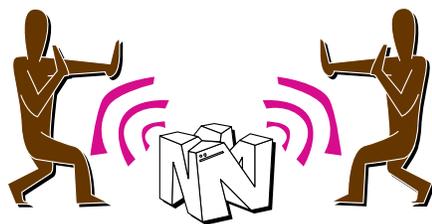


ALL THE WORLD'S A GAME: the future of context-aware gaming



INSTITUTE FOR THE FUTURE

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about the ...

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CONTENTS

- 1 **What Is Context-Aware Gaming?** 1
- 2 **Technological Enablers of Context-Aware Gaming** 5
- 3 **Scenarios: Visions of Context-Aware Gaming in the Next Decade** 13
- 4 **Organizational Opportunities for Context-Aware Gaming** 29

Imagine a world where every nook and cranny is a potential space for playing a game.

Imagine that every movement of the body is a potential means of control, where a wave of the hand casts a spell or fights off an enemy.

Imagine, as this graffiti suggests, if the streets actually were alive with hidden layers of stuff, waiting for someone to come along and use it in entirely new ways.

These what-if scenarios begin to describe the world of what we call context-aware gaming. A context-aware game uses physical and digital information about the current status of the player to shape how the game is played. The integration of physical and digital context moves the experience beyond what we've come to expect of games played in either the digital or physical worlds alone.



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1 What Is Context-Aware Gaming?

Contextual input can be divided into four categories:

- **The environment:** This includes the current location of the player or the presence of objects in their environment, such as tagged products in an RFID-equipped supermarket.
- **Physical activity:** The movement of the player, either in the form of changing location (say from one street to another) or more intimate gestures, such as the wave of a hand.
- **Body data:** The raw feeds coming off of our bodies, sometimes controllable, sometimes subconscious. This includes brain activity as well as stress levels, breathing rate, and emotional state.
- **Context from other people:** Some game experiences aren't meant to be solved by one person or even a small group of people. These games are solved by the collective comments, interpretations, recommendations, votes, and descriptions provided by other players of a game or users of a system or service.

Context-aware games are very different than what we expect from digital games, and some early examples will help show the differences.

Mogi is a location-based game launched in Japan in 2003. *Mogi* players explore their physical surroundings to collect hidden virtual items. Players interface with the *Mogi* world through software on their GPS-equipped mobile phone. As they move about the city, the software updates their positions and displays their proximities to virtual tokens. The goal of the game is to gather as many tokens as possible, trade these tokens with other players for rarer ones, and build the ultimate *Mogi* collection. *Mogi* uses a player's location as the main source of context: where he is physically in the real world determines what kind of experience the game provides. Games that take location as an input to the experience are often called "pervasive games" because they extend the gaming experience off the screen and into the terrain of the physical world.



Human Pacman, out of the National University of Singapore, takes the *Mogi* idea of a fictional layer on top of the real world one step further. Players wear a portable computer and a heads-up display; the display analyzes the terrain in front of the player and then overlays elements from the original *Pac-Man* game onto the player's field of vision. A player's location and position of the head are the contextual inputs here. As the player walks and looks in new directions, the game updates accordingly.

Mogi and *Human Pacman* take a player's current location as the contextual input to the game experience. *Journey to Wild Divine*, a software and hardware package for personal computers, gets even more personal. It uses biological readings from the body—namely a player's heart rate and galvanic skin response—as the main inputs to the in-game experience. *Journey to Wild Divine* aims to teach proper breathing and stress reduction techniques, and the only way to progress through the virtual world of the game is to simply, or not-so-simply, relax.

The Playstation EyeToy camera and the gesture-recognition controller for the upcoming Nintendo Wii suggest that context awareness will also be the next frontier in the home video gaming. Both devices require the player to act out the actions they want to perform in the game, as their physical activity is the only contextual input affecting the game—no joysticks here. A snowboarding game for the EyeToy requires a player to stand in front of the camera as if maintaining balance on a board and swerve left or right to avoid obstacles. The handheld Wii controller will be even more sensitive to players' movements: one game actually calls on would-be fishermen to cast a virtual line and fight with a potential catch. The EyeToy has been such a success as an optional accessory that visual capabilities will be built into the next version of the Playstation home console, and in a radical break from traditional video gaming, Nintendo is making gesture recognition the core feature of Wii.

I Love Bees was a serialized, pervasive space opera that could have been played alone but was a lot more fun when other people were involved. This game exemplifies context awareness that comes not from a new type of sensor or a stream of numerical data but rather from the collective interpretations and ideas of other players. The clues and story clips provided by the game developers were only a launching pad—the experience took on new meaning when the community of players took these game elements and shared their own insights and unique perspectives.



Context-Aware Games Are Leading Indicators of Technology Evolution

The last 35 years have seen several fundamental transformations in technological ability. The 1970s and 1980s were driven by raw developments in computing, and an explosion of new tools for communication and connection in the late 1980s and the 1990s finally brought a social dimension to technology. By mapping the history of video gaming on a timeline of these major technological shifts, we see that gaming has always been one of the earliest domains to incorporate the newest technologies and tools. As we now shift into an era that will be dominated by the ability to sense context, we find that games are again a leading driver.

While the contextual elements of today's context-aware games cover a fairly broad spectrum—from location to heart rate and other people's ideas—there are some fundamental similarities among games that integrate elements of the physical and digital world, all pointing to a new era of gaming that builds on the rich spaces and interactions of daily life. This shift will offer new channels for communication and marketing, build valuable skills in future workers, and pose challenges and opportunities for products, services, and brands when anything can and likely will be part of a game.

Five key developments will define the new terrain of context-aware gaming:

- 1. Anyone can play these new games.** When games are built around existing elements there won't be a need to learn arbitrary controls before playing, and these experiences will reach a broader swath of the general population than any video game ever has.
- 2. Gaming will occur anywhere, anytime, with anything.** Games that bleed into the real world will be played anywhere and everywhere, and formerly non-gaming objects (such as a crosswalk) will suddenly take on dual identities.
- 3. Game space and "real" space will become one.** When everyday actions, like driving to work or buying items at the supermarket, begin to affect the state of a game, players will begin to see spaces in the real world both for their traditional purposes and their roles in game stories.
- 4. Other players are more essential to context-aware games.** In some games, the ideas and interpretations of other players will actually be the source of context as bottom-up communities form to give life to clues and puzzles. Other games will recognize the diversity of situations in the real world and give players the tools to create and share their own adventures.
- 5. Most exciting games will come from the bottom up.** Context-aware games won't require million-dollar budgets or highly specialized developers to be successful. The barriers to creation and distribution are much lower than traditional video games, and ideas for compelling stories or novel interactions will be far more valuable than a degree in computer science.

Even though bleeding-edge technology isn't necessarily a requirement for a context-aware game,

developments in technology over the last several decades have been the fuel for innovators to experiment with new formats for games. In this section, we map the present and future of key enabling technologies of context-aware gaming.

in the future ...

- smaller devices and components
- longer-lasting batteries
- larger and improved displays
- integration of new sensors useful for gaming

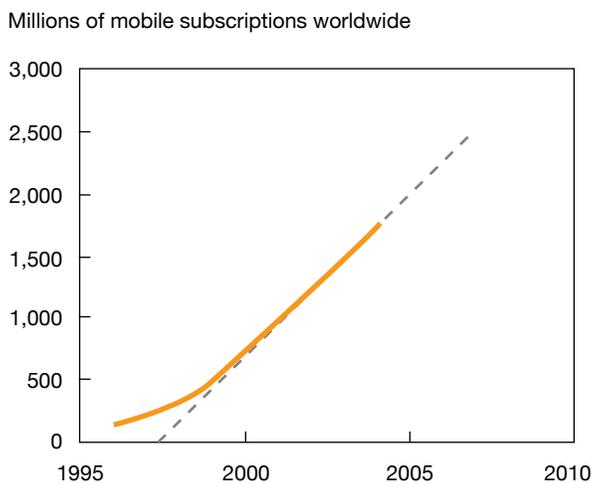
Today: Most Common Context-Aware Game Interface

Mobile devices such as phones and PDAs are the most common interface between a player and a context-aware game, particularly games that factor in a player's location. The evolution of the mobile phone has created a rapid climb toward a more personal, portable, and powerful device. Mobile phones today are massively flexible environments, capable of running many types of programs, and due to improvements in size and battery life, they've become near-constant companions—perhaps the most personal technology yet created. These qualities make mobile phones an ideal platform for games that will occur anywhere and anytime. Even the current generations of portable devices dedicated to gaming are becoming connected devices. The Nintendo DS and Sony Playstation Portable are both network-capable, a feature that will become integral to the portable video gaming experience and bring these devices closer to their mobile phone cousins.

The Future: Handhelds Will Become Powerful Companions

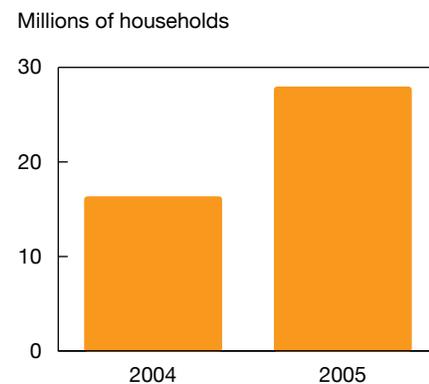
Mobile devices will become even more powerful personal companions in our lives, and the boundaries between communicating, sensing, information-gathering, and gaming will continue to blur. Raw technology developments will aid this progression, including improvements to battery life and continued miniaturization of components. Screens on mobile devices, such as phones, will be bigger and brighter as organic LEDs replace LCDs, and new high-bandwidth cellular networks will deliver rich media experiences to these better displays. The Nintendo DS and Sony PSP portable gaming devices have sold 13 million and 10 million units to-date respectively, indicating there is a strong worldwide market for on-the-go gaming. The next iterations of these devices are expected to include even more components for sensing the outside world and connecting with other gamers.

Worldwide Growth of Mobile Subscriptions Will Continue to Be Rapid



Source: International Telecommunications Union

Households Engaged in Cell-Phone Gaming on the Rise



Source: Ziff Davis Media, Digital Gaming in America Survey, mobilegames.blogs.com/mobile_games_blog/research_stats/index.html.

GPS

Today: Provides Early Key Context—Location

Games that change based on the player's location are some of the first examples of context-aware games, and many of these have used GPS to determine location. The first GPS satellite was launched in 1978 by the U.S. military. But it wasn't until May 2000 that the government allowed civilian devices and applications full accuracy of the GPS system. Prior to that time, the signal sent to consumer devices had been intentionally degraded. With full accuracy came the first mainstream consumer GPS devices and applications. The earliest of these were outdoor exploration, but GPS units have been slowly making their way into cars and mobile phones. The OnStar system, a remote safety and information service for cars, continuously reports a vehicle's location via GPS, and GPS-based navigational units have become common accessories for drivers in the United States and Japan. Some mobile phones include GPS chips as standard, though, in the United States, so far there are few compelling location-based services for owners of such phones to use.

in the future ...

- smaller GPS chips that use less power
- GPS functionality in more mobile devices
- improved accuracy of location data

The Future: Location Will Be a Filter for Everything

Inevitably smaller chipsets, better power consumption, and cheaper price tags will bring GPS capabilities to more mobile devices in the next ten years. In early 2006, a New Zealand-based startup announced a GPS chipset roughly the size of a baby's fingernail that is due to be in devices by late 2006. Drivers who have enjoyed peace of mind and the way-finding capabilities of GPS units in their cars will want the same services for their mobile devices, and a new ecology of location-based offerings, including games, will emerge. Game devices like those made by Nintendo and Sony are widely rumored to include GPS chips in their next iterations, and these devices will be another driving force for new location-based services and games. Another significant driver of ubiquitous location-awareness is the new European GPS equivalent, Galileo. Unhappy with U.S. military control of the current GPS system, European leaders have allocated billions of euros for this new system, scheduled to be completed in 2010. When fully operational, Galileo will provide even greater fidelity than the current GPS system—down to 1 meter. Watch for a diverse ecology of location-based services to become ubiquitous quickly, and context-aware games will be leading-edge applications.



in the future ...

- broader and cheaper coverage with Wi-Max
- free and subsidized Wi-Fi in cities



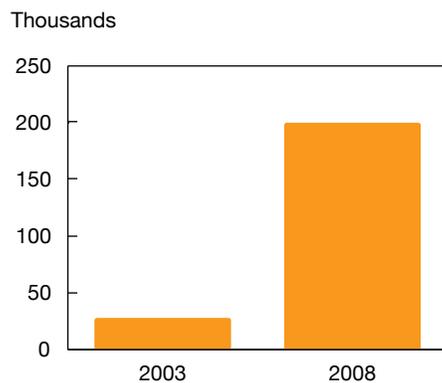
Today: The Common Standard for Connectivity

Wi-Fi is the ubiquitous standard for wirelessly sharing a broadband connection over medium-range distances and currently empowers context-aware gaming in two ways. First, Wi-Fi can be used as an alternate or complementary method for tracking location, particularly in urban areas where GPS signals are often muffled by buildings. When a Wi-Fi-capable device can detect signals from multiple Wi-Fi base stations, it can triangulate its position. Wi-Fi will also be used as a source of constant connectivity to the net for context-aware games. Major urban areas are blanketed by thousands of Wi-Fi signals from dense clusters of stores and residents sharing their connections. A gamer can move through a city and hop from one connection to another, maintaining a continuous connection to the net for new developments in the game.

The Future: More Coverage and More Experimentation

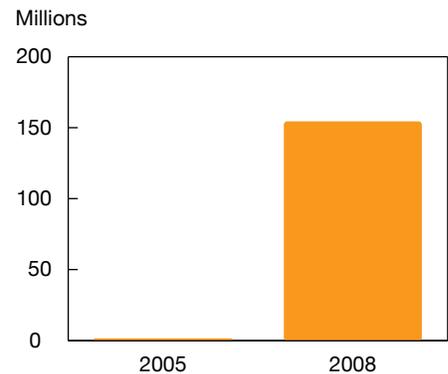
Wi-Fi coverage will become broader and cheaper in the coming years and will be augmented by a new standard in distributing broadband called Wi-Max. Ranges for Wi-Max connections will be measured in miles and kilometers, rather than in feet and meters. Wi-Max won't replace Wi-Fi, but it will help smaller cities blanket their towns with coverage and help dead zones in rural areas get connected to the net. Big cities, traditionally the hotspots of innovation in context- and location-aware gaming, won't be left behind however. Many municipalities are working quickly to spread cheap or free Wi-Fi coverage over their borders. New Orleans is the first major U.S. city to widely offer residents a free connection, as a part of rebuilding after Hurricane Katrina. Major cities like Philadelphia, Toronto, and San Francisco are close behind. Google and Earthlink's winning bid to blanket San Francisco with free wireless access suggests that other major content providers will get into the business of giving away coverage in return for the ability to deliver location-targeted advertising. One clear winner will be pervasive gaming. Expect many new location-aware games and experiments to still begin in big cities and then quickly migrate to other newly-connected areas.

Thousands of Hotspots Worldwide



Source: Allied Business Intelligence

Wi-Fi Mobile Phones Will Be More Common



Source: News.com, news.com.com/Cell+phone+makes+to+adopt+Internet+calling/2100-7352_3-5618191.html.

SENSORS & RFID

Today: Largely Untapped for Context-Aware Games

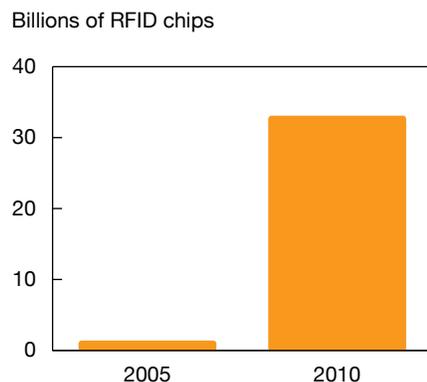
Advancements in sensors, visual- and gesture-recognition equipment, and the wireless tagging technology of RFID have also been important precursors to the age of context-aware gaming, though the potential in this area is the most untapped of any context-aware gaming technologies. These components all act as a bridge between the analog world of real life and the digital realm of scalable and easily duplicated games. The Playstation EyeToy camera discussed earlier can be considered the most successful consumer device to bring the real world (in this case, natural movement) into digital gaming environments.

The Future: A Bridge Between Gaming and Everyday Environments

As sensors become smaller and use less power, they'll be integrated into more devices such as mobile phones, cars, furniture, and the built environment. If manufacturers open up the raw data from these sensors to be freely used by game developers, then many more environments will provide input to context-aware games. In addition, visual- and gesture-recognition sensors and software, including cameras, will make digital games a more kinesthetic experience. Cameras are standard in mobile devices today, and gesture-recognition components are now included in new models of mobile phones. The integration of cameras and gesture-recognition devices in the next versions of video game consoles from Nintendo and Sony will bring natural interfaces to millions of homes.

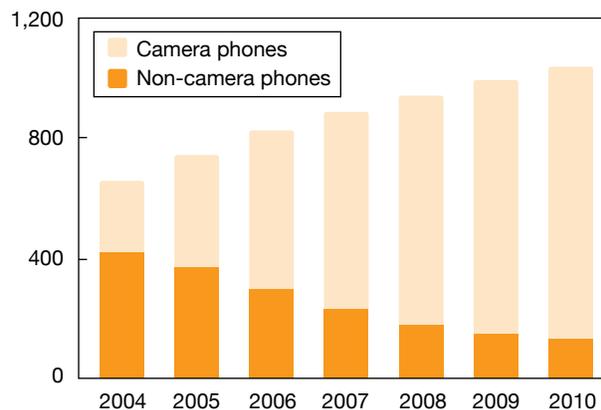
A world of RFID-tagged objects will turn even mundane minutia of the real world into potential game elements, particularly if RFID readers become commonplace in homes, stores, and mobile devices. Nokia has already launched several mobile phone models that include RFID readers, and as component prices fall and more objects in the world are tagged, RFID readers will become standard in mobile devices. IFTF forecasts that RFID tags will cost 1 cent each by 2010, considered the magic price point for item-level tagging. Expect artists and game designers to be some of the earliest users of RFID, creating radically new uses for everyday objects.

RFID Chip Production to Explode



Source: InStat, www.instat.com/press.asp?ID=1545&sku=IN0502115WT.

Cameras Will Be in Nearly All Mobile Phones by 2010



Source: InfoTrends, www.wirelessmoment.com/statistics_camera_phones/index.html.

in the future ...

- sensors are embedded in many environments
- cameras are embedded in more devices
- RFID tags make more objects smart



in the future ...

- games are leading applications in age of sensing
- context-aware gaming evolves apart from traditional video games



Today: Video Games Adapt to Faster Processors ...

The first two decades of video games were fueled by advancements in computing power. As faster and cheaper processors, memory chips, and storage devices were developed, video games quickly adopted these new capabilities to provide gamers with better graphics and more sophisticated game play. The first home video game is widely considered to be *Pong*, released in 1975. *Pong* was a clunky, stand-alone device that offered the barest hint of graphics and crude game play, yet it continually sold out in stores. Atari released the most popular console for its time, the Atari 2600, in 1977. The 2600 was many orders of magnitude more powerful than *Pong* units, and it was a console in the true sense that it could play multiple modular games. Popular games from this era were the classics *Space Invaders* and *Pac-Man*, attractive to gamers because of their colorful graphics and, for the time, impressive game play. The Nintendo Entertainment System, known as NES, was the next milestone in home gaming. Not only was NES a powerful device, but game cartridges used the latest advancements in memory to store expansive worlds that offered players many hours of virtual adventuring.

Home game consoles continued to become more powerful through the 1980s and 1990s, culminating in the Sony Playstation in 1995—the most popular home console ever produced with 100 million units sold worldwide. The Playstation wowed gamers with stunning three-dimensional graphics, first-person perspective, and game worlds stored on CD technology that sometimes seemed endless. Developments in home gaming continue, and although current generation video games offer graphics that are indistinguishable from movies, the broad population of gamers has become less interested in raw technology advancements than they were 20 or even 10 years ago. Standard console gaming for many people plateaued, and they began to want games that offered more connection to other players and the world outside of their living rooms.

... And New Channels for Communication

The 1990s can be considered the era of communications due largely to mass adoption of the Internet. Cyberspace quickly became a virtual meeting space for people with a variety of interests. The earliest online gaming experiences were text based, since typical household connections were too slow to support more advanced media. Thousands of players logged onto these large virtual worlds of words at the same time and engaged in activities ranging from group quests in fantasy worlds to almost pure conversation in more social environments. With no graphics, time spent in these spaces was fueled solely by the imagination and the group-created context of those involved. As powerful home computers dropped in price and broadband connections became affordable and commonplace, these worlds—commonly known as massively multiplayer online games, or MMOGs—became graphical and appealed to a much wider audience. The first blockbuster online world was Sony's *EverQuest* in 1995, which was the dominant online space until *World of Warcraft* hit it big in 2003 and turned online gaming into a worldwide phenomenon, with over

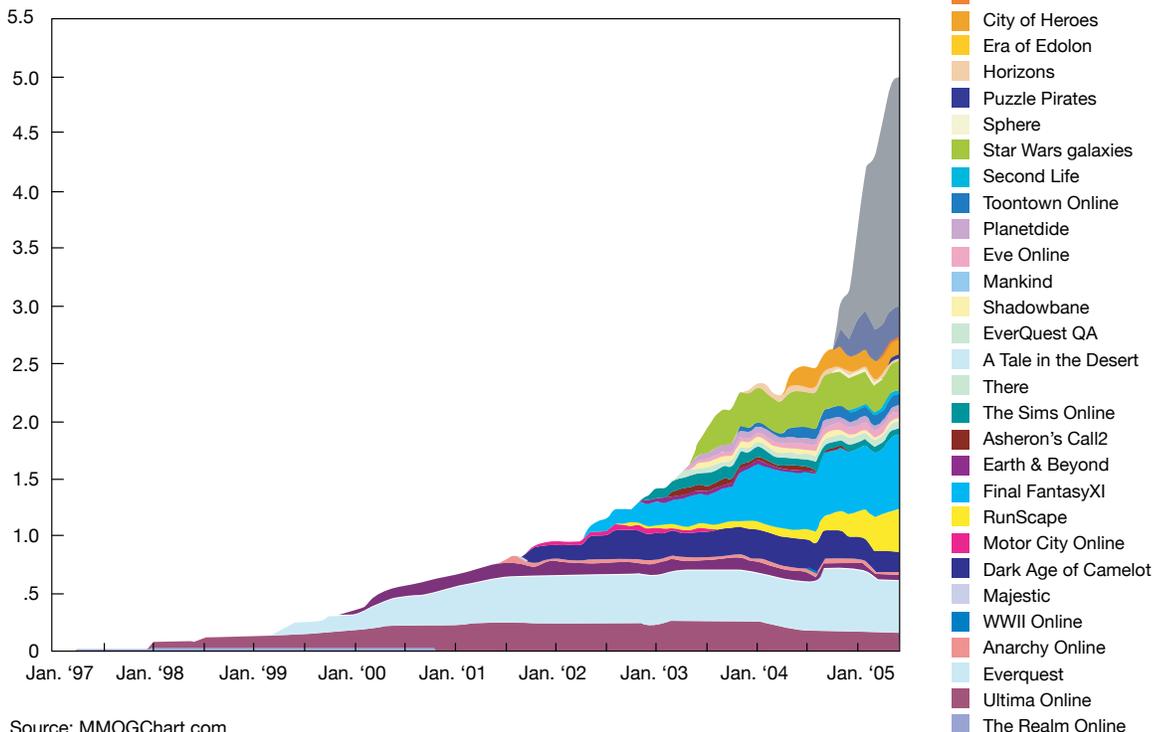
5 million active subscribers as of mid-2005 and up to 6 million in early 2006. Both of these environments are steeped in fantasy narratives, but there are also online spaces for those interested more in growing their social network. *The Sims Online*, the online variation of the hugely popular virtual-person simulation for PCs, launched in 2002. And in 2003 *Second Life* debuted, offering users a never-ending world and novel tools to build a virtual life or just chat with other people from around the world. Such online worlds are the first examples of community-generated context awareness. The infrastructure of the virtual worlds themselves would offer little enjoyment if they were played as non-networked, single-player game experiences. This is by design, because developers know that the creativity and opinions of thousands of players interacting will yield an endless supply of interesting permutations.

The Future: Games Will Lead the Way Toward the Sensing Revolution

The era of sensing is rapidly bringing awareness of our context to the objects, devices, places, and networks we interact with daily. All indications suggest that this shift will be so profound in all aspects of our lives that context-aware games will begin an entirely new branch on the digital-gaming tree. Games that factor in, or entirely revolve around, some aspect of a player’s current situation will be at the leading edge of this sensory transformation and will facilitate even deeper connections between ourselves and the technologies we adopt. Context-aware games will attract entirely new types of players—many of whom never would have touched a traditional video game—and tap into unexplored voices, stories, and genres of game play.

World of Warcraft Dominates MMOGs by 2005

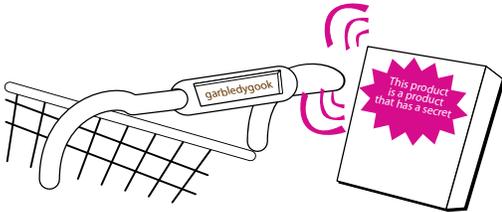
Millions of active subscriptions



|

The following four scenarios are visions of the direction context-aware gaming might take during the next decade. They originate from a broad look at the landscape of early- and current-generation context-aware games combined with likely future technology developments. For each scenario, we offer insights into the future of context-aware gaming and dive deeper into the early indicators of that future we see today.

SCENARIO 1 BULLSEYE



- < shoppers at a popular discount store start to find clues and secret messages when they scan tagged items in the store with the RFID readers built into shopping carts.

June 18, 2012



- < as people start talking, both in person and in online forums, it becomes apparent that the messages and clues work together. It's all pointing to something larger, and a community quickly forms online to share information.

June 18, 2012



- < unique messages are appearing from items in stores all over the world, and the community grows as new players are recruited to complete the puzzle. Many of these new scavengers would never call themselves gamers, yet they find themselves completely absorbed.

June 18, 2012



- < no one knows yet who's behind this. Many participants suspect the store, but they're still having fun and continue to play.
In reality, the store's marketing department has nothing to do with it. They don't even know how the shopping carts were hacked. But they certainly don't mind the attention, and are curious as everyone else to see where it all leads.

June 18, 2012

insights

Traditionally non-gaming areas and objects will be repurposed as game terrains

Novelty has always been a key quality of gaming, expressed by performing actions and using tools not typically found in our daily lives. Think of a group of children playing hide-and-seek, or the unique shapes of pieces in a game of chess. Context-aware games will draw heavily from the billions of objects and places in the real world to provide experiences that offer an unparalleled number of variations in game play. Environments that contain thousands of novel items like stores, malls, libraries, and museums will be fertile ground for a new generation of pervasive games, particularly as these objects become smart and can digitally communicate information about themselves. There will inevitably be collisions between people using these spaces for their original purposes and players repurposing them as game terrain. The earliest examples have been underground productions built around stealthy behaviors. As these games become more common, organizations will find value in allowing this repurposing and begin to work with players to create hospitable spaces and even new types of games.

Context-aware games will build on top of reality, rather than replace it

Context-aware games that add fictional layers to existing elements of the real world will be more popular among a broader swath of gamers than current video games. Context-aware games can be said to subvert reality—a street intersection that doubles as a battleground or a box of imported cream cheese that also serves as a precious in-game commodity. The minutiae of daily life aren't distractions in these types of games but rather form the foundation of their novelty. At the other end of the spectrum, most video games today strive to create realistic fantasy worlds with their own rules that supplant reality, offering immersive getaways with few or no real-world connections. These escapist fantasies are popular, and will always be a strong thread in digital gaming, but they hold little appeal to people who consider themselves non-gamers. Watch for context-aware games to tap into the daydreams and imaginations of non-gamers.

Communities of cooperation will provide the context to new types of games

As games become more pervasive and integrate elements of the real world, no single player will be able to experience the entire story by working alone. Designers in this space will deliberately craft their games to encourage communities that share information and collectively interpret clues. One piece of the game experience might unfold only late at night, or in one particular geographic location, requiring players to cooperate to capture that part of the story. The reputation boost that comes from sharing a rare and essential part of the puzzle discourages hoarding and encourages gamers to work together and visualize themselves as part of a larger community. Many of these groups will disband after a story runs its course, but many others will maintain ties and collaborate on future games as well as non-gaming projects.

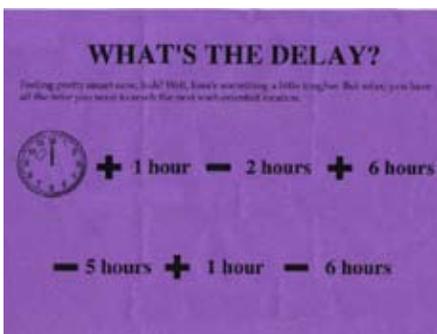
Bottom-up game creation will become easier

The technologies that power context-aware game experiences will be as usable by small-scale or independent developers, hackers, and storytellers as by large corporate game developers. Context-aware games aren't fueled by raw horsepower or massively realistic graphics, but rather by compelling stories and actions that cleverly tie the real and digital worlds together. The data required to bring about this digital-physical fusion is often no more complex than a player's location from a GPS unit, or the unique ID of an RFID tag, and the tools a context-aware game creator needs are widely available off the shelf. Some technical skills will still be required to create these games, but they won't come close to the programming knowledge necessary to make even the simplest console video game today. As game experiences move off the screen and onto the street, development will once again be ruled by strong game design and engaging stories.

early indicators

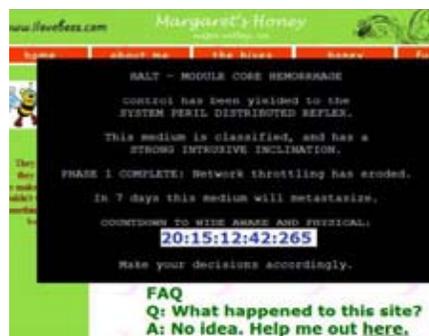
Scavenger Hunts

At its core, the basic scavenger hunt is a structured tool for exploring the environment and interacting with other people, common goals for even the most technologically advanced context-aware games. The scavenger hunt has been around for many years, and is still commonly used as an ice-breaker among college freshmen, a group that often lacks knowledge about either their new city or their new neighbors. The format of the typical scavenger is either list-based or clue-based. In the former, players have a list of objects to gather or activities to complete, while clue-based scavenger hunts often combine logic puzzles with features of the built or natural environment to suggest the next stop on a sequential route. Both types often call on players to consider or act upon locations in different ways than people traditionally use them. To complete a given task, a group may need to recombine found elements to create a new object or experience, or carefully examine the features of an otherwise transitory space to get their next clue. The basic structure of the scavenger hunt has been the basis for many early context-aware and pervasive games and will probably be one of the first applications of new connective and sensory technologies yet to come.



I Love Bees

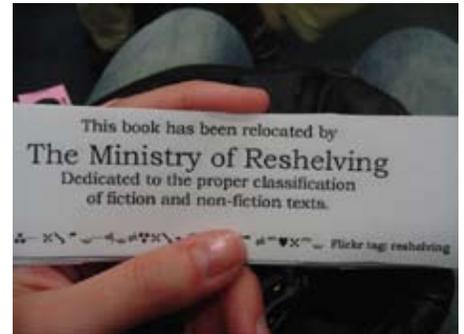
I Love Bees is an example of a context-aware game that derived meaning largely from working with other players. The game started in the summer of 2003 with one URL and a countdown clock, and an online community quickly formed. The collected interpretations of this community became instrumental to unfolding the story. GPS coordinates were discovered spread over the Web and followers soon realized these were the coordinates for payphones. Visitors to one of these payphones at the countdown time were rewarded with the first segment of an elegantly scripted serial drama about a future attack on Earth, the same storyline in the *Halo 2* video game, the launch of which *I Love Bees* was created to support. Games in this style are often referred to as alternate-reality games because they insert fictional content into the same media and tools—often the Web, but also newspapers, e-mail, and in this case, payphones—used primarily for real-world, nonfiction purposes. The aggregation of all of this content can only be done by groups of players working together, and context is provided by the collective interpretations of the player community.



Ministry of Reshelving and Graveyard Games

These two contextual experiences, though fairly different in goal and execution, show how real-world spaces can be recast as playful terrains by artists and non-commercial developers. The Ministry of Reshelving project, secretly initiated in early 2005 by game designer Jane McGonigal (also one of the designers of *I Love Bees*), used bookstores as a platform for fun and political commentary. The project defied corporate bookstores' traditional classification systems by encouraging players to reshelve books across categories, the notable example being a call to move George Orwell's dystopian classic *1984* from the fiction section to the current affairs section as commentary on the Patriot Act and government surveillance. A slip of paper was left in the new vacancy that informed shoppers of the move and the supporting reasons. As the individual objects in stores and libraries become "smart" through digital tagging, developers will have more power to create large, scalable game experiences that repurpose these environments and the objects they contain.

At six cemeteries around the United States in the fall of 2005, people gathered to play an unusual type of poker. Graveyard Games was the last stage of an augmented-reality game created in support of the *Gun* video game, though this final event attracted many new people as well. Upon arrival, players were asked to place a flower on a tombstone out of respect for the setting and then explore the cemetery. Poker chips were scattered in random locations throughout, and the names and dates on tombstones provided a novel form of context to the experience—for example, sharing your birthday with someone's date of death provided a joker for use in later play. Sub-games were planned that played off the unique contents of each location, such as the famous residents of the Hollywood Forever cemetery. There were some objections to bringing a playful experience to these cemeteries, but many more saw these events as opportunities to combine play with reverence and to give new life to traditionally under-used spaces.

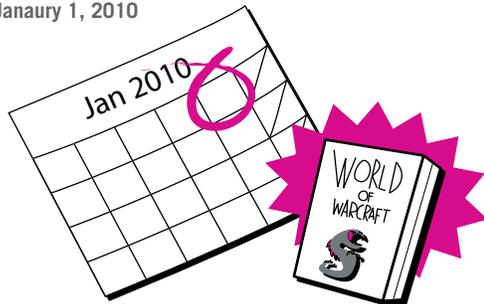


© 2005 Jane McGonigal



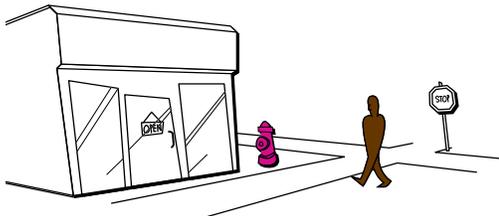
SCENARIO 2 THE REAL WORLD: WARCRAFT

January 1, 2010



- < today is the one-year anniversary of the hugely popular online fantasy World of Warcraft extending off the screen and out into the real world, and surprises have been planned for players.

January 1, 2010



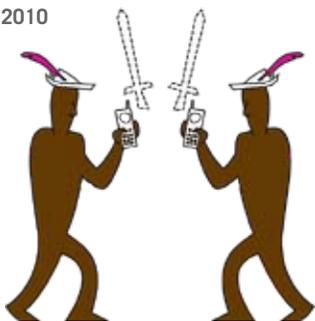
- < alternate identities in this fantasy world are no longer chained to the computer screen. Every street corner can be a treasure or a battle, and any person passing on the street may be an ally or foe.

January 1, 2010



- < even the phrases “alternate identity” and “real world” are becoming antiquated—many players now see the world as a perfect mixture of game and reality.

January 1, 2010



- < the mobile phone now makes no distinction between the game and the real world, equally facilitating connections to contacts in both. Phones with gesture recognition are flying off the shelves, and it's not unusual to see people on the street “air sword-fighting” with their phones.

the game will even sync with your calendar and the calendars of other players to arrange impromptu quests and battles during coffee breaks, or it will work with your online map directions to suggest a route that maximizes opportunities for collecting gold.

insights

Players will frequently navigate between their gaming and non-gaming identities

Context-aware games that occur off the screen and in the world will require players to constantly shift between their gaming identities and their real life identities as spouse, parent, student, employee, and the like. As more gaming opportunities will occur during niches of time, like waiting for a train or walking to lunch, gamers will need to successfully navigate between in-game and real-world tasks, sometimes multitasking both types of responsibilities simultaneously. As these identities begin to blend, watch for players that bring lenses from their game experiences to bear on challenges in work and life.

Distinguishing who's playing and who's not will be a challenge

As context-aware gamers move about the world with fictional layers running through their heads, there will be new issues between gamers and other people in the same space. Some people not engaged in the game may be confused by a player's or group's actions, some may be concerned, and many others will simply be curious and want to know how they can join. Context-aware gamers and game developers may need to develop virtual or physical signals that broadcast their current activities and offer entry points for others interested in playing. The early years of context-aware and pervasive gaming, when more people start playing these games and before they become widely known, will yield some humorous collisions and early attempts at bridging this gap.

Games will coexist in rich media and pervasive environments

The development of context-aware interfaces and off-the-screen channels for gaming will not be the end of media in the home. The most innovative and in a sense, the most immersive game experiences will play out their stories across any available platform. At home, games will take advantage of large displays and powerful processors to deliver rich multimedia experiences which mobile devices can't match. Once on-the-go, increasingly capable mobile devices will sense a player's changing context and customize a persistent story to a current location and situation. Context-aware games will be an early model for narrative media and marketing messages that move seamlessly from traditional immersive media to new types of real-world immersion.

Open devices and protocols will attract users and developers, who in turn will drive new content and service offerings

Context-aware gaming experiences depend on knowing something about a given situation, such as GPS location data, and communicating that information over protocols like Wi-Fi and Bluetooth. Players and developers will seek devices and services that offer easy and open access to the data and the networks used to send and receive. This community will also be among the first to adopt technologies that include extra features, such as new sensors in mobile devices and expanded data sets in online services. Some of these early adopters will also be developers, and they will write new applications that build on these extra features to create even more demand for the device or service.

Yellow Arrow

Like geocaching, Yellow Arrow is an early and low-tech means of changing the meaning of a place and adding new layers of context. The Yellow Arrow system revolves around eponymously styled paper stickers, each bearing a unique ID. When a sticker bearer encounters a place or an object that compels him to share a comment or story, he leaves the sticker behind and encodes his message in the Yellow Arrow central database through his phone or later through the Web. Any passerby that notice the sticker are instructed to send a text message with the sticker's unique ID to a phone number printed on the sticker, and they instantly receive the story, comment, recommendation, or even poem recorded by the sticker's original owner. The Yellow Arrow service requires more effort than the promise of fully automatic context-aware computing, but in return today's participants can experience much of the same functionality on existing cheap technology.

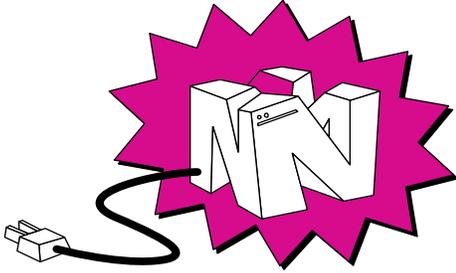
Google Maps

Google Maps demonstrates how a well-designed product with open access to its inner workings can spur a new genre of projects that extend the reach of the original offering. Google's online map lookup service launched in early 2005 and served up not only impressive functionality but also complete access to the code that powered the site. Almost immediately amateur developers began creating "mashups," new combinations of the Google Maps interface with other datasets. Many of these mashups start with previously nongraphical yet geocoded data, like apartment listings, and overlay them onto the rich map database found in Google's service, yielding a new hybrid that offers more functionality than either ingredient could alone. There are mashups that map real estate, crime data, personals, cheap flights, blogs, and user-generated local reviews. One mashup only exists to help Seattle residents find the nearest taco truck. Multiplayer games have also been built with Google Maps as a foundation, including a version of the classic game of Risk and a new game called Tripods. Mashups are being built so quickly that several blogs have emerged solely to track the newest creations. Other online services have since followed Google's lead and opened up their code for use by outside developers, setting the stage for more original creations and greater sharing of previously proprietary resources.



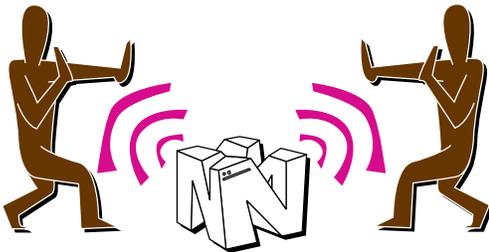
SCENARIO 3 NINTENDOYOU

July 4, 2008



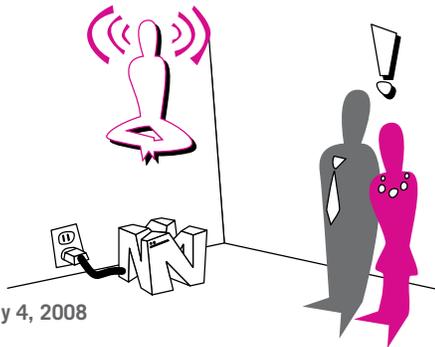
- < video game sales, usually white-hot, were starting to go cold. Graphics were better than ever, but gamers were tired of the same types of games repeated generation after generation. Nintendo, always willing to experiment, announced a new home console called the Independence.

July 4, 2008



- < the Independence was released today, and by all appearances gaming will never be the same. There are no joysticks or buttons to learn. Instead, a house and its occupants are the controls. The system comes bundled with sensors to monitor players' movements throughout the house, their biorhythms, and those of their buddies around the world.

July 4, 2008



- < games can be played by only one player, but most of them are orders of magnitude more fun with a group. Parents come home to find their kids practicing states of Zen rather than shooting monsters to advance to the next level in a game.

insights

Physical context-aware games will deepen connections between game and player

Spurred by inexpensive cameras and tiny sensors worn on the body and embedded in the environment, physical movement and data from players' bodies will be a primary and supplemental interface to many future game experiences. Some games will call on players to become human joysticks and enact the same gestures in real life as their in-game characters. Even more primal types of body data, such as heart rate and brain activity, will be easily measured and serve as a new type of input affecting game play. Depending on the goal, a biofeedback game that detects increased stress in its player might correspondingly lower the intensity of the current situation or choose the opposite approach and create a more demanding scenario. Either reaction will ultimately deepen the connection between context-aware games and their players.

Games will bring context-aware technologies into the home

The first experience many households will have with context-aware technology will be through gaming hardware and software. Millions of EyeToy cameras that interpret body movements have been sold for the Playstation 2 gaming console, and a gesture-recognition interface is the core of the Nintendo Wii console to be released in 2006. Game developers will turn to context-aware platforms to distinguish themselves from their competitors, especially once gamers take impressive graphics and powerful processors for granted. If these large developers allow commercial and amateur players and developers to create their own context-aware applications that use gaming sensors, expect to see the video-game console as a hub for context-aware functionality far beyond gaming.

Health and wellness will be early applications of context-aware gaming

Games that are intimately aware of the state of our bodies will be used for applications beyond entertainment. Consumers are seeking more health and wellness benefits in the products they buy. They will turn to context-aware gaming platforms for programs like personal fitness services that can adapt their routines to an individual's ability and then evolve these routines over time. Context-aware technologies will also support skill building among lifelong learners. Gesture- and motion-recognition hardware and software will power virtual coaches that teach proper technique for sports, dance, or yoga, while biofeedback sensors will monitor heart rate and breathing to encourage relaxation and stress reduction. When these games are networked, users will tap into remote friends and strangers as motivating sources of competition and cooperation.

Natural game interfaces will lower barriers to play

When measured on graphics, story, or intricacy, the modern video game is vastly more sophisticated than ones from the 1970s. Yet the primary input mechanism—the joystick—has hardly changed. This stagnation has largely relegated gaming to those willing to learn controls that are often multi-layered and arbitrary. Context-aware technologies will take gaming back to its predigital roots of direct, simple, and easily learned actions: walking to change the current game location, or swinging an arm to attack an in-game monster. This style of control will make games instantly understandable and easily approachable by anyone interested in playing. As a result of this wider audience, shooter and fantasy games will make room for entirely new genres that take unique advantage of a context-aware interface.

early indicators

Organum

The human body offers a range of new inputs for game experiences, and this example from the Center for New Media at the University of California, Berkeley challenges players to use their voices in new ways. One-to-five players speak, sing, and grunt into microphones that in turn control the X, Y, and Z axes, with a goal of helping a sound escape on an abstracted journey from the lung to the tongue. Using only their voices, and working together, the team must clear as many tracheal rings as they can while avoiding major organs and steering toward enemy pathogens to destroy them. The designers of Organum aim to challenge traditional notions of game interface and the way people use space by pushing players to violate social norms of volume and decorum just to complete the game's central challenge. Organum points to a more primal and less arbitrary style of game interaction spurred both by technology developments and growing interest in new types of game experiences.



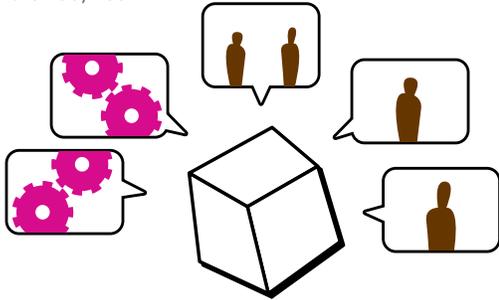
The Nintendo DS

Nintendo has chosen a tangential approach for its products relative to other game developers and has successfully tapped into a base of gamers interested in more than bleeding-edge graphics and ultra-realistic game play. In addition to the gesture-based input that forms the core of the soon-to-be-released Wii console, Nintendo also built an untraditional interface—touch—into its latest portable game device, the Nintendo DS. While the DS does include traditional buttons, the most successful games for the platform require the player to tap and stroke the dual screens to interact with the game environment. *Nintendogs*, for example, is a virtual puppy simulator where players pet and care for their animals only through touch, and the massive popularity of the game has helped the DS sell millions more units than its more hyped and far more traditional competitor, the Sony PSP. Other novel DS games include one in which players touch 3-D musical plankton to create new compositions and a role-playing title that requires blowing into the DS's microphone to keep a fire from extinguishing. These experiments might have had limited applicability to the larger world of gaming if not for the impressive success of the DS device. More natural gaming interfaces are sure to follow.



SCENARIO 4 SEARCH PARTY

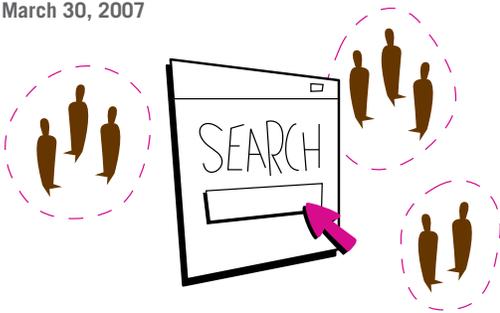
March 30, 2007



< with all of the innovations occurring off the-screen, it might seem like the Web lost importance. Actually, more people are doing even more things that involve a net connection.

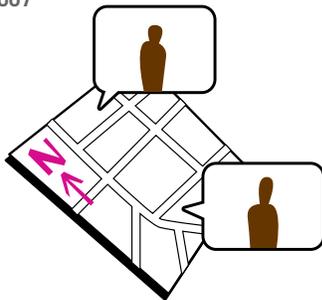
nearly every bit of information online is now tagged with both technical metadata—like machine-generated keywords and location data—but also user-generated tags, including personal opinions, suggestions, and descriptions that no machine would ever think to apply.

March 30, 2007



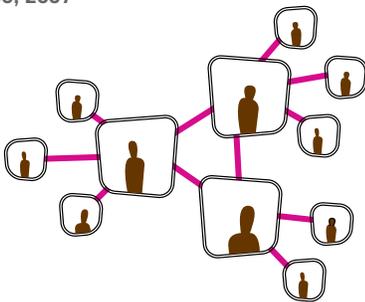
< with so much user data out there in the world, people wanted to know more about each other. Basic Web activities were reconfigured to include this personal information.

March 30, 2007



< every Google or eBay search now turns into a party, as ad hoc groups of people interested in the same topics form instantly. Online maps include location-tagged opinions from residents who live there, including easy ways to say “hi.”

March 30, 2007



< some people ask, is all of this a game? That depends on your outlook. Many people play games not to slay monsters or collect gold, but to interact with other people in the world. Now with easy ways to access useful information provided by other people, the Web may not quite be a game but it's definitely more fun than ever.

insights

Online activities are redesigned around socially generated metadata

People have always been a valuable source of contextual information that technology just can't provide: opinions, vivid descriptions, deeper understanding borne of discussion and debate. This social layer is becoming an important component of more and more online services. These services are built on a foundation of personal media like photos and video or databases of information like news or movie listings, but they increasingly rely on contextual information supplied by users to bring it all to life. But these services only reach a critical mass of social participation when the common actions of adding and retrieving information are so simple as to be mindless. Flexible tools such as XML, tagging, and RSS make it easy for users to add comments, label content with tags, vote on others' content, and easily monitor content filtered by person or by description. Watch for traditional online sites like newspapers, maps, and local guides to tap into socially generated content to distinguish themselves from their competitors and their old media formats.

Services and tools become more like games

As socially generated metadata become interwoven with computer-generated context awareness, online services are taking on the same core characteristics as game experiences. Users cooperate to build a collective commons of personal contextual information on top of existing data sets. They add opinions of restaurants to local guides and commentary on news stories, and they share personal experiences with products and services. Tagging is such a simple way to add metadata to content that users of media-sharing services don't mind describing their photos or movies in great detail, even adding descriptions to the media of random strangers. Each tag is a small step toward an unspoken collective goal of a pool of extensively annotated and easily accessed content. The competition element is more subtle in services with social tools but still a powerful motivator, particularly when tied to online reputation. Users compete over quality and quantity. Simply adding a large amount of well-described content to a collective space increases the likelihood that one's contributions will be enjoyed by others, but many users also choose to share only carefully crafted ideas and opinions.

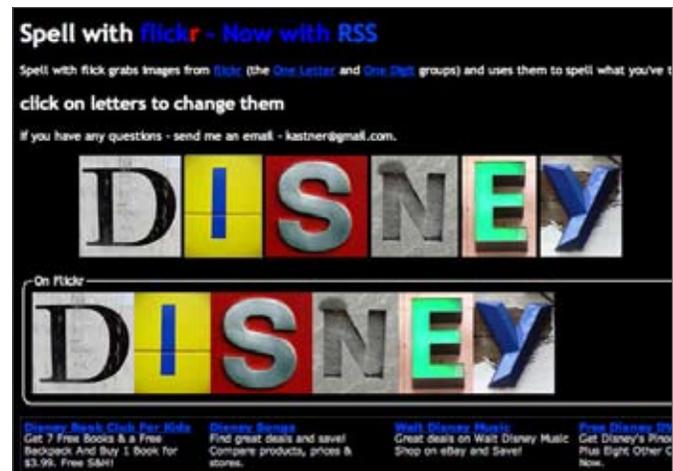
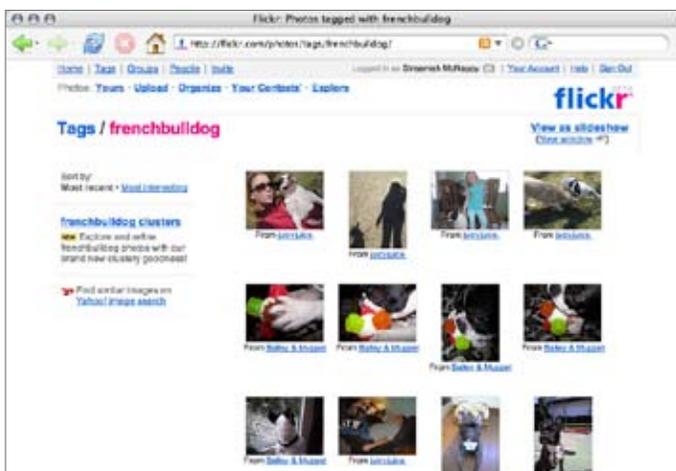
SCENARIO 4 SEARCH PARTY

early indicators

Flickr

Flickr is an early pioneer of using socially generated context to bring a new level of user engagement to a traditional online activity. At its core, Flickr is a photo-sharing service, and many users only post photos and add quick descriptions to share with family and friends. Many more Flickr users think of the service not as utilitarian tool for small group communication, but rather as a large collective commons that just happens to be built around photos. The smallest unit of user-generated contextual information in Flickr (and many other sites) is the tag. Tags act as “nouns” and “adjectives” (in the case of Flickr, simple keyword descriptions provided by users) can also be seen as “verbs” because each tag is a live link that can perform an action. In Flickr, clicking on the tag “fun” that is used to describe a photo from a party will open up a new page with every photo in the Flickr database that is similarly labeled.

Many Flickr users contextually tag a photo of friends with only the first name, of those featured, like “Norman,” to categorize photos for their own purposes, but also to add to an easily accessed worldwide pool of people named Norman. A well-tagged photo is also more likely to be viewed by other Flickr users, and a subtle form of competition emerges as motivated users strive to take interesting photos and provide enough contextual information to increase the number of times their photos are viewed. Like Google Maps, Flickr has been very open with access to its underlying code, particularly related to tags, and amateur developers have created many external projects built on the Flickr database. One such project replaces each word in a current news headline with a photo from Flickr that uses the same tag. Many online services have learned lessons from Flickr’s successful implementation of socially generated contextual information, and users of other Web services are beginning to expect tools for easily sharing their own data and interacting with the ideas of others.



Context-aware gaming will be a marked shift away from traditional video gaming, complete with its own impacts and advantages. Businesses can begin to leverage the innovations of context-aware gaming now by understanding the terrain, facilitating gamer repurposing of places, products, and services, exploring appropriate opportunities for marketing, and understanding the diverse collection of skills a context-aware gaming workforce will acquire while playing these new types of games.

4 Organizational Opportunities for Context-Aware Gaming

Create Game-Friendly Spaces

With their huge collections of unique objects, stores, malls, libraries, and museums of the next decade will be fertile ground for context-aware game experiences. Public spaces will also become game terrains, as landmarks in the real world take on multiple identities in any number of games built around a player's location. Many cities now blanket their parks with Wi-Fi, and stores, malls, museums, and libraries should also consider adding this free benefit. Companies not in control of public-facing spaces can sponsor Wi-Fi connectivity in other areas that are lacking. As more objects take on smart properties, such as through RFID tags, consumers and patrons should be given access to the information on these tags, either for pervasive game experiences or bottom-up applications that deliver expanded information services. Creating spaces that are compatible with pervasive games will cost little and endear organizations to the gaming community. Those places that show hospitality to gamers will likely find themselves as popular settings in future game mythologies.

Craft Messages That Extend into Context-Aware Settings

Many successes in context-aware game history were created as commercial marketing campaigns: Verizon and Audi sponsored location-based digital scavenger hunts, and augmented-reality games supported the video game *Halo 2* and the movie *A.I.* These games all engaged consumers far more deeply with the content than any traditional media message could have because they were dependent on and responsive to the active participation of the player. At the same time, these campaigns weren't seen as intrusive marketing spam because, first and foremost, they were *fun*. The story or the challenge at hand was more important than a constant focus on the brand message. Extensive end-to-end campaigns like these aren't the only way to get involved in the context-aware gaming space. Explore options for sponsoring the gaming experiments of artists, researchers, and developer communities.

Enable Consumer-Generated Contextual Information About Products and Services

As gaming extends out of the box and off the screen and into the world, context-aware game creators realize that the number of permutations offered by the places and objects of real life is too overwhelming to create outcomes for every possible situation. These designers solve the problem by instead creating tools for players to add their own stories, interpretations, and challenges based on personal experience and individual context. Companies can learn from these new types of games by rethinking their corporate messages as a base for continued conversation among consumers rather than a top-down broadcast. Online spaces could include new input tools, first for a user to share experiences and tips about a product or service and then to add tags describing his particular context so others can quickly find the information most relevant to them. Inevitably these forums will include some negative content, but this will be offset by a large base of consumers trading useful ideas that personalize and extend their experience with the commercial offerings.

Open Access to Devices and Services

Context-aware games and other applications need information about the world in order to be context-aware. Some device manufacturers and online services have turned off access to these very features such as GPS or Bluetooth on carrier-provided mobile phones, instead requiring users to navigate

through proprietary networks or just do nothing with these features. The end result is a growing animosity toward the carriers by a large community of users and independent developers, many of whom would have been potential customers and advocates but who are now turning to alternative platforms. The explosion of user-created services that build on the Google Maps database demonstrates what can happen when users can “look under the hood,” create their own projects, and ultimately drive more use of the core product. There will be some thorny legal and branding issues, but remaining closed in an era of openness will associate products and services with limited use and stifled innovation.

Roll Out New, Untested Features Early

The relatively short history of context-aware gaming is made up of nearly as many noncommercial projects as commercial ones. Many of these bottom-up projects began as early adoptions of new features found in devices or online tools, sometimes originally implemented with no clear purpose. SMS technology, also known as text messaging, is the medium of choice for many context-aware games, yet it was originally included in European mobile phones without a sense of how consumers might use it. In another instance, the tilt sensor in Macintosh laptops designed to stop the hard drive in the event of a drop has been tapped by developers to create kinesthetic games. As context-awareness is integrated into our homes, workplaces, cars, and devices, or generated through communication between users of online services, companies should tap into the user-developer community as a source of extended R&D. The most involved users will write their own games and applications that build on some new feature while thousands of others will run these homebrew programs, reporting flaws and unexpected benefits. Companies that work with this growing DIY community will find eager collaborators and a rich pool of freely shared ideas.

Rethink Workspaces as Context-Aware Terrains for Communication

Context-aware games provide challenges that are tailored to elements of a player’s situation, like location, current activity, and proximity to other people. Training and learning modules can be unbundled in much the same way and distributed across the physical and virtual work landscape. Content that appears only when relevant—in a particular building or tied to a specific action in a piece of software—will be more engaging and retained longer than noncustomized lessons chunked together in the classroom.

Redesign Internal Online Resources Around Worker-Generated Contextual Information

Sharing opinions and debating multiple interpretations are core activities of many context-aware games like *I Love Bees*. In these games some content is provided from the top down, but it only truly comes to life once the player community sinks their collective teeth into the problem. Consider this as a model for internal networked resources like intranets or knowledge management systems. Tools like wikis, tagging, and RSS allow users to personalize content easily, to reclassify and reorder it, to contribute personal experience and monitor the experiences of others, and to work together to create relevance across the organization. Loosening the constraints does open up internal resources to more disagreement and unexpected directions than static systems, but even this potential promises more life, more relevance, and ultimately more use for these internal tools.

Leverage the New Skills of a Context-Aware Gaming Workforce

In the IFTF report, *New Entertainment Media: Transforming the Future of Work* (2003, SR-813), we explored how the generation that is blogging, sharing personal digital media, instant messaging, and solving augmented-reality games will bring a new palette of skills to the workplace. This trend will continue as workers increasingly add context-aware games to their new media practices. Games that use location as a source of context require players to size up new terrain quickly and seek out the range of potential resources in every new situation—behaviors directly relevant to the constantly shifting landscape of the modern workplace. Biofeedback and kinesthetic games help to strengthen a player’s mind–body connection and raise awareness of subconscious physical indicators like breathing and heart rate. These games will ultimately reduce stress, extend attention, spur physical activity, and improve the overall health of future workers. The last type of contextual-game, one in which players share and debate ideas and opinions, is perhaps the most relevant to the workplace. These games will build competencies in brainstorming, communal problem solving, healthy debate, and efficient knowledge sharing. Companies can prepare by understanding the landscape of context-aware gaming and reshaping work practices to play to the strengths of these new gamers.