have further enabled companies to improve the efficiency and flexibility of their operations.

Exhibit 1
The Web Has Evolved into an Interactive Mechanism for Content and Communications

EVOLUTION OF THE WEB



Source: InformationWeek; Thinking Space; Booz & Company analysis

KEY ELEMENTS OF THE TRANSCENDENT WEB

What will the Transcendent Web look like? To the degree that it will be an extension of the current Web, Web 3.0 will build on the kinds of applications and services that have proved so popular in the past few years. Recommendation engines will produce much more complete and targeted information, based on a greater knowledge of the habits and preferences of users. Search engines will become more precise and helpful, taking into account context and wording in generating their results. Thanks to the Web's greater ability to record and store information, all manner of social media will arise to keep users even more tightly connected to friends and businesses alike. And services will arise that enable users to create avatars to perform all these recommendation, search, and social functions for them, automatically, depending on highly specific preferences.

These kinds of services will depend on new Web technologies—most notably the Semantic Web and the Internet of Things—that are significantly more intelligent than current standards.

The Social Web

Social networking has grown hugely in popularity in the past several years, and it will continue to be a mainstay of the Transcendent Web. Indeed, much of the activity on Web 3.0 will take place within the context of social media, as the connections among like-minded people become strengthened and multiplied through Web 3.0's new technologies. Recommendations, search, location, and other services will be enhanced and personalized by leveraging the massive amounts of data collected on users as they interact on social networks.

The Semantic Web

Web services such as search have always depended on the specificity of search terms to find accurate results. New technologies are being developed that will understand on a much deeper level the meaning of the search terms people use, and the context in which they are used. This in turn will enable technologies such as resource description framework (RDF) and Web ontology language (OWL), Web

languages used to describe different kinds of information and how they are related. Such technologies will be much better at understanding the relationships between data on the Web, and thus enable far better results for those searching and requesting recommendations on the Web.

The Internet of Things

The Transcendent Web will depend greatly on the growing ability of machines to communicate with us and with other machines. More and more things are being made Internet-enabled—houses, cars, appliances, even clothing—allowing them not just to be located through technologies like RFID but to communicate richer amounts of information about themselves. Home appliances that highlight problems for the person repairing them, tags sewn into clothing that allow direct visibility into inventory and pricing information—all this becomes not just possible but also visible to Web users.

Artificial Intelligence

Ultimately, the Transcendent Web will depend on a high level of artificial intelligence underlying many Web processes. Using inputs from different sources, including browsing history, user-specified preferences,

and contextual information such as location, these systems will profile users to better understand both the content and the context of their requests. These inputs will be used to update user profiles and information

filters, which in turn further refine the relevance of searches and other activities on the Web.

Much of the Transcendent Web will depend on activities and technologies

that take place behind the scenes. But companies looking to take advantage of these capabilities must prepare to expand their own customer-facing efforts as well (*see Exhibit 2*).

Exhibit 2
The Evolution Toward Web 3.0 Is Leading to an Enriched and Personalized User Experience

IMPACT OF WEB EVOLUTION ON USERS

	Web 1.0	Web 2.0	Web 3.0
Front-end Characteristics	<ul style="list-style-type: none"> - Read-only static Web - Company-oriented - Low portability (computing equipment) - Professionally developed stand-alone applications 	<ul style="list-style-type: none"> - Read-write interactive Web - Community-oriented - Medium portability (mobile) - User-developed open applications 	<ul style="list-style-type: none"> - Read-write intelligent Web - Individually oriented - High portability (mobile and consumer electronics) - User-developed smart applications
Back-end Characteristics	<ul style="list-style-type: none"> - Syntax-aware basic browsing and search capabilities - Low data richness (HTML) - Point-to-point / hub & spoke architecture - Siloed data 	<ul style="list-style-type: none"> - Syntax-aware advanced browsing and search capabilities - Medium data richness (XML) - Service-oriented architecture (SOA) - Lightly interlinked data 	<ul style="list-style-type: none"> - Content (semantics)-aware and context-aware next-generation browsing and search capabilities - High data richness (RDF) - Web-oriented architecture (WOA) and Internet of Things - Worldwide database

Note: Anyone or anything that shares information on the Web is considered a producer.
Source: Booz & Company

MAKING THE TRANSCENDENT WEB A REALITY

The various pieces that will eventually make up the Transcendent Web are not fully in place, and it will take some time to ensure that they are. Three areas in particular continue to present challenges to the full development of the technology.

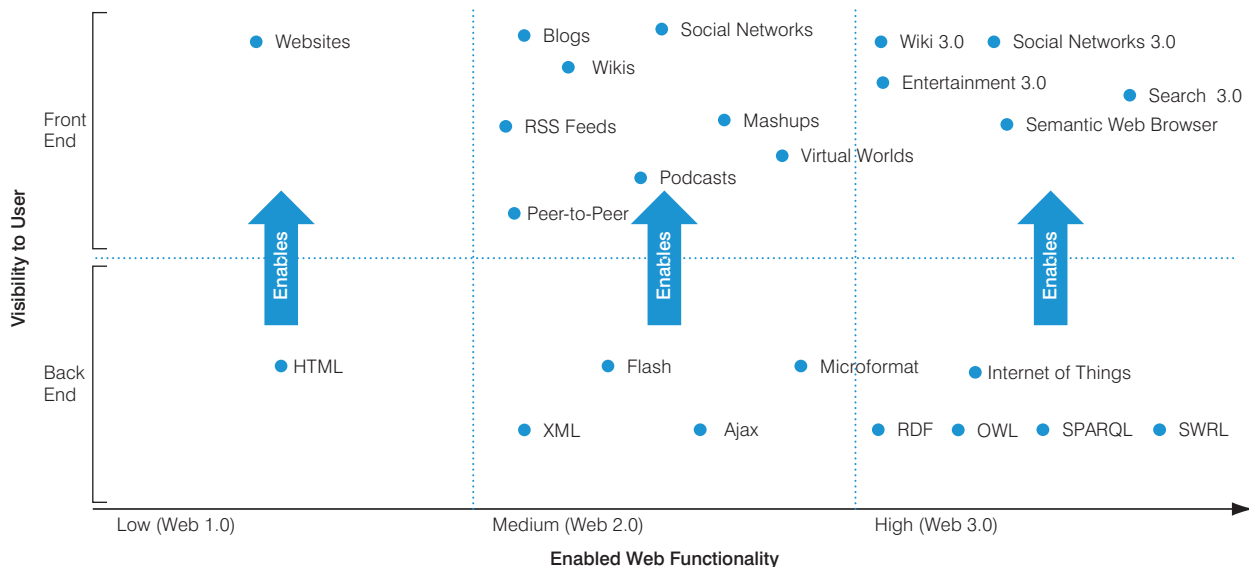
Technical Issues

The Internet's current technical protocol, called IPv4, can accommodate only about 4.3 billion Internet device addresses, and it is already running short. The Transcendent Web will require many more, but it won't be able to accommodate them until the full deployment of IPv6, which will multiply the number of potential Internet addresses by the billions. Until it is in place, the vision of the Internet of Things cannot be fully achieved. Indeed, it is the very push to create Web 3.0 that will likely promote the implementation of IPv6.

Moreover, many of the individual technologies that must come together to make up the major elements of the Transcendent Web are still relatively immature. Among them are SPARQL, a language used to ask questions across diverse data resources, and SWRL, which is used to define the rules between data domains, in addition to RDF and OWL, mentioned above. Ensuring that they are completely interoperable is a highly complex task that may take years to accomplish (*see Exhibit 3*).

Exhibit 3
The Shift to the Transcendent Web Will Require the Further Development of Critical Enabling Technologies

VISIBILITY AND FUNCTIONALITY



Source: Booz & Company

Security Issues

The Transcendent Web will greatly increase the number of data nodes and interconnections among devices, which in turn will increase the risk of security breaches at any of these many new points. Because much of the Transcendent Web's success will depend on leveraging sensitive user data—preferences, browsing history, location, and the like—to create a more personalized Web experience, plugging these potential security holes will be critical.

Scale Issues

Implementing the Semantic Web will likely require tagging of much of the content on the Internet in order to make it available for semantic and contextual analysis. A bottom-up approach to annotating all the data on the Web is a huge task, and one that may not be feasible at all. One possible solution would be to tag only newly published data and to develop software that could tag old information automatically by analyzing the language of the content.

These issues are real, and could conceivably become serious roadblocks on the path to the Transcendent Web. But the history of the Internet, a succession of technical breakthroughs over seemingly insurmountable barriers, suggests otherwise. Businesses making long-range plans to take advantage of Web 3.0 should carefully monitor progress in all three areas.

Because much of the Transcendent Web's success will depend on leveraging sensitive user data, preferences plugging potential security holes will be critical.

IMPACT OF THE TRANSCENDENT WEB

As Web 3.0 comes into being, its effect on both users and businesses will be profound. It will change how people work and play, and how companies use information to market and sell their products, as well as operate their businesses.

The Personalized Web

The Transcendent Web will present to users a uniquely personalized experience. Users will be able to find the information they're looking for quickly and precisely. The technologies behind the Transcendent Web will be able to understand both the content and the context of user requests, and provide results carefully tuned to user needs. Thanks to semantic engines that allow users to search specific content and location-based queries, both complex, research-based queries and entertainment searches such as those for movies and restaurants will generate highly relevant results.

Social networking, too, will be transformed, becoming even more appealing and useful to its users. Web 3.0 will enable social networks to be automatically tailored to the specific needs of users, bringing them closer to all their connections and relationships, and vastly reducing the time required to maintain their profiles and keep up with ever-changing platform features. Platforms such as Origo already allow users to aggregate friends from different social networks into one interface.

The increasing intelligence of the Web will allow for the creation of virtual representatives that will make the browsing experience easier and more intuitive. These stand-ins will perform many functions that now must be done manually—updating profiles and preferences, timing searches and requests, managing the flow of news and information. Virtual representatives will make up only part of the Transcendent Web technologies that will allow users to “pull” information automatically, replacing the need to “push” requests out to the Internet. The result will be the much more efficient management of time spent on the Web, and a vastly more personalized experience.

The Business-friendly Web

The current Web has been a tremendous boon for all kinds of businesses,

enabling more targeted marketing, increased sales, and operational efficiencies. The Transcendent Web will become an even more effective tool in all three of these areas.

The huge increase in user data, behavior, and preferences offers marketers a great opportunity to attract more consumers to their websites, target their efforts to particular consumers, gather more information about those consumers, and use that information more efficiently. To do so, they must prepare to take advantage of the coming Semantic Web, optimizing their websites by embedding them with search engine-friendly, structured, semantic data to increase traffic. According to Yahoo, websites with search results using such tags received 15 percent more click-throughs than those not using them. When Best Buy embedded semantics into the descriptions of its online products in 2009, describing not just the product, but also accessories, delivery and payment options, and warranty conditions, its site traffic increased by 30 percent.

Advertising, too, will be transformed, as businesses come to understand and take advantage of behavioral advertising, in which the kinds of ads placed on websites will depend on highly specific information about who's visiting

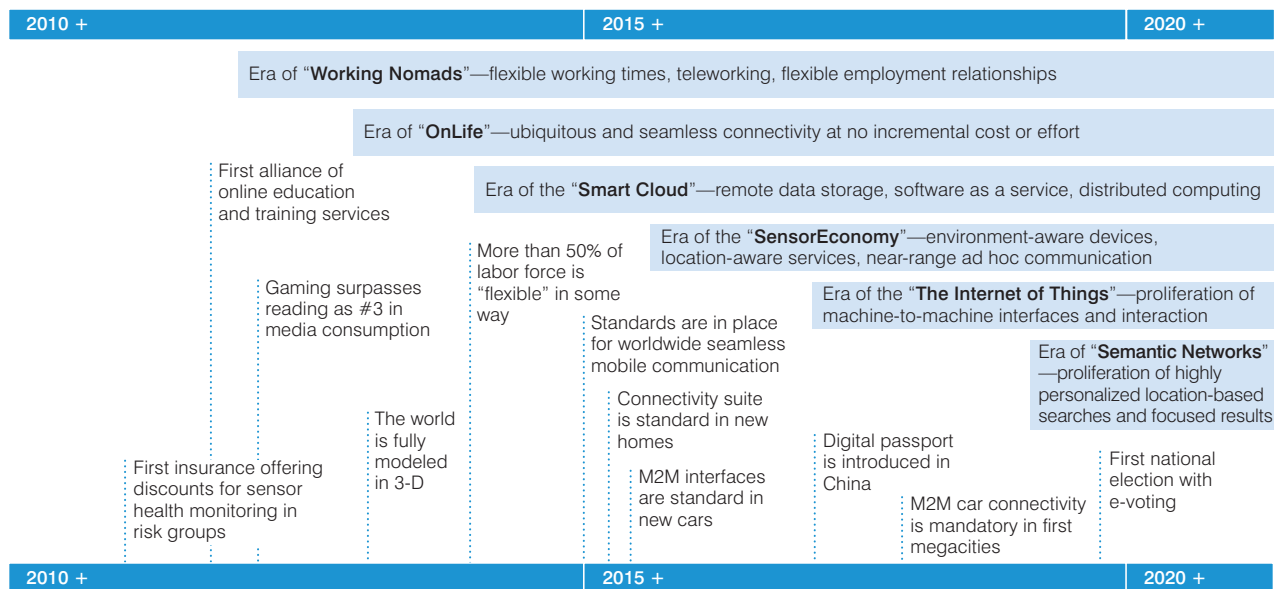
the site. The result will be a large boost in online sales, as companies learn how to target those consumers most likely to purchase their products.

The impact of the Transcendent Web will also allow companies to reexamine their entire organizational structures, business and governance processes, supply chains, and product innovation efforts. Companies will be able

to further automate many processes, promote better communication among employees, and enable far more efficient manufacturing, supply chain, and inventory management practices, as parts, machines, and finished products are linked together in the growing Internet of Things. Enhanced customer feedback will allow companies to boost innovation and continuously improve product quality.

A great many critical elements of the Transcendent Web have yet to be put in place. We expect, however, that the effort to implement them will accelerate through the coming decade. Exhibit 4 offers our best estimate of a timetable for when the Transcendent Web's key technologies will be up and running.

Exhibit 4
A Glance into the Future of the Transcendent Web



Source: Roman Friedrich, Matthew Le Merle, Michael Peterson, and Alex Koster, "The Rise of Generation C: Implications for the World of 2020," Booz & Company, 2010: http://www.booz.com/media/uploads/Rise_Of_Generation_C.pdf

Emerging Opportunities

Although Web 3.0 is still very much in its infancy, companies in several industries—most notably online retailing, media and entertainment, and the Internet—are already incorporating aspects of it into their operations.

Retailers: The more advanced online retailers are adding increasingly sophisticated artificial intelligence technologies to their websites in hopes of better tailoring their offerings to customers and improving the customer experience. Amazon, for example, provides recommendations to customers based not only on their browsing and purchase histories but also on the behavior of customers with similar histories.

Others in the industry are among the leaders in incorporating elements of the Internet of Things. A number of companies, including Nordstrom and Walmart, use RFID tags in their operations to improve transparency into their supply chains, and the industry as a whole is contemplating how to combine the Internet of Things with the Semantic Web as a way to enhance the customer experience and increase cross-selling opportunities as a means of boosting sales. Companies like Overstock.com and Best Buy have added RDF technology to their websites, enabling search engines and other applications to make detailed use of the information on each product page. Best Buy is already seeing positive results, gaining consistently higher rankings in search results and a 30 percent increase in traffic.

Few online retailers, however, have succeeded to any great extent in integrating advanced social networking capabilities into their websites, most of which are still limited to reviews and like/dislike votes.

Media and entertainment: Companies in the media and entertainment business have begun to use more artificial intelligence technologies in hopes of tailoring their content more tightly to users. Streaming music site Pandora, for instance, bases its song recommendations on a complex algorithm that chooses among 400 musical attributes and 2,000 traits. Other companies in the industry are beginning to make headway in working with social networking companies to promote their entertainment wares. So far, however, no companies in the industry appear to have investigated the benefits of the Internet of Things or the Semantic Web.

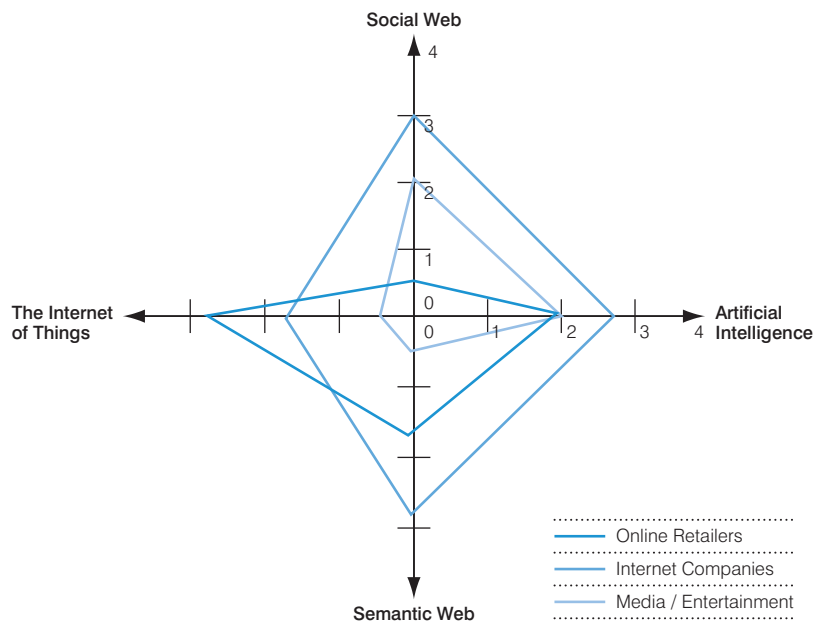
Social media and database companies: Companies in the Internet business are the clear leaders in the effort to implement different aspects of Web 3.0. Google, Facebook, and Foursquare, a location-based mobile social network, have already made extensive use of artificial intelligence capabilities to tailor and personalize their customers' online experience. They are also revolutionizing how humans interact with each other, by embedding social interactions into the online browsing experience, as Facebook has done through its tight integration with third-party websites.

These companies are also among the earliest adopters of the Semantic Web: Google, for example, is using microformats such as hReview to refine its search results. And the DBpedia knowledge base now consists of more than 672 million pieces of information linked through RDF, of which 286 million were extracted automatically from the English edition of Wikipedia and another 386 million were extracted from other language editions. Researchers can now present much more general queries, such as “British musicians,” for instance, and get comprehensive results that never could have been put together in the past.

None of these efforts yet comes close to the ultimate promise of the Transcendent Web, but they do serve as leading indicators of what is possible (see *Exhibit A*)

Exhibit A
Online Retailers, Media and Entertainment Companies, and Internet Firms Are Leading the Way to Web 3.0

WEB 3.0 INDUSTRY MATURITY MEASUREMENT



Source: Booz & Company

BE PREPARED

Despite the revolutionary potential of the Transcendent Web, the path to its implementation will be an evolution—one that will be accelerated by the rise of Generation C. Still, it will take time.

However, companies should not use that as an excuse to wait and see what it will look like once it's finished. Each stage of the journey will bring benefits; companies therefore need to start planning now to reap those incremental benefits—and to be that much better prepared when all the pieces are in place.

In order to get ready for the Transcendent Web, companies need to begin now to build the capabilities that will be key to attaining its benefits.

- ***Open up to the (Internet) world.*** Ensure that every critical business system is open and ready to securely interface with external systems over Internet protocols. As the value of customer and transaction data increases, every system must be able to capture and work with this information in an intelligent way.
- ***Move to real time.*** Convert business systems from today's often asynchronous data management operating models to real-time analytics and processing. All internal and external data needs to be available to real-time analytics engines and automated decision-making processes.
- ***Structure the data.*** Move to structure all the company's data so that it can be used in different ways both internally and externally (i.e., by business partners). This will require the automation of tagging to provide for how data is managed and searched in context. Data is instrumental to the vision of the Transcendent Web—the more a company has, and the better it is at managing that data, the greater the company's competitive advantage.
- ***Develop talent.*** Create a plan to ensure that the company has the skills needed to take advantage of today's needs and tomorrow's opportunities. Keep in mind that the skills required will extend beyond the technology department to encompass the entire organization: It may be easy to find good programmers who can work with new technologies. But it is likely to take a very long time to train traditional marketers to develop campaigns based on real-time data analytics.
- ***Involve customers.*** Companies that have not done so already must start now to move their customers from a passive, "lean-back" approach to a more active, "lean-forward" attitude. Stimulate an active online dialogue about company products and services, then capture the information produced and use it to further refine products and services as well as to enhance marketing activities.

Endnotes

¹ Roman Friedrich, Matthew Le Merle, Michael Peterson, and Alex Koster, "The Rise of Generation C: Implications for the World of 2020," Booz & Company, 2010: http://www.booz.com/media/uploads/Rise_Of_Generation_C.pdf.

² <http://techcrunch.com/2011/01/03/j-p-morgan-global-e-commerce-revenue-to-grow-by-19-percent-in-2011-to-680b/>.

³ <http://www.marketingcharts.com/television/worldwide-internet-advertising-spending-to-surpass-106-billion-in-2011-5068/>.

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