

## **The Home CIO Project: The Drivers and Consequences of Technology Convergence in Personal and Home Entertainment**

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### **Abstract**

A research project investigating the drivers and consequences of technology convergence in personal and home entertainment is described. UCSD's Information Storage Industry Center has tracked the evolution of storage technologies and their IT complements, and this work will be a starting point for analyzing technology convergence and product complements in the personal and home entertainment marketplace. A focus of USC's Center for Telecom Management has been to define strategy frameworks enabling a more systematic understanding of the Networked Digital Industry (NDI). These models will be used as starting points for analyzing disruptions in the business models of incumbents and new market entrants. Research deliverables include industry-based reports, academic working papers, and joint industry – academic forums for research and practice interaction. The project will start in the summer of 2006 and run approximately a year.

### **Background and Motivation: Personal Technology Innovation**

Consumers now can access and enjoy a digital lifestyle that was not possible only a few years ago. Led by digital music, video, photography, games, IP telephony and advanced search and related services, both large and small businesses continue to add functionality and build out various “experiences” on the Web for consumers, making the storing, sharing and protection of digital content a growing priority. The simultaneous decline in PC and related

hardware prices, proliferation of home networking, penetration of residential broadband and deepening Web-based, consumer services has fueled demand for access to digital content and the need to share that content among multiple digital devices. According to IDC, it is estimated that at least 13.5 million households already have a home network in the United States, and that number will increase to nearly 36.6 million by 2008.

Always a second cousin to processor technologies in the digital revolution, storage increasingly will share center stage. A typical MP3 music file occupies about 4 megabytes (MB), while a DVD-video occupies approximately 5 gigabytes (GB). With consumers collecting DVD content at \$10 per unit, and music collections averaging 25-50 GB and moving upwards, consumers require more storage than ever. Integration with television, especially HDTV with PCs, will require complementary investments in additional storage.

Paradoxically, this sharp uptake in consumer demand is occurring at the same time consumers continue to rely on traditional storage media and means of sharing storage on small private networks. That is, consumers still rely on internal disk drives, USB and Firewire external storage devices and CD-ROM and DVD read-only (WORM) storage. Most of this media has industry expected lifetimes of approximately 10 years for error free data recovery (under favorable assumptions of use). What will happen when consumers discover that the family digital photographic album, shared across the network with the extended family as the kids grew up, has an expected storage lifetime of only 10 years?

One storage technology option for consumers is to move storage to a personal or home network. The Personal Network Drive is a storage device that, while physically connected to a router,

access point or network switch, appears, behaves and is managed exactly as an internal disk drive. The trick is that data storage is allocated by software to networked storage devices, or in industry terms, a SAN (storage area network), and is managed and backed up using commercial grade protocols. Personal Network Drives centralize and consolidate data storage on a home network, enabling users to access data simultaneously from multiple devices, and when tied to backup and recovery software, to protect irreplaceable files in the event of a disk failure or application / data corruption. In short, the concept of the Personal Network Drive is to organize computing and storage resources on the network principle, distributing processing, data access and storage across devices connected to the network. Multiple devices beyond computers (iPod, cameras, set-top boxes, music systems,) will all rely on network storage. It is not a new concept, but one that has steadily evolved with technology improvements in networks, PCs, storage devices, and software.

### **Background and Motivation: Disruptions in Traditional Business Models**

Widespread consumer adoption of digital devices using a networked storage concept has the potential to radically disrupt existing business models of incumbent firms. For example, companies such as Kodak (digital photography) or Electronic Arts (Internet gaming), have traditionally built their businesses on photographic and gaming products, not networked services which tie their products and customers together. PC manufacturers and distributors such as Dell, HP and Apple, and digital video manufacturers including Pioneer, Sharp and the bevy of Asian manufacturers producing HD-TV and related products, all would experience disruptions to current business models in any serious move to consumer networked storage. And digital content companies - in essence, anyone producing home digital entertainment products - would face the decision of engineering devices and software products using very different protocols for network access and use, a potentially costly and time-consuming transition.

Conceptually, many of the potential business models that could be applied to the new environment have already been tested by the eBusiness companies of the late 1990s. However, with a few notable exceptions, the majority of firms were unable to integrate the capabilities of the Internet with those of traditional "brick and mortar" businesses, forcing most to exit the online market, and the rest to radically restructure their Web businesses. The continued evolution of PCs, home networking and storage systems, however, have come together again to provide opportunities for companies to innovate technologically and concurrently, to enter consumer markets with new value propositions to a new generation of digital consumers. It is the defining of these new value propositions, driven by new combinations of evolving consumer-based technologies, that forms the basis of our joint centers research project.

### **A Joint USC UCSD Research Project**

Our project draws on the research focus of two university based applied research centers, USC's Center for Telecom Management and UCSD's Information Storage Industry Center. Researchers at both centers will work to:

- Identify (classify) advanced storage and complementary technologies with the potential to radically disrupt existing business models, of both incumbents and new entrants, in selected industry sectors
- USC researchers will concentrate on challenges to existing business models, and the process of creating new ones
- UCSD researchers will focus on converging storage and complementary technologies setting the stage for new product and service introductions
- Both Centers will research the profile of the new digital consumer
- Both Centers will research new market mechanisms for funding technology innovations and business model transitions of incumbent firms and new entrants

### Sample Research Questions

- What technologies are on the horizon with the potential to drive new products and services that will radically disrupt existing business models (pricing models, service delivery models, customer relationship models)?
- What are the potential adoption curves of these technologies? In what consumer sectors will they be adopted? What are the potential disruptions to adoption curves, and how might they occur?
- Who and where are the new consumers who will purchase the new products and services? How and when?
- What new business model thinking must come into play? Who will take the lead in introducing new business models? In what sectors? What will be the competitive and economic impacts?
- How will industry competitive boundaries be redrawn? What companies are best positioned to take advantage of the new boundaries?
- What will be the interaction between home network storage and Internet-based storage services?
- Where will new consumer value be created, and will they pay for it?

### Project Methodology

Center researchers will draw on primary and secondary data collection, selected case studies, and frequent interaction with industry participants and analysts. Our methods and data collection strategies will follow those appropriate to research on technology innovation (forecasting) and corporate strategy (market signaling and strategy development). This includes:

- Expert panel ranking and surveys (evaluation of technologies, adoption models)
- Analysis of partnership / alliance strategies of vendor companies in go to market strategies
- Expert panel rankings of future business scenarios and investment analysis
- Consumer surveys of current and expected product offerings in selected product – service segments
- Consumer scenarios and analysis of home budgets

### Project Deliverables and Timeline

Three sets of project deliverables are planned:

- Industry focused research reports
- Academic working papers
- Center meetings with industry partners, in the design stage of the project, and at project milestones
- Where appropriate, news articles and summaries in industry trade journals

Our planned start date for the project is August 2006. Center researchers will organize milestone reports and meetings quarterly. The project will run through September 2007.

### About The Authors

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### For More Information

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**ABOUT ISIC**

The Information Storage Industry Center (ISIC) at the University of California, San Diego is a university-based, management research program studying the business applications and economics of advanced storage technologies in the modern information-intensive corporation. ISIC's program areas include industry studies (competitive dynamics, product innovation and manufacturing, industry structure), business innovation and applications of advanced storage systems (data management, data mining, distributed information management), and the management of storage as an integral part of the firm's IT business resource. ISIC works closely with the Center's StorageNetworking.org community of practice in conducting industry facing, direct observation research.

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