

the **hammersmith** group
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Clicks & Mortar: Web 4.0, The Internet of Things

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“The future is already here. It’s just not evenly distributed.”

— *William Gibson, author*

“This is a true story. It’s about the future.”

— *Sean T. Drinkwater, Freezepop*

The real estate industry has traditionally been a slow adopter of technologies. But it is about to become a cornerstone of the emerging wave of technologies.

Web 2.0 was the emergence of social media and user-generated content. Web 3.0 is generally regarded as the emergence of the semantic web. Web 4.0 will be the Internet of Things.

The nomenclature is misleading: these are not version numbers, and they are not sequential. In fact, 3.0 and 4.0 are developing concurrently and will benefit from each other’s advances.

One of the most critical developments of Web 4.0 will be the migration of online functionality into the physical world. To use one of the simplest examples, imagine being able to Google your home to locate your car keys or the remote control.

The entrepreneurs behind Violet, Rafi Haladjian and Olivier Mével, created some of the first Web 4.0 consumer electronics. They observed that, “You can visit Amazon.com twice and it will recognize you and provide relevant and personalized advice. You can live in the same house for all your life and you will always be a foreigner.”

By attaching IP addresses to physical objects, people will be able to remotely communicate with or control actual devices through a web-based interface. Attaching wireless sensors to objects allows them to track their environment in real-time, providing the foundation for the equivalent of a Google Analytics for the physical world’s data. There will be a growing overlap between physical objects and digital icons.

There will be an increasing overlay of information tagged to physical locations. Innovations such as QR barcodes function as two-dimensional ‘hotlinks’ from physical objects to the Internet. Users can center the QR code in the camera of their phone and can connect to a related web site.

Hiroshi Ishii of MIT’s Media Lab observed that, “At the seashore, between the land of atoms and the sea of bits, we are now facing the challenge of reconciling our dual citizenship in the physical and digital worlds.”

The individual technologies to enable this vision — GIS, GPS, QR codes, and RFID — currently exist and are beginning to be pieced together in original ways. Many of these technologies will emerge in association with energy-efficiency applications (connected devices and converged systems; smart devices and intelligent buildings; power sharing and smart grids). As awareness grows and prices drop, these will filter out into broader business, consumer, and entertainment uses.

The amount of information that will be associated with a physical location has the potential to revolutionize tourism, shopping, and how we navigate public and commercial spaces. It is increasingly common for photos to be geotagged with location. It seems likely that we will also have more user-generated content such as Google Maps mash-ups that combine images, narratives, and physical coordinates in unexpected ways.

“This is the next step in making the history of cities legible and accessible,” said Donovan Rypkema, principal of Place Economics, a consulting firm based in Washington, DC. Donovan describes an urban planning charrette where the planners and residents created a digital map that combined historic and personal photos that were tagged to individual street addresses. “There is so much local, location-based information that can only be found offline. It hasn’t been indexed, and it is not easily searchable or identifiable.”

Peter Morville emphasized the connection between the semantic web and the Internet of Things: “Location is easy, but what about aboutness? Can the folksonomies of Flickr and del.icio.us survive in the wild? Will free tagging deliver a physical world of findable objects?”

Faris Yakoub of McCann NY gives some practical and possible examples of how social media will adapt to the Internet of Things: “You’ll see your own, specific reality being mined, to give you insight into your own life: ‘You know your route to work could be 10 minutes faster? Or — why not take a different route, a five-minute detour means you will bump into an old friend. Or — the bookstore on your way home has an event on today that matches your Amazon profile, why not pop in? Insert brand as relevant. And that’s the just the commuter tip of the personal data iceberg.”

So, why will this begin in real estate?

“Real estate is not a technology-intensive sector, and construction is even less so,” said Jamie van Klemperer, FAIA, principal of Kohn Pederson Fox, the firm which created the master plan for New Songdo City, the largest private development project in the world. Songdo was designed as a showcase for ubiquitous computing, converged networks, and other emerging technologies. “Just looking at the last fifty years, contrast the leaps forward in information, manufacturing, medicine, and transportation with the lack of innovation in real estate.”

“The current global financial crisis may be one of the best things for innovation in the real estate sector,” said Greg Kats, Director of Climate Change Policy for Good Energies, a venture fund based in Washington, DC. He believes that the downturn will drive adoption of technologies that reduce operating expenses. “As these technologies demonstrate their value to the early adopters, these features will likely become industry standard as the markets return to a boom cycle.”

“People don’t change until they have to,” contends Charles Randall, managing director of Revival Funds. “High energy prices raise awareness of how prices affect you on a daily basis. When your natural gas bill goes up 50 percent, you feel the pressure to become energy efficient — quickly.”

The spike in oil prices over the past few years demonstrated the risk of exposure to the volatile price of fossil fuels. For many buildings, the cost of heating and cooling became a significant

percentage of overall operating expenses. This underscored the pressure to consider alternative sources of space conditioning, such as geothermal exchange.¹ Also, in the current recessionary environment, revenue growth will be largely driven by reducing operating expenses. The combination of green and intelligent building features increase efficiency by enabling systems to work collectively.²

Second, there is a growing awareness that the price of many resources — including gas, oil, and water — is highly subsidized. The ‘price at the pump’ excludes the political and military costs associated with these resources. The subsidized prices also obscure the payback period for investments in energy efficiency in certain sectors. However, an increasing number of federal and state level tax credits and incentives are hastening the adoption of green and intelligent building features.

These technologies will become a platform for further developments and innovation once that infrastructure is in place. A number of projects — including the Peninsula Hotel in Tokyo and the Hotel 1000 in Seattle — constructed around converged networks have begun to explore the unexpected benefits that arise from connecting formerly disparate systems.

Intelligent buildings will be a precursor to the broader Internet of Things.

Conventional buildings have 20-30 separate systems (electrical, HVAC, lighting, water, etc.). Converging these building systems on an IP platform is the foundation for intelligent buildings. IP addresses can be assigned to individual appliances, components, devices, or multiple devices can be addressed through a gateway. Sensors enable individual systems to detect and respond to changes in their environment. Converging systems allows them to interact and to work collectively, whereas in conventional buildings these systems often work at cross purposes.

No system or process can be managed until it can first be measured. One of the most significant aspects of intelligent building systems will be the massive amount of real-time data that they

¹ “Valuing Green Buildings,” *Urban Land*, June/July 2008: <http://thehammersmithgroup.com/about/images/Valhouli-Valuing.pdf>

² This is covered in greater detail in Hammersmith’s white paper *Clicks & Mortar (2): Costs and Benefits of Intelligent Buildings*

generate during the course of their everyday performance, as well as metadata about that data.

These systems will be collecting the data that makes the business case for their own adoption. This ability to measure, quantify and correlate results has the same potential to revolutionize property development, management and operations as what online advertising compared to print marketing.

“How do we make real estate more googly?” asks Jeff Jarvis, author of *What would Google do?* “Google loves data. These systems and components are going to produce data, data, and more data.” Jarvis’ book asks us to rethink industries to see how they would develop if they were conceived today, in our present social and technologic environment, rather than with their legacy processes.

Author and futurist Bruce Sterling coined the term ‘spimes’ to describe the comprehensive life-cycle data stream associated with a physical object. Author and activist Cory Doctorow noted that, “In *Freakonomics*, we learn how accidental collections of fortuitously arranged information allow economists to measure and understand the impact of complex social interactions. A universe of spimes is a universe of millions of these experiments in potentia.”

The Hotel 1000 in Seattle, one of the most wired hotels in the world,³ demonstrates one of the unexpected benefits of converged systems. The minibar in guest rooms has been connected to the Internet. As a result, the hotel gathers a stream of usage data which can be correlated at the guest level or at a broader level. “Let’s say that someone has been a guest for ten visits, and we’d like to do something nice for them. The records may indicate that they always end the night with a nip of Jack Daniels and a Toblerone. That suggests a relevant and personalized gift. When they check in, we may have a bottle of Jack and a large chocolate bar for them,” said Matt Hagerman, the general manager of the hotel.

“It would be time-consuming to enter and parse this data manually,” said Hagerman. “But it is just one small example of the ancillary benefits of connecting individual appliances and systems to the Internet. It makes it feasible to track and use data in ways which could not have been done before.”

“Remote control is another side effect of convergence,” said Can Habib of Cisco’s Connected Real Estate Advisory Group, which consulted on the systems for a number of the leading projects worldwide.

Hospitality is a critical vector for showcasing new technologies, as many people are first exposed to new products and innovations in hotels. Senior housing is also an early adopter of housing technologies because these innovations meet pressing needs, and can influence the broader adoption of these innovations into other markets. Because caregivers and families of the residents are exposed to the benefits of these technologies, “these kind of applications will have a viral marketing affect,” according to Alex Soojung-Kim Pang of the Palo Alto, California-based Institute for the Future.

The Peninsula Hotel Group is recognized as one of the pioneers in using design and technology to improve the guest experience. Many of its innovations have come to be regarded as industry best practices. The Peninsula Tokyo opened in September 2007 showcasing a number of ideas which will likely filter out into different classes of multifamily projects.

For example, at the Peninsula Tokyo, the phone and the entertainment systems are connected and responsive to each other. As a result, the system automatically lowers the volume of music or television when the phone rings. If it is a late-night call, the bedside lamp gently glows while the phone is in use. This is a synergy that would not be realized if the entertainment, phone, and lighting were simply unconnected devices that could not respond to each other.

Computing power will be embedded in devices that are not regarded as computers

Universities were among the earliest adopters of connected washing machines and dryers for their dormitories. Students can log in and check the availability of and even reserve machines. Appliances can even text users when their laundry is done.

³ *Clicks & Mortar: Using technology to enhance the experience of a space* <http://thehammersmithgroup.com/images/reports/tech.pdf>

Once people have been exposed to this level of convenience, it will be difficult to go to apartment buildings in major cities that don't have this functionality.

Individual devices will have more flexible functionality. TV's become computer monitors, and become the interface for a number of hotel services at the Hotel1000 and the Peninsula Hotel. IP phones also provide a number of services that analog or electronic phones could not provide. Andrew Carle, the founding director of George Mason University's program in Assisted Living/Senior Housing Administration, believes that voice recognition may become a more prevalent interface between users and systems. Lastly, Violet's Nabaztag "rabbits" demonstrate that you can receive information in a number of formats that don't involve monitors or keyboards.

The corporations driving these innovations include technology firms (Cisco, HP, Intel, Microsoft, Siemens) and consumer electronics/household appliance companies (GE, LG Electronics, Whirlpool). This reflects the growing integration of the technology and brick and mortar sectors, and provides a sense of the size of the market and the budgets of the major corporate players.

The convergence of smart devices, intelligent building systems, connected real estate, and locative media will begin and generate awareness through energy-efficiency. However, it will quickly move beyond these origins. The Internet of Things presents new channels for commerce, entertainment, games, and media — as well as a platform for innovative, customized advertising, communications, marketing, and public relations.

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