

Smart Systems Drive New Innovation Modes

As the price of embedding intelligence and connectivity into devices continues to fall, smart networked devices will push further and further into the mainstream. This process is self-reinforcing making smart systems and services increasingly prevalent in our lives and businesses.

To understand the future of networked information, it helps to remember that the Internet of Things is about machines making better use of human data, either through the use of the emerging network intelligence or through new applications of sensing in embedded things to make them more contextual and adaptive. Smart devices will be better able to understand where they are and the role they play, and adjust themselves based on human needs and desires. The Internet will be the platform for moving and sharing this data, but people interacting with smart devices and systems will extend these values.

Obviously, such systems cannot be “designed” in any ordinary sense. Certainly, they cannot be designed “topdown.” And yet Smart Systems must be designed in some sense. In the future, Smart Business solutions in areas like healthcare and energy could easily rank among the biggest technical achievements in the history of humanity. New modes for conceiving and realizing these types of solutions must be in place to guide the development of such vast, distributed and complex systems as they evolve according to a logic all their own. It demands that we think about systems and business design not just devices and networks.

The solutions 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 between people and smart things will extend beyond traditional ideas about new products and services to the very manner in which business is conducted. We believe there are indications that this era of Smart Systems is fostering new types of innovation and design. There are several phenomena already happening that can potentially drive significant new modes of value creation. Some important forces evident in the marketplace include:

Collaboration and Crowdsourcing Are Real: It is becoming increasingly clear that “crowdsourcing,” meaning that a large group of people can create a collective work whose value far exceeds that provided by any of the individual participants, including building applications that literally get better the more people use them; and, designing participatory systems that harness network effects not only to acquire users, but also to learn from them and build on their contributions.

Sensors & Social Networks Converge: The integration of sensor technologies and social networks is upon us. Feedback and information from sensors along with information from social networks and the web will creatively combine. While this integration and interaction is still decoupled the online integration of the physical world and the virtual world is progressing.

Service Delivery Platforms Extend To All Connected Devices: The usage measurement,

recording and billing system associated with wireless cellular networks is one of the most complex systems ever built in human history. The complexity and cost of these so-called OSS systems makes it possible for great flexibility in services delivery and pricing models, and as they extend to integrate new types of sensors, smart devices and machines, the ability of these platforms to support new innovation modes will increase exponentially.

Smart Phones Are Driving Innovations In User Experience and Sensory Systems: Many people fail to understand the significant sensor innovations that are being designed into smart phones. Today's smart phones contain microphones, cameras, motion sensors, proximity sensors, and location sensors. As the design innovation from smart phones extends to new sensor-based systems, they can be designed to get better the more people use them, collecting data that creates a virtuous feedback loop that creates more usage.

Analytics Drive New Values: Data analysis, visualization, and other techniques for seeing patterns in data are going to be increasingly valuable. Sensors and monitoring programs are not acting alone, but in concert with their human partners and an increasing number of machine learning algorithms. The continuing promises of an Internet of Things will finally produce tangible value via a hodgepodge of sensor data contributing, bottom-up, to machine learning applications that gradually find more patterns and make sense of the data that is handed to them.

The Network Becomes More Intelligent: As more and more microcontrollers and sensors are embedded in everyday objects, encoded information in physical objects will also create pervasive information "signatures." Seen in this way, a printed bar code, a CD or DVD disc, a house key, or even the pages of a book can have the status of an information signature on a network. A product on the supermarket shelf, a car on a dealer's lot, a pallet of newly produced food sitting on a loading dock-- all have information signatures now. In many cases, these information signatures are linked with their real world analogs by unique identifiers: an ISBN or

ASIN, or a part number. Take the smart grid as an example--neutral web services back-end for energy-related sensor data and will combine smart meter and power device data from homes and businesses to discover unique energy signatures. It will be possible to determine not only the wattage being drawn by the device, but the make and model of each major appliance or any electrical device plugged into any wall socket. Signatures will combine with data fusion technology to drive rapid advances in systems awareness.

B2C Drives B2B and Visa Versa: The Smart Systems phenomenon is not limited to consumers with smart phones. Cisco's Connected Communities initiative and its "planetary skin" project with NASA as well as IBM's Smarter Planet program demonstrate how the B2B world is being transformed by the sensors on the Internet. Factories, refineries, steel mills, and supply chains are being instrumented with sensors and machine analytics that we see in mobile consumer applications.

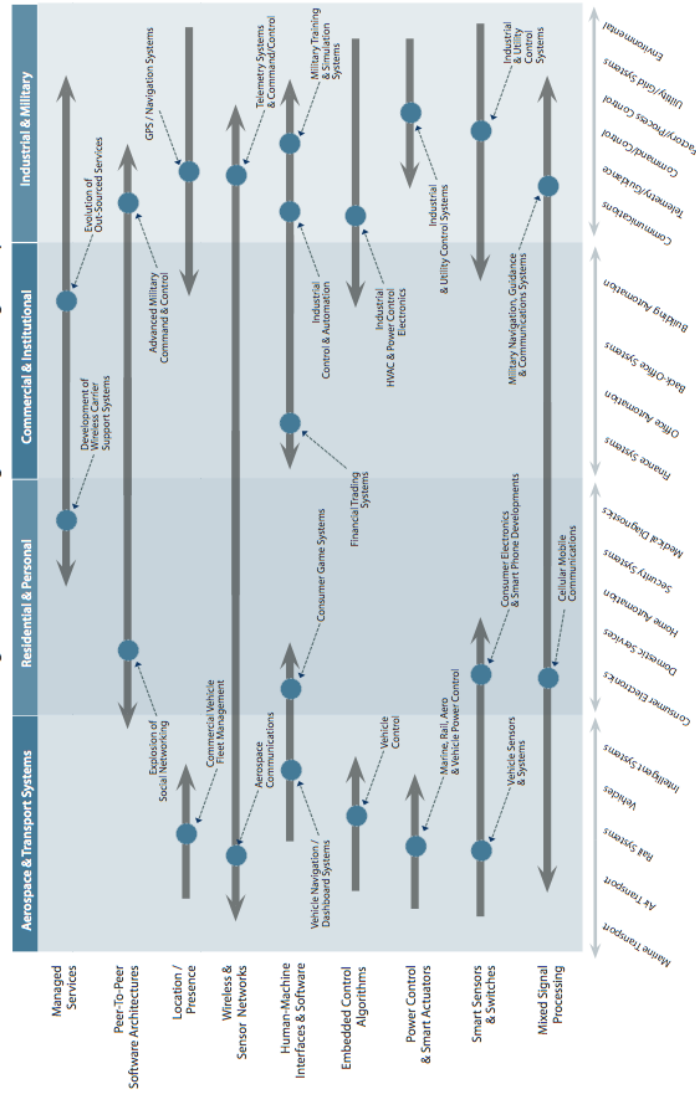
The Internet of Things and People will depend on managing, understanding, and responding to massive amounts of user and machine-generated data in real time. With more users and sensors feeding more applications and platforms, innovators and developers are able to tackle serious real-world problems. As a result, the Smart Systems opportunity is no longer growing arithmetically; it's growing exponentially.

Creative Combinations of Technology.....

Continuing Combinations of Innovation Will Move More Fluidly Across Sectors, Applications & Platforms Creating Entirely New Categories of Opportunities ...



Technologies & Innovation Driving The Internet of Things & People



The marketplace is converging into a vast unified technology architecture to support smart systems integration and collaboration based on common digital building blocks and standards for software and communications

Drive Smart Systems Innovation



These Phenomena Will Allow For New Opportunities To Emerge As Well As Significant Societal Challenges To Be Met

	Behaviors & Relationships	Experience & Content	Skills & Technology
<p>Connected Consumers Networks will change how people behave & interact with each other—existing social constructs & behaviors will change driven by shared awareness & intelligence.</p> <p>Energy & Resources History demonstrates the growing potential for major societal impacts due to neglect of natural resources such as water, air, minerals & food. 1</p> <p>Collaborative business Peer-to-peer info and network integration are combining to create new models of creation for traditional businesses.</p> <p>Health & Well Being As the world grows more interconnected, the ability to affordably access health & lifestyle forces will create vast new opportunities.</p> <p>Sustainable Mobility As awareness of sustainability rises, transportation systems will become managed—public and private systems evolve to meet the needs of public, modular and convenient.</p> <p>Connected Communities As digital natives, people living & working in communities will drive multicultural urban constructs & behaviors will change driven by shared awareness & intelligence.</p>	<p>Behavioral Shifts Self-organizing teams and communities will expand driving new forms of ecologies, collaboration and awareness.</p> <p>Personal Energy People will drive energy initiatives increasingly linked to health, energy products, energy efficient products & carbon neutral services will rise.</p> <p>Large Scale Interactions Swarms become the new teams driving new relationships and interactions.</p> <p>Real-Time Usage Capabilities to sense & analyze impacts grows creating causing new economic structure for resource mgmt.</p> <p>Aging Is Re-invented Aging body as the new frontier - project manage aging - people will expect more health benefits from more products and services.</p> <p>Modular Urban Travel Interconnectedness of disparate transit resources will allow better planning and routing of commuters.</p>	<p>Real-Time Choice Access to information on routes, options, economics and time greatly improves decision support.</p> <p>Global Energy Citizens Awareness of usage and waste spans multi-country and global / regional boundaries causing new avenues of policy development.</p> <p>Reliable Resources Access to food, water, and other resources will radically re-shape public policy and business decisions.</p> <p>Connected Experience Personal knowledge becomes much more valuable - ability of individuals to impact larger and larger numbers of related people through shared awareness and intelligence.</p> <p>Real-Time Usage Capabilities to sense & analyze impacts grows creating causing new economic structure for resource mgmt.</p> <p>Aging Is Re-invented Aging body as the new frontier - project manage aging - people will expect more health benefits from more products and services.</p> <p>Modular Urban Travel Interconnectedness of disparate transit resources will allow better planning and routing of commuters.</p>	<p>Experiences Expanded Individuals and groups start seeking more intense experiences - technology expands potentialities.</p> <p>Deep Personalization People will increasingly reject mass offerings in favor of customization.</p> <p>Smart Infrastructures Complete re-thinking of the movement of goods and services - emergence of smart components and systems combine with lower interaction costs to force less bulk, smaller scales and reduced rigidity.</p> <p>Smart Grid Technologies provide new forms of energy development, manipulation & mgmt.</p> <p>Physical & Virtual Integrate From physical vs. digital to seamless integration of physical and digital experience - all things, all suddenly available and accessible.</p> <p>Self-Referring Products Personal desires integrate with systems of interconnected products and products - automated reference and integration.</p> <p>Smart Health Delivery New business models for healthcare will likely emerge as improvements in health sensing, emergency and support services; and, related IT infrastructure all combine to create new medical and well being value.</p> <p>Self Sensing & Aware Technology augmentation to the human body will evolve rapidly - medical modifications; personal drugs; location-based healthcare.</p> <p>Network Intelligence Group participation modes change - referral behaviors altered/increased - locative activities increase.</p>
	<p>Amplified Concerns Local, regional, global tensions rise relative to securing resources - increased visibility highlights dangers.</p> <p>Extreme Climate Variability Climate change is an urgent challenge that affects long-term corporate performance. The pace of climate change is accelerating as are the risks of increasing alternative energy jobs.</p> <p>Open Innovation New communities emerge as designers of products, services, mandate and act upon their needs and wants.</p> <p>Health Insecurity Increase in pandemics, chronic diseases will cause anxieties.</p> <p>Shared Systems ZooCar and similar shared resources become economically viable as information access allows virtual fleet mgmt.</p> <p>Mega-Cities Expand Local communities within large urban centers will experiment in shared economies, sustainable systems and new civil and social processes.</p>	<p>Populate Re-Invents Time Work span lasts longer; new communities of interests spring up in social and business contexts driving new interactions and values.</p> <p>Energy Accountability People and the planet become much more attuned and integrated resources - elements combine to increase knowledge of personal and group impacts.</p> <p>Enabled Engaged Employees New modes of career development emerge - new forms of peer interaction and knowledge exchange rise.</p> <p>Predictive Powers New sensing capabilities combine with new analytic and simulation tools to foster much greater predictive powers.</p> <p>Health Economy Creation of health-focused communities; location-based health services; health information and awareness become a dominant societal force.</p> <p>Democratized Movement Awareness of transport systems conditions allows better travel decisions - swarm travel becomes the organizing schema.</p>	