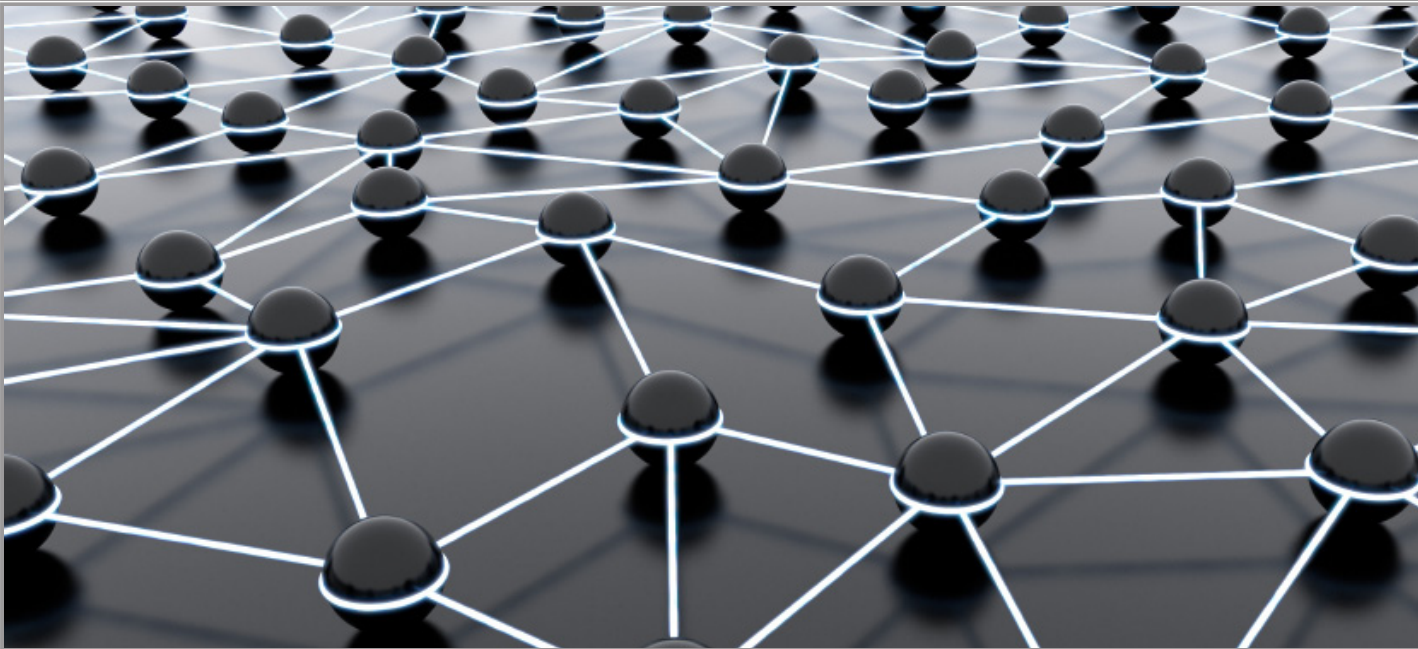


# The Internet of Things Meets The Internet of People

WHITE PAPER



## How The Internet of Things, Social Networks & Creative Collaboration Will Shape Future Market Opportunities

Apple, Google, P&G and FaceBook have forced the pace of development in networked computing, catching larger rivals off-balance and threatening to effect fundamental shifts in technology markets. Their strategies reflect the increasing importance of large-scale collaboration and alliances in creating new opportunities. Alliances and collaborative systems are hardly new but as social networks converge with intelligent sensors, devices and assets radical new modes of value creation are emerging. Only those who grasp the new rules of smart systems and collaborative market creation can win key positions.

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**W**e have entered an era where people, businesses and social organizations are beginning to understand the profound impacts awareness, collaboration, and intelligence will bring. In the not too distant future, hundreds of millions, then billions, of individuals and businesses, with billions, then trillions, of smart, communicating devices, will stretch the boundaries of today's business and social systems and create the potential to change the way we work, learn, entertain and innovate.

Peer-to-peer information, social networking and pervasive computing are combining to create new modes of collaboration and decision making. People, information, and technology are becoming more connected, distributed and pervasive enabling the convergence of physical and virtual worlds. Social networking technologies are moving to the enterprise and will be embraced and experienced differently than in the consumer space. Network awareness will include knowledge, people and things.

These forces are informing a new trend we call "Smart Business." In its simplest form, Smart Business is a concept in which input—from machines, people, video streams, maps, newsfeeds, sensors, and more—is digitized and placed onto networks. These inputs are integrated into "Smart Systems" that connect people, processes, and knowledge to enable collective awareness, creativity and better decision making.

The Smart Systems we are describing here have no managerial hierarchy, command and control decision making or proprietary ownership of ideas. These networks will be self-organized by people who are motivated to explore and develop ideas they care deeply about. Collaborative innovation will extend beyond ideas about new products and services to the very manner in which business is conducted. To discover, design and develop ubiquitous systems, organizations will need new tools and methods.

## INTRODUCTION

Technologically, the 21st Century began with a very big bang: the dot-com and Web boom and bust. Back then, the Web's value derived from people: people building Web sites; people "surfing" the Web; people looking at screens with their eyes; people typing on keyboards with their fingers. People, people, people.

Since then, two major technology developments have emerged that appear now to be on a path of convergence—The Internet of Things and The Internet of People (or as most people have become familiar with social networking or Web 2.0).

The technologies collectively driving the Web and Enterprise 2.0 have spread widely in the last five years, particularly among consumers. Social networking sites such as Facebook and MySpace attract hundreds of millions of visitors a month. Web 2.0 covers a range of technologies, including blogs, wikis, podcasts, tagging and social networks. Collaboration technologies are spreading throughout the Internet and leading the next wave of growth. With the advent of participative technologies such as Wikipedia we can now see the enormous value that can be derived from collaboration on the Internet.

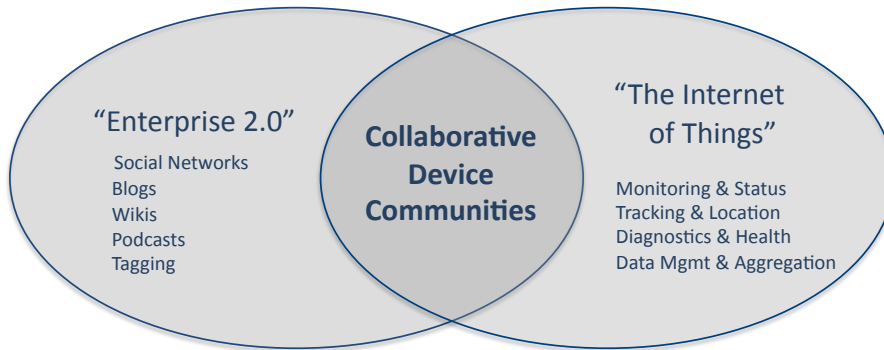
Meanwhile, intelligent device networking, sometimes referred to as "Pervasive Computing" or the "The Internet of Things" is upon us. Billions of devices, are currently being connected to the Internet. The types of devices being connected today extend far beyond the laptops and cell phones we have become so accustomed to. Today, virtually all products that use electricity—from toys and coffee makers to cars and medical diagnostic machines—possess inherent data processing capability. Any manufactured object has the potential to be networked.

In the long run, such "invisible" machine-to-machine (M2M) applications will create many new automated services. These "invisible" services will be much more important to business—and to the evolution of our economy—than today's cumbersome services. The value of future products will require manufacturers to outfit their products with intelligence and connectivity. This product OEM activity has begun, and will continue to increase exponentially.

These phenomena are not just about people communicating with people or machines communicating with machines: it also includes people communicating with machines, and machines communicating with people. The Internet's most profound potential lies

in the integration of smart machines and people—its ability to connect billions upon billions of smart sensors, devices, and ordinary products into a “digital nervous system” that will smoothly interact with individuals.

**Figure 1: Convergence of Enterprise 2.0 & Intelligent Device Networks**



Take home health care as an example. Social networks and sensor networks can be combined to support independent living and health support for the sick and elderly. For daily living purposes, we can check the status of friends and relatives or help the elderly find nearby walking buddies to promote mobility. By using semantic representations of information from sensors, we can build on the idea of connecting people through shared activities and interests.

More importantly, we can send alerts based on abnormal activity patterns. Through sensor readings of body position or health measurements, we can issue requests for attention not just to doctors or clinicians but to nearby friends in the elder’s social network.

Another example is the The Personal Travel Assistant (PTA) project—an initiative involving the Massachusetts Institute of Technology (MIT), Cisco and select cities—is helping cities connect their urban environments to enhance public services and improve sustainability. Personal Travel Assistant (PTA) allows people to access transportation information on any web-enabled device, from any location, helping to improve their transit experience within urban environments and reduce their personal carbon footprint. Unlike map-based direction-finders or trip planners, PTA provides a wide array of real-time

information, including suggestions that allow citizens to reduce the cost of travel and find the route and transportation method that will result in the lowest carbon emissions.

### **CREATIVE COLLABORATION FOR BUSINESS: FACEBOOK & WIKIPEDIA AS MODELS FOR NEW COMPETITION**

As the popularity of collaboration and social networking technologies has grown, it has attracted a great deal of attention in the enterprise realm. Many business organizations are aggressively embracing Enterprise 2.0 by using social networks for new modes of innovation and business development. However, many executives in the B2B world still view open collaboration and social networking as an activity for kids at home or hackers in the night—not tools for real business. Futurists have been describing such collaboration in B2B technology markets for years with little real progress. That is, until now.

Currently, there are over 20,000 core contributors actively producing Wikipedia. A quarter of a million people collaborate on Slashdot. Thousands of programmers contribute to Linux and similar open source tools. Amazon has over 100,000 developers building applications and businesses. Apple with its iPhone and App Store is driving an entirely new form of collaboration and peer product development. The business benefits of large scale collaboration and social networking tools in the B2B arena are finally being recognized.

The example of Wikipedia suggests that businesses can leverage specialization by providing more control over the content of products to collaborators and participants (suppliers, customers, intermediaries, etc.). Does this sound like the world of kooks and hackers? Big IT “arms merchants” like IBM and Sun don’t seem to think so. Their support of open source software development is driving the complete displacement of traditional proprietary tools that manage IT infrastructure.

The Internet and new social networking technologies are allowing companies and their customers to interact with unprecedented levels of richness. Companies like P&G and Peugeot are even drawing customers directly into their product and service definition and development processes. Even heavy equipment manufacturers such as ABB are finding these new tools more than just useful methods for communication between and among employees and customers. New forms of mass collaboration suggest that companies are making real headway with a more self-organized approach to teaming and collaboration.

This collaboration can come in many forms, from an end user and call center operator working together to solve a problem with a piece of equipment, to a service engineer devis-

ing shortcuts to streamline repetitive tasks, or a customer working with a service or product design engineer to design a new and improved piece of equipment. These collaborative efforts often lead to new innovative solutions that create long-term value for the OEM, the user and all the value adders involved in its use. Relational capital, that which grows from customer intimacy and collaboration will define new rules of competition.

## THE ADVENT OF DIGITAL COLLABORATIVE COMMUNITIES

All intelligent devices contain data that can be turned into very valuable business information if it can be put in the hands of the right people at the right time. For example, a simple matter of providing standard support and maintenance requires a growing amount of collaboration between service organizations, engineering departments and end customers. Providing value-added services based on device usage, spare parts supply chain needs, and add-on capabilities requires an even more collaborative information-intensive environment.

Obtaining value from collaboration will often mean de-emphasizing products in a manner that's understandably difficult for product companies to do. After all, if product companies aren't selling material objects full of features that buyers touch and interact with and admire physically, then what are they selling? The short answer is that they will be selling portals into networked services that are elegant and unobtrusive—sometimes even invisible. Before the end of this decade, the M2M revolution will lead to manufacturers using smart, networked products to drive enormous growth with next-generation smart services.

Beyond machine-to-machine communication, however, lies the real revolution. The fact that many common devices have the capability to automatically transmit information about status, performance and usage and can communicate with other devices anywhere in real time also points to the potential for intelligent devices that can interact with people and social networks. In fact, combining device connectivity with social networking platforms opens the potential for substantially new forms of collaboration between people and things. Connectivity of people and connectivity of devices are no longer independent phenomena.

### Palantiri Pioneers Collaborative Devices

Palantiri has taken a fundamentally different approach to leveraging the convergence of collaborative innovation, social networking and intelligent device networking. Collaborative Device Communities, as Palantiri founder John Canosa refers, are not about "futurism." They are about matching available, feasible technology to real world needs. Palantiri has broken many of the previous barriers by cleverly combining the collaboration tools and environment of a common enterprise social networking platform while adding the ability to support remote devices, machines, and equipment as peer members of the community.

The next phase of connectivity and integration of content will be one of placing communities of humans in context with objects and devices and visa versa. Devices need to be better able to understand where they are and the role they play, and adjust themselves accordingly based on human needs and desires.

The very concept of network-enabled collaborative communities forces a complete re-thinking of the whole relationship of people and devices to businesses and social systems. The nature and behavior of truly integrated device and social communities are concerns that have yet to take center stage—not only in business communities, but in most technology communities, too.

### **NEW VALUE AT THE INTERSECTION**

Isolated examples of next generation interaction between intelligent devices and humans are plentiful. But to fully understand the true power of collaborative communities, applications must be realized on a large scale. The next chapter of this story will require a sophisticated platform that allows edge devices—be they business, or consumer, human or machine, operated wirelessly or wired—to participate in coordinated knowledge sharing, problem solving, and transactions that span dynamically created communities.

This will take personalization to another level, turning “things” into learning machines that can be trained to know a users’ habits and behaviors. Based on a human’s needs (e.g. a user, fixer, designer, etc.), intelligent devices will be able to infer needs and deliver highly individualized content without requiring a user to search, or in many cases to think about.

The intersection of Enterprise 2.0 and the Internet of Things creates value at two disparate ends of the business spectrum. The adoption of Web 2.0 social networking & collaborative software for businesses is creating new value for businesses, driven from social collaboration between employees, partners, customers and suppliers. On the other end, the rise of the “Internet of Things” has helped transform manufacturing companies into value-added service companies. Manufacturers are learning that by putting products on networks they are essentially placing themselves into continuous contact with their customers, thereby enabling them to better understand their customer’s needs and act appropriately. The intersection of these two emerging trends creates an opportunity for product manufacturers and OEMs to evolve their business model and drive competitive differentiation by cleverly combining the collaboration tools and environment of a common enterprise social networking platform while adding the ability to support remote devices, machines, and equipment as peer members of the community. These tools are based on commonly available Web 2.0 technologies

such as Blogs, Wikis, Instant Messaging and RSS feeds. While they are inherently disruptive and sometimes challenge an organization and its culture, they are not technically complex to implement. Rather, they are a relatively lightweight overlay to the existing infrastructure and do not necessarily require complex technology integration.

In a collaborative community, devices themselves can blog, send & receive messages, report status, share files and interact on a peer-to-peer basis along with humans. Examples of such collaboration include:

- Having devices share their status, history and “knowledge”, through blog posts.
- A service technician having the ability to securely and remotely “chat” with a device to check status and run diagnostic routines.
- Elderly care via a combination of medical device monitoring and community awareness of peers.
- Personal location services that integrate friends, family and co-workers into systems that understand real-time “whereabouts.”
- Customers being able to run value added applications in the community that incorporate device profiles as well as alerts, alarms and value-added notification.
- Customers posting questions regarding unique product usage and systems interactions to a forum accessible to all members of the community.
- Devices having a Facebook-style “wall” allowing technicians, customers, and engineering to post information and learn from other contributions in a new form of input for a knowledge management system.

An example device integration package for such a community includes the ability to “chat” with the device to request status and execute commands, the ability to share files, the ability for the device to “blog” to its community home page or send updates to a feed, and the ability to establish a direct peer-to-peer (P2P) connection to a device for remote desktop or more specialized diagnostics.

A good social productivity suite also recognizes that valuable data can be stored in many locations in many different formats. Therefore, a key feature of any collaborative device community is the ability to aggregate data from many locations as well as the ability to

provide data feeds to other existing enterprise applications, knowledge bases, and customer portals.

**Figure 2: Collaborative Community Participants & Roles**

	Internal To Enterprise / OEM		External To Enterprise / OEM
<b>Content Creation</b>	<b>Internal Collaboration Contributions</b> Allows various employees & functions to collaborate on capturing and utilizing knowledge, sharing best practices & coordinating responses	<b>Broad Problem Solving Sourcing</b> Search & source solutions and problem solving capabilities across diverse participants and experts – both internal and external to organization and across entire value	<b>External Collaborative Contributions</b> Provide external participants and collaborators access to and enablement of product design/development, supply chain interactions, services and support inputs as well as feedback
<b>Communities &amp; Collaborators</b>	<b>Build Large Internal Collaboration Communities</b> Prompt and enable cross functional communities where experts and thought leaders can be found and invited to participate		<b>Build Customer, Partner and Channel Collaboration Communities</b> Develop explicit communities of interest with broad diverse groups for design inputs, sourcing expertise, service collaboration and support expertise
<b>Decision Support &amp; Problem Solving</b>	<b>Utilizing and Leveraging Experience, Information and Expertise</b> Gather and aggregate inputs, opinions, knowledge and related to support a wide variety of decision making – real-time decision analytics		

Finally, one other very important aspect of a collaborative people-device community is its openness which allows anyone to create applications that can be subscribed to and used by other members of the community. These Software as a Service (SaaS) offerings are similar in concept to the Apple App Store, Facebook “applications” or Google “Gadgets”. These applications may be horizontally focused, such as a predictive maintenance analysis package, or vertical applications focused on specific markets. The fact that these systems can be completely open provides third party Independent Software Vendors (ISVs) with access to a customer base that they otherwise may not have been able to viably approach and eliminates the burden of them having to deal with gaining access to critical device information. Open source development has proven itself as a powerful mode of innovation and development.

## **COLLABORATION BECOMES CENTRAL TO A PRODUCT OEM'S STRATEGY**

The structure of an emerging collaboration network must evolve together with a product OEM's strategy. It does not flow from the strategy in a traditional linear way. Why? Because companies are not prosecuting a known opportunity. Rather, they are creating an environment in which a new emerging smart product or service opportunity can flourish. They cannot know in advance exactly which aspects of the opportunity will evolve at what speed and in what order. Therefore, structure, modularity, and multiple points of contact (with real-time communications) are essential to growing the opportunity.

Collaborative communities both inform and express the strategy. Built to pursue multiple aims simultaneously, a dynamic network of connected products and people drive new information values which, in turn, create new influences in the marketplace. Power in human and device collaboration structures falls to those who best understand how to use this information and influence to get and keep a key position.

Forging collaborative communities means managing uncertainty. A product OEM needs a clear understanding of the forces at work between and among devices and people. They must try to identify those few "interactions" that make a difference. From this understanding provided via real time interactions, early indicators of the true direction of customer needs and behaviors can be understood long before others.

To achieve success, companies will need to recognize the new opportunities for innovation driven by a collaborative community—from customers, from partners, from your own people. This will require new thinking, including:

- **Understand The Entire Customer Experience By Inviting The Customer To Participate:** Companies often fail to make products with the right benefits because they don't have a good understanding of what their customers are trying to achieve and how they want to achieve it. Customer behavior is complex, but a product OEM can increase its chances of success by understanding the "customer lifecycle experience": discovery, purchase, first-use, ongoing-use, management and disposal. By looking at the customer experience through the customer's eyes and the creativity of multiple parallel participants OEMs can gain a deeper appreciation of the viability of their offering, and potentially discover new opportunities as well.
- **Look For Non-Conflicting Business Models That Will Encourage Collaboration:** Collaborative communities differ from today's social networking models as well as those born from the remote services being created today by product OEMs.

They are coalitions of self-motivated market participants that pursue a common goal, not mere subcontractors tied to a “command and control” scheme. Success will depend upon understanding and choosing new or modified business models.

- **Build Open Collaboration / Align Partner Behaviors** : Seemingly superior offerings can also fail because a product OEM’s partners have no incentive to participate. The customer is buying an experience with a desired result, and the OEM and partners must work in concert to create a superior experience that provides tangible benefits to all participants. Successful communities are usually composed of proactive participants, not simply a group of companies in and around a particular market space. Accordingly, a community’s design needs to allow participants to invest resources and reap rewards—indeed, to innovate openly with one another—while pursuing individual interests.
- **Target The Highest Value Customer Segments** : Many great ideas fail because companies focus on the wrong customer segments. Marketers often get distracted by the sheer size of a particular market segment or because of the marketers’ familiarity with it. In the process, they often miss the segments where collaborative communities could deliver the most value.
- **Act Early; Act Often**: Assembling a collaboration community calls for a balance of timing and participants. Most community opportunities will fail and re-form as learning grows. These communities do not necessarily have a finite window but they need to be initiated early and gain momentum before a competitive network emerges in its place.

#### Google Introduces Real-Time Collaboration

Google has recently unveiled an online collaboration and communication environment called ‘Wave’ and is inviting developers to get involved in the open-source project. Wave allows developers to build their apps for real time interaction between multiple sources of input – be they people or properly outfitted devices.

Wave is a completely new type of collaboration platform that essentially mimics the way we naturally interact. It underscores Google’s relentless focus on reducing the latency of online actions bringing the online experience closer and closer to our real world experience of face-to-face communication. Wave is ushering in an era of truly pervasive communications where specialized devices can utilize services from the global network of networks.

Google’s approach is significant because it will enter the work environment without having to go through IT management. Google has developed a vision that doesn’t require complex computer networks or over-powered operating systems. Wave is about bringing the innovation benefits of Web 2.0 collaboration to individuals in enterprises.

Communities create value and strengthen market leadership by increasing customer intimacy, creating operational efficiencies and enabling new product innovation. This value is manifested in several ways, including:

- Increased revenue and competitive differentiation through device based aftermarket services.
- Significantly lower cost of service, maintenance and customer support.
- Increased customer intimacy through collaborative interaction and problem solving.
- Low impedance path to unexpected innovation and sophisticated services.
- Valuable market feedback, based on an open dialogue with customers, that will drive new product and service innovation.

### **TECHNOLOGY DOES NOT NEED TO BREED COMPLEXITY**

Many basic technology hurdles that have previously held back Pervasive Computing have now been overcome. For example, we are now capable of enabling devices in a cheap and easy manner that requires minimal power. We also have the ability to communicate over a wide range of wired/wireless networks.

But the challenges of integrating complex systems and unifying communications in an interoperable manner remains a hurdle. Interoperability is a key goal when evaluating new technologies, as wireless systems meld with legacy wired systems and developers integrate enterprise software systems. The inability of today's popular enterprise systems to interoperate and perform well in distributed heterogeneous collaborative environments is an obstacle that newer intelligent "middleware" platforms like the "Wave" platform from Google can overcome.

Some things that look easy turn out to be hard. That's part of the strange saga of the Internet of Things and its perpetual attempts to get itself off the ground. But some things that should be kept simple are allowed to get unnecessarily complex, and that's the other part of the story. The drive to develop technology can inspire grandiose visions that make simple thinking seem somehow embarrassing or not worthwhile. That's understandable in science fiction. But it's not a good thing when defining and deploying real-world technology to deliver new innovation. This is where today's technologies and IT departments behaviors come into play.

For all its sophistication, today's corporate IT function is a direct descendent of the company mainframe, and works on the same "batched computing" model—an archival model, yielding a historian's perspective. Information about events is collected, stored, queried, analyzed, and reported upon. But all after the fact.

That's a very different thing from feeding the real-time inputs of billions of tiny "state machines" into systems that continually compare machine-state to sets of rules and then do something on that basis. In short, for connected devices and social networking to mean anything in business, the prevailing corporate IT model has to change.

Devices will need to host intelligent software components that communicate to other devices directly (peer-to-peer) or to logical collections of devices (peer-to-group) in any programming language, and do so autonomously. Combining the technologies that enable social networking and device networking helps bridge many gaps in today's enterprise systems.

In its most basic and practical form, the story is "Enterprise 2.0 meets embedded device computing." But that's not as simple as it sounds. Capturing the real value of Internet-connected devices goes much further than providing connectivity, databasing, and some XML-based transport scheme. For example, real Web services will allow networked, embedded devices to execute remote applications as if those applications were part of the internal operating system. This type of enablement can bring extraordinary value to the growing population of network embedded devices and collaboration in and amongst devices as well as humans.

At the end of the day, the convergence of collaborative systems and machine to machine communications implies a total paradigm-shift in IT. The depth of this shift has begun to suggest itself, but it is by no means accomplished. It's a shift from knowing "what happened" to knowing "what is happening"—all the time—and then automatically controlling systems with that knowledge. IT professionals rarely talk these days about the need for ever-evolving *information services* that can be made available anywhere, anytime, in real-time, for any kind of information—human or device. Instead, they talk about "web services" or "cloud computing" interchangeably without giving it a thought. New collaboration platforms that are just now emerging in the marketplace show a keen understanding of how the network services "cloud" changes how we work together and how this next generation of platforms will "seep and creep" into the lives of workers.

For IT departments to really succeed at community building, they will need to fully embrace the real-time benefits of the internet collaboration. Beyond this, collaborative communities demand that we design not only devices and networks but also information itself in ways not addressed by IT today.

### **PRODUCT OEMS NEED TO CONSIDER THE IMPACT OF SMART SYSTEMS**

As the popularity of Web 2.0 has grown, companies have noted the increased customer engagement and creativity driven by these technologies. Many product OEMs we have spoken with are keen to harness Web 2.0 internally, and are experimenting with the tools or deploying them on a trial basis. We believe these technologies are having a more far-reaching organizational impact than technologies adopted in the 1990s—such as enterprise resource planning (ERP), customer relationship management (CRM), and supply chain management. The latest Web tools have a strong bottom-up element and engage a broad base of workers. They also demand a mind-set different from that of earlier IT programs, which were instituted primarily by edicts from senior managers.

Earlier technologies often required expensive and lengthy technical implementations, as well as the realignment of formal business processes. With such memories still fresh, some executives naturally remain skeptical. But these new tools are different. While they are inherently disruptive, the core technology is not that difficult to implement. These tools leverage existing infrastructure and do not require complex technology integration.

What distinguishes social networking and device integration systems from previous technologies is the high degree of participation they require to be effective. Unlike ERP and CRM, where most users either simply process information in the form of reports or use the technology to execute transactions (such as issuing payments or entering customer orders), Web 2.0 technologies are interactive and require users to generate new information and content or to corroboratively edit the work of other participants.

Product manufacturing company executives are only just beginning to understand the opportunities driven by the complicity between collaboration tools, networked device intelligence and service business design. It is this set of relationships, not the technological shift, that will benefit but also challenge many product manufacturers.

What product manufacturers looking to leverage collaboration or benefit from connecting “smart products” to the Internet need to understand is we have entered a phase in the marketplace where ideas can emerge from anywhere in the world; new network and IT

tools have dramatically reduced the cost of utilizing them. The bottom line: no single company should look to innovate on their own.

But this raises many questions concerning the mode of collaboration a company should consider focusing on developing. For example, should a company open up its traditionally proprietary product design technology to a community of collaborators? Should companies focus on encouraging collaboration with a select group of partners or a broad federation of participants? Often, companies will jump into relationships without considering these questions and their potential impacts.

Executives need to consider the mode of collaboration and make informed decisions about the nature and types of relationships that can build sustaining value and differentiation. Determining the degree of openness and participation and the “design” of the system and user experience will be key.

As revolutionary and far-reaching as the collaborative device-networking paradigm shift is, the greatest opportunities usually involve the greatest risk. When you open yourself to relationships, and connect to other people, you can get hurt. The real-world risks of open technology and asset connectedness include the following possibilities:

- Increased commodification of your own products and services.
- Dilution of your identity and brand-recognition.
- Loss of control over your customer relationships.

However, the risk of idly standing by and doing nothing remains the greatest risk of all. Time and time again, we see that companies that fail to act are surpassed by those who take advantage of the latest technologies.

#### **ABB Embraces Device Centric Services**

ABB, a global leader in power systems, robotics and process control systems, has been exploring the potential for creating a type of “DeviceSpace” that could use next-generation Internet and enterprise-based technologies as an information platform—a device is thought of as a user that can generate content of value to a community. By utilizing the connectivity already established for remote services, ABB is developing a collaborative device community that will be able to personify a piece of equipment or system, thus enabling it to interact with end users and technical experts. The traditional approach to troubleshooting separates the interaction between technical support and the end user from the diagnostics performed by the service engineer. By enabling the device to engage in a collaborative community, problems are quickly and accurately resolved. More importantly, however, diagnostic approaches are captured and readily available for reuse.

Most companies looking to connect their tangible and intangible assets still view themselves largely as “product-centric” businesses. This puts many organizations in a very precarious position, with one foot in the new world and one in the old world. Making the move from product-centric to a collaborative services-centric culture will not happen automatically. It’s a major transition that will demand different strategy and culture than most product businesses have known before.

**Figure 3: Potential Modes of Collaboration**

<b>Open System</b>	<p><b>Qualified Group of Innovators</b></p> <p>A community where a focused player proposes a solution system and invites participants to add value (e.g. The Apple iPhone App Store)</p>	<p><b>“Come One - Come All” Group of Innovators</b></p> <p>A community where any and all participants can propose and design solution systems (e.g. open source software projects)</p>
	<p><b>Closed System</b></p>	<p><b>Select Group of Focused Innovators</b></p> <p>A community where a focused player designs a solution system and chooses a group of select players with distinct skills to participate (e.g. select automotive systems design partnerships)</p>
	<b>Command &amp; Control</b>	<b>Federated Participation</b>

But there is one truth inherent in ubiquitous collaborative communities—the risks of openness are reduced when companies consciously “design” their collaborative systems with an integrated approach -- that is, when strategy, positioning and the uniqueness of the customer experience have been determined in close coordination with the mode of collaboration. For those product OEMs who have moved forward with this opportunity, the benefits of real-time collaboration combined with product usage intelligence are nearly revolutionary.

## A TRUE “INFORMATION AGE” FOR BUSINESS

Technology adopters are vigorously debating the evolving nature of business and profit models driven by pervasive connectivity and open, collaborative systems. Everyone agrees that after the shift from closed and proprietary to open and connected, competitive advantage and profitability will lie in creative use of shared, non-owned commodities and the real-time customer contact and services they make possible. Differentiation, value addition, and brand-identity will now occur at a higher level, not at just the core product. Obviously, companies will continue to prosper in open, connected landscapes, but they will do so in different ways—some of them variations on old models, some entirely new.

Rather than owning declining-profit commodities, companies will own their particular innovations, whether in technology or services, and they will also own the stream of device data coming in from their connected devices in the field. Most importantly, thanks to that device data and now collaboration tools to support it, companies will “own” their relationships to customers and partners in ways never before imagined.

## CREATING POWERFUL COLLABORATION COMMUNITIES

Collaborative communities are such a valuable strategy because they offer the following decisive advantages:

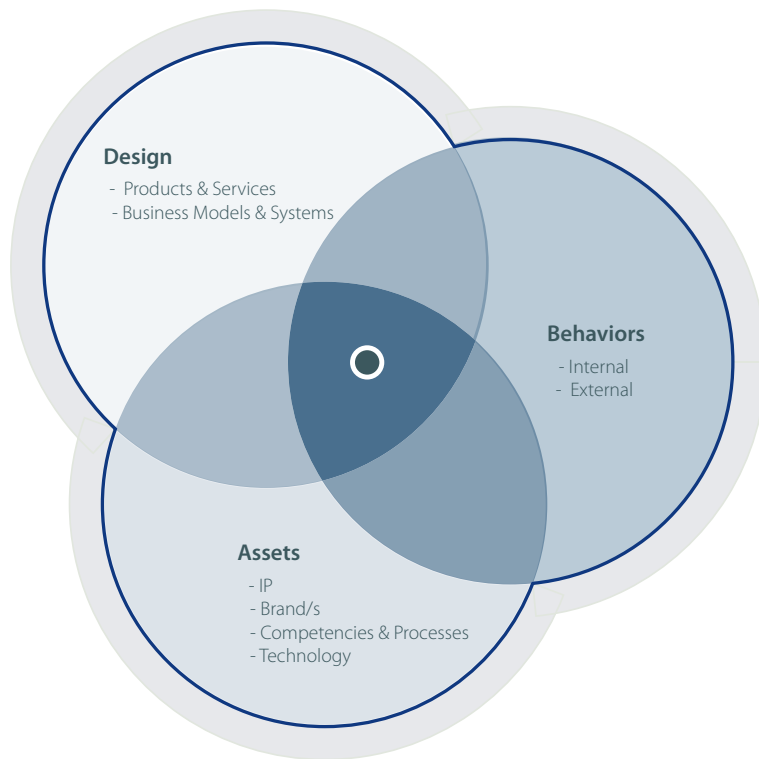
- **Uniqueness:** There is a central tension in technology markets. Revenue growth requires collaboration, but sustained profits requires uniqueness. Collaboration requires that knowledge be shared. Participation speeds the flow of information and knowledge (driving growth) without foreclosing all opportunities to achieve unique advantage (driving profit).
- **Scale and Scope:** Fast! Collaboration communities “fast-track” the development of new markets when the network of contacts acts as the “market” before such a market exists, keeping all interested parties effectively linked as the whole opportunity takes shape. Communities ensure that the environment provides the parallel and enabling capabilities needed for success.
- **Coordination in Undeveloped Markets:** The heart of any not-yet-existent market is a changed view of how people might use that technology to achieve desired goals. Networks bring together sources of expertise and provide coordination so that each “strand” of the community can work on a distinct piece of the total solution.

- **See the Future:** Plotting an effective course in emergent markets requires great peripheral vision. A collaborative community connects many participants and knowledge, some of which may have no direct impact on their business today, but any of which may be keys to success tomorrow. Efficient management of these informational links is critical to the success of individuals, businesses, and the community as a whole.
- **Help Shape the Future and Ride the Next Wave:** Collaborative Device Communities are clear expressions of the “power of knowledge.” Those with the best position in the community can influence what others believe, and hence, what they do.

The recent creation of social networks and Wikipedia are excellent examples of collaborative alliances that will shape significant future opportunities—in this case, provoked in large part by the grassroots success of kids and parents alike collaborating and creating content value. These values combined with pervasive embedded intelligence and connectivity in the B2B arena affords opportunities previously unimaginable. While some people will always choose to stay with the status quo, we believe that leading product OEMs will vigorously embrace the power that lies within self-initiated communities. Particularly as customers begin to expect the immediate gratification or responsiveness to their problems that device and social networking enables, companies will want access to the device-data and content necessary to deliver the full customer experience. All trends are pointing to this opportunity as having an enormous impact across virtually every market.

## About Harbor Research, Inc.

Harbor Research is a research, consulting and venture development firm that drives innovation and value creation to build new businesses in the connected economy. We bring together a unique combination of knowledge, skills, experience and processes that enable our clients to succeed.



Harbor Research serves the “Smart Business” community of emerging technology ventures, diversified product and services companies, Global IT infrastructure players and capital market constituents.