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Design and Integrated Digital Experience

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Truth Designed: Transformation Through Design Integration and Transparency

by Ying Liu, David Summers, and Bill Hill

The availability of increasingly interactive and robust technologies is unleashing new approaches to business and problem-solving. Ying Liu, David Summers, and Bill Hill—with compelling examples from politics, healthcare, and product development—highlight how the core of today’s most powerful and disruptive applications is a deeper transparency that delivers facts and information to facilitate the exchange of ideas and decision-making.



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The decisions we make define us. At every turn we are asked to make choices. These choices are based on our interpretation and analysis of everything we know about the decision at hand—information that may come from a variety of sources. We make our decisions by processing information and understand-

ing that which we believe to be true.

In recent years, the amount of information available to us has increased by leaps and bounds. Today, an average consumer can buy a one-terabyte hard drive (1 million megabytes) for as little as \$100. In 1992, a terabyte drive, if such a thing had existed, would have cost \$5 million. In mid 2008, the four-gigabyte (or 4,096 megabytes) flash memory chip in an iPod Nano cost \$25. In 1992, the same four gigs of flash memory would have cost \$500,000, making the price of a hypothetical Nano, oh, about \$3 million. For most of us, the Internet didn't exist in 1992. Monthly Internet traffic totaled about four terabytes; in fact, in

1992, the total of all the data traversing the global Net came to about 48 terabytes. Today, YouTube alone streams 48 terabytes of data every 21 seconds.¹

The upshot is that our ability to cost-effectively deliver and store large amounts of information has grown to the point at which the global population sees the world through a digital lens that today invites participation and collaboration. The interactivity that is now part of many people's way of life has created new levels of transparency that affects how decisions are made regarding almost any topic.

The Internet is an obvious starting place for understanding the onset of transparency. When the Web opened up as a publishing platform in the mid 1990s, it allowed anyone with a bit of HTML know-how the ability to publish specialty content online. Forums, bulletin boards, and user groups became hubs through which people could communicate in a one-to-many context.

A turning point was when commercial sites such as Amazon began to create user-generated content to support product descriptions, giving potential buyers a new set of information on which to base purchasing decisions. It was not long before the transparency offered by such user-generated content became the backbone for entire businesses. Yelp offers user-generated reviews of local businesses. Flickr offers a user-generated lens into world events, art, and travel, yielding a perspective that sometimes goes deeper than traditional media outlets. Facebook offers the opportunity for people to become totally transparent as they broadcast up-to-the-moment details about themselves through an assortment of tie-in features and applications. All of these and other similar applications are designed structures for creating new levels of transparency and truth and challenging us to redefine our overall approach to evaluating information for better decision-making.

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Certainly, the quality of some user-generated content as it relates to truth can be debated—with Wikipedia a common example. However, transparency and truth in design extends beyond what is believable; it also drives what is actionable. The transparency offered by today's applications reveals a level of honesty and truthfulness that is driving

transformation across industries. The integrated design of today's digital tools offers a view into information that reveals new levels of truth that drive decision-making and wholly positive change.

Here we will look at how integrated design is bringing about new levels of transparency and truthfulness in politics, healthcare, and manufacturing. The tools available in these fields today drive new levels of actionable decision-making, better collaboration, and game-changing transformation. Ultimately, design managers are well served to understand the deeply integrated relationship among information, technology, and truth, and how design serves as a lever for creating useful and usable applications and experiences.

Digital reality in politics: Seeing through the issues

The recent presidential election saw technology and transparency at the core of what will most certainly be a transformation of how political candidates and voters will experience future campaigns. One of the most significant digital advances can be seen in the fundamental change in fundraising that the Obama presidential campaign embraced. In the June 2008 issue of *The Atlantic* magazine, Joshua Green writes:

“What ultimately transformed the presidential race—what swept Obama past his rivals to

1. Bret Swanson, “How Techno-Creativity Will Save Us,” Progress Snapshot Release 4.25, December 2008 (originally published at forbes.com on December 12, 2008).

*dizzying new levels of campaign wealth—was not the money that poured in from Silicon Valley but the technology and the ethos.*²²

The disruptive influence that enabled Barack Obama to raise half a billion dollars online for his campaign was digitally enabled. Al Gore saw the beginning of this in his campaign four years ago, as did Howard Dean. But without the emergence of social networking sites and, more important, entrepreneurs who saw the power in their design, Hillary Clinton might be in the White House. Motivating entrepreneurs, such as Joe Rospars, who became director of the Obama new-media department, and Chris Hughes, co-founder of Facebook, who took a sabbatical to work on the campaign, brought with them the spirit of innovation.

Design practices and analytics played a huge and ongoing role, using the Beta approach to continuously modify and update BarackObama.com. An analytics team measured everything that went in and out of the site—tracking which links drew the most traffic and what kinds of emails from the campaign generated the most activity. The effort included a chief technology officer, Julius Genachowski. If the site was the car, the analytics team served as its mechanic, tuning and tweaking as needed in a 24-hour online cycle.

“The technology now has made it a lot easier

for everyday people to participate. It’s made it easier for campaigns, too. The technology allows us to build a platform and see if people come,” said Genachowski.³

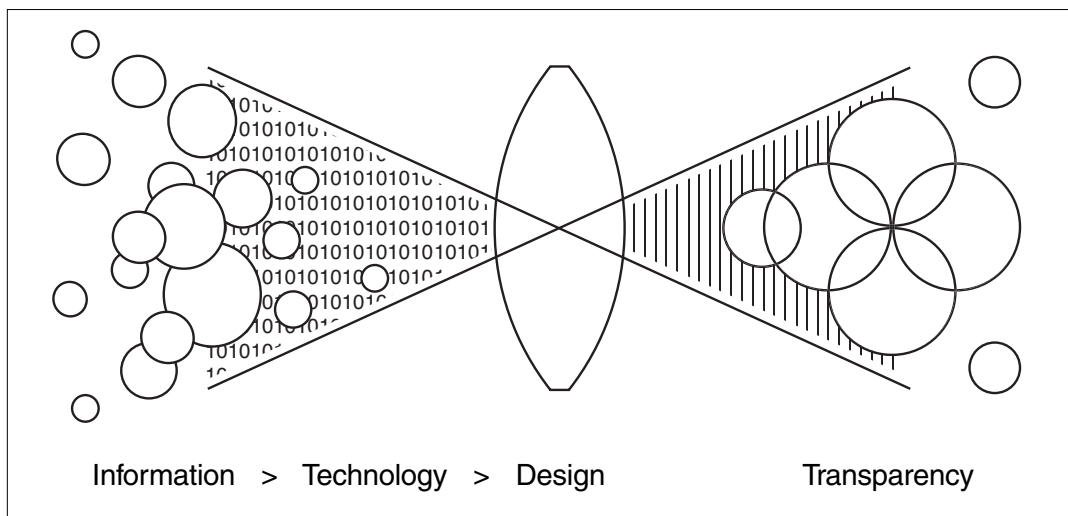
Where technology may have taken center stage in the Obama online campaign efforts, it is the design applied to the technology that allowed for the information to be delivered, analyzed, and put to use. This is a common misperception—technology can be used to deliver information, but it is design that makes information useful and true when functionally integrated across multiple levels of data.

Design tends to thrive in hard times. In the scarcity of the 1940s, Charles and Ray Eames produced furniture and other products of enduring appeal from cheap materials, such as plastic, resin, and plywood, and Italian design flourished in the aftermath of World War II.

Will today’s designers rise to the occasion during similarly turbulent times? “What designers do really well is work within constraints, work with what they have,” says Paola Antonelli, senior curator of architecture and design at the Museum of Modern Art. “This might be the time when designers can really do their jobs, and do

2. Joshua Green, “The Amazing Money Machine,” *The Atlantic*, June 2008.

3. Jose Antonio Vargas, “The Clickocracy: Obama Raised Half a Billion Online,” *washingtonpost.com*, November 20, 2008.



Passing unorganized data through a design lens can render information more transparent, useful, and truthful.

them in a humanistic spirit.”

There is a reason she and others are optimistic. However dark the economic picture, it will most likely cause designers to shift their attention from consumer products to the more pressing needs of infrastructure, housing, city planning, transit, and energy.

Designers are good at coming up with new ways of looking at complex problems, and if President Barack Obama delivers anything like a W.P.A., we could be “standing on the brink of one of the most productive periods of design ever,” says Reed Kroloff, director of Cranbrook Academy of Art.

As design is brought to the table to tackle complex problems, transparency and the ability to see through a challenge will serve as a lever for success. We can expect new software applications to add transparency to civic issues at all levels of government, bringing clarity and truth to all concerned in the interest of making decisions based on actionable information.

**Digital reality in healthcare:
A healthier view**

The healthcare and well-being industry is another traditional industry currently undergoing a digital makeover. With a renewed focus on how people experience their healthcare systems, it seems inevitable that design will play an increasing role as the industry adopts new systems that allow for gathering, analyzing, and sharing information digitally.

The current task facing the medical industry harkens back to a student project, more than three decades ago, to capture patient records on microfiche. It is clear that lit-

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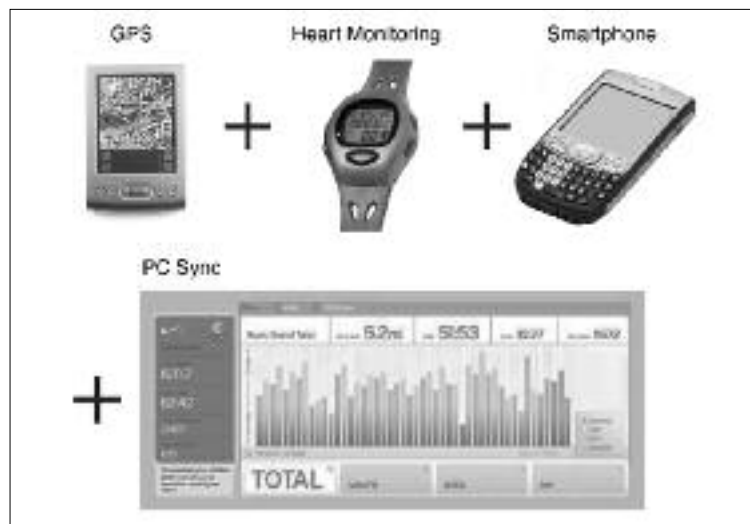
tle has changed when you see such headlines as, “City to Pay Doctors to Contribute to Database,” accompanied by images of rows upon rows of file folders stuffed onto shelves, literally waiting to be mined.⁴

Today’s efforts are no less ambitious. Government initiatives are underway to harness electronic data for public-

health goals such as monitoring disease frequency, cancer screening, and substance abuse. Other projects are focused on harnessing health information from individuals and populations, sharing it across networks, and analyzing it to make the practice of medicine more of a science and less of an art.

The potential of these organizational applications becomes magnified as they are integrated across vertical technologies, medical products, and tools. For example, entrepreneur David Rose has developed a product called Glowcaps (see image on next page) to help individuals improve medication adherence by replacing the cap of a standard prescription medicine container with a digitally enhanced one. A simple idea that reminds a patient or

4. Anemona Hartocollis, “City to Pay Doctors to Contribute to Database,” *New York Times*, December 29, 2008.



Elements from existing technologies are combined to add new transparency to industries such as health and wellness. Over time, these technologies may serve as a bridge between physician and patient.

informs a doctor or caregiver by monitoring adherence comes as the result of the integration of digital technology with human need—grounded in economics.

Again, where technologies are available to store and deliver massive amounts of information, without proper design integration the usefulness of the information may be limited. In the case of Glowcaps, the technology serves as a conduit for doctors to monitor patient activity. This application could be integrated with other healthcare applications, ultimately logging the information in the patient's medical history and making this information available to other doctors who might someday treat the patient, or to cross-reference potential treatments with patients with similar medical histories.

This reality may be nearer than we think. Microsoft's beta launch of HealthVault offers individuals the opportunity to organize personal health information, and to use the data to

manage health across different types of medicine. Microsoft offers a software development kit exclusively for HealthVault, encouraging innovation and expansion of its platform. The HealthVault service is currently free and available online.

Google has its own plans for a health platform and is well positioned to leverage its data storage expertise with a variety of stakeholders who crave personal health information, including insurance companies, hospital networks, and a number of upstart companies (such as 23&Me—see below), in the personal genomics space.

These tools exemplify the continued validity of Moore's and Metcalfe's laws applied to products and services on digital processing power. As designers, we are constantly challenged to create useful, usable, and desirable experiences that match the expansion of the core technologies that enable them. As Don Norman reminds us: Study human beings, not technologies, because human beings have not changed significantly over thousands of years.

In a recent class at IIT's Institute of Design (ID), I challenged the students to embrace what I termed YOUser centered design. I wanted them to first experience and then design business models based on the integration of practices like yoga, meditation, and nutrition. As a center of innovation design, ID has advocated user research in all aspects of its curriculum and created many product ideas based on the integration of technology and healthcare.

But I felt it was important to begin this with a nondigital design process, immersing ourselves in the research rather than simply observing others. The results of the class were prototypes of social networking sites, ubiquitous monitoring systems targeting safety and security, economic incentive programs for businesses, and changes in the education practices of our children that, while enabled digitally, were based in human needs and concerns. What all of the aforementioned have in common is a level of interconnectedness where technology and information come together to fill needs by transforming exist-



The Glowcaps product sports a digitally enhanced top that reminds a user every 24 hours to take a pill. The display automatically resets when the top is taken off the bottle. Alternatively, the user can buy a more complex version that connects to the Internet to keep track of usage.

ing ways of connecting, managing data, and completing tasks.

Building on the computational power of computers and the immense value of social networking, the developments in the personal genomics space further exemplify the future of digital technologies in healthcare. Companies like 23&Me are basing their business models on the integration of low-cost genetic profiling and social networking to mine both the long tail⁵—taking advantage of frequency distribution as exemplified by the 80-20 rule—and the mass market. On a bigger scale, firms like Pacific Biosciences plan “to bring gene sequencing to the masses, making it fast and cheap enough to really deliver on the promise of personalized medicine.”⁶

Biology is also on the innovation curve and is likely to accelerate. When the Human Genome Project began in the early 1990s, sequencing one DNA base pair cost about \$10. Craig Venter famously began his own competing genome search in 1998 and completed the project simultaneously, at around one-tenth the cost. Today sequencing one base pair costs a tenth of a cent, and by 2024—just 16 short years from today’s presidential transition—we’ll sequence an entire human genome (yours, if you’d like) for \$100.⁷

One of the big changes that will likely emerge in the Obama Administration is the way digital medicine is funded. That support is likely to move from the advocacy and the private sectors to the government. In his campaign, Mr. Obama promised to earmark \$50 billion over five years to spur the adoption of electronic health records and said recently that a program to accelerate their use would be part of his stimulus package.

The upshot is that healthcare is moving toward a new level of design integration and transparency, and moving with a full head of steam. Technologies, information, and design will no doubt converge to create disruptive transparencies, some of which may be transformational.

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As Brent Edwards writes, “... I heard biotech guru Steve Burrill say a couple of years ago when predicting future trends in biotech... that better diagnostics will allow healthcare professionals to treat causes rather than symptoms.” This speaks directly to

designed information revealing new truths about the core of a situation—in this case, transforming how we think about personal health and wellness.

Digital reality in manufacturing: New ways of making things

Perhaps the most tangible representation of integrated design is found within the building and manufacturing industry. Recent developments in digital prototyping are bringing together teams from all areas of the building process to collaborate around a project in a virtual environment.

Digital prototyping gives manufacturers the ability to virtually explore a complete product before it is built—so that they can create, validate, optimize, and manage designs from the conceptual design phase through the manufacturing phase of the product development process. By using a digital prototype, manufacturers can visualize and simulate the real-world performance of a design, boosting design efficiency and innovation and saving time and money by reducing the number of physical prototypes they build.

The digital prototype is a virtual representation of the product that not only communicates the design to others (for feedback and review, or downstream to suppliers or manufacturing) but

5. Chris Anderson, *The Long Tail: Why the Future of Business is Selling Less of More* (New York: Hyperion Books, 2006).

6. Michael V. Copeland, “Silicon Valley’s Hottest Startup: Pacific Biosciences’s Groundbreaking Gene-Sequencing Technology Could Change Healthcare” (www.cnn.money.com/2008/10/03/technology/pacific_biosciences.fortune.index.htm), Oct. 16, 2008.

7. Bret Swanson, op. cit.

also allows the engineer to validate the product in a virtual environment. Autodesk has been acquiring simulation/computer-aided engineering (CAE) applications and including them in their digital prototyping solutions set. Autodesk has also been moving closer to manufacturing by acquiring companies that produce design validation and optimization tools, such as Moldflow, and integrating them into their portfolio of products that together form a digital prototyping solution. This will bring them closer to solutions that bridge the gap between the virtual and the physical product.

The long process of bringing products to market is shortened by digital technologies: software used by product designers and architects can directly go to specifications and blueprints, with the software checking for errors and suggesting efficiencies. Three-dimensional printers drastically reduce prototyping cycles, and are dropping to near a critical price point for mass adoption.

The distribution of products has seen a sea change with e-commerce, and the distribution of software and content via flat distribution models is becoming more mainstream and more established. Apple's App Store for the iPhone, one of 2008's biggest success stories in technology, changed the complicated relationships among vendors and platform manufacturers. Google Android, Palm, and Blackberry all have similar online markets, and other enabling technologies, such as context-aware services, are in turn pushed forward dramatically.

Autodesk's success with digital prototyping highlights the need for integrated applications that are scalable, attainable, and cost-effective. The latter allows for greater numbers of people to use the various products surrounding a specific project. Autodesk is simplifying solutions so that engineers can use them directly. Some would argue that giving a tool like CAE to a person who isn't trained in the rigors of design

The long process of bringing products to market is shortened by digital technologies

analysis, stress, or thermal studies is a dangerous thing. However, the absence of professional analysts may force a choice between having the designer do some analysis and not having any analysis done at all. This approach is a fundamental value for the notion of truth and transparency in integrated design—take a complicated process, mask the complexity from the user, and make it usable by everybody.

With these digital creation and collaboration tools becoming increasingly connected and easy to use, the barrier to market is much lower. As noted at the beginning of this article, we are seeing products and services growing out of entirely user-generated ideas. In the Web 2.0 world, what used to be called participatory design is now called crowdsourcing—allowing the public to contribute solutions to problems, or designs for production. If the Big Three automakers had started to listen to customers earlier and implemented some of their suggestions, would they be in the position they're in today? Is it too late to change that?

At times, these collaborations are driven by typical work structures, but often they arise from simple recognition and kudos from a community that forms around the creative challenge. Examples include footwear company RYZ, which produces the shoe designs that garner the most user votes and that pays \$500 per chosen design, as well as \$1 per pair sold—and also offers “shoe designer immortality.” Ponoko brings 3D printers to the masses, allowing them to become industrial and furniture designers. The most widely known example of crowdsourcing may be the X Prize (“bringing about radical breakthroughs for the benefit of humanity,” as the website has it), whose foundation plans to launch 10 new prizes over the next five years, with combined purse amounts of \$100 million. On a smaller scale, the Netflix prize of \$1 million for anyone who can substantially improve the accuracy of predictions about how

much someone is going to love a movie based on their movie preferences, will be open through 2011 and is not yet awarded.

Looking ahead

New information creates new connections that tend to change the way things have always been done. Prior to the middle of the last century, farmers did the best they could all year, then took their products to the market and accepted whatever price was in ascendance for that day, since they had no other choice. Once a system was in place for farmers to hedge on commodity prices and be able to limit their risk, agriculture was forever changed. Though we'll never have the benefit of hindsight, we think that changes on this scale are happening in many industries and accelerating with the network effect of information. Health information standards will change everything about how we stay healthy and prevent sickness. Application stores and public access to remote production without the need for scale will change distribution channels forever.

All signs point to levels of integration that give us unprecedented views of the world. Consider being able to tie the health impact of a building material to individual patient diagnoses, with this information available to politicians as a key issue in their campaigns. For design managers, understanding the relationships among information, technology, and design is an initial step toward creating experiences that offer a truthful view into information to make it valuable. Integrated design is the catalyst that makes this possible.

In closing, it seems fit to remind ourselves that design is essential to driving change—or, as Natalia Davis of Kairos, Inc., so aptly said, “Designers invent solutions to new problems. Designers invent opportunities in a changing world. Business schools teach the history of what has worked, not the methodologies for figuring out what will work. In this ever-changing global market, the agility provided by top designers matters most.” ■

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