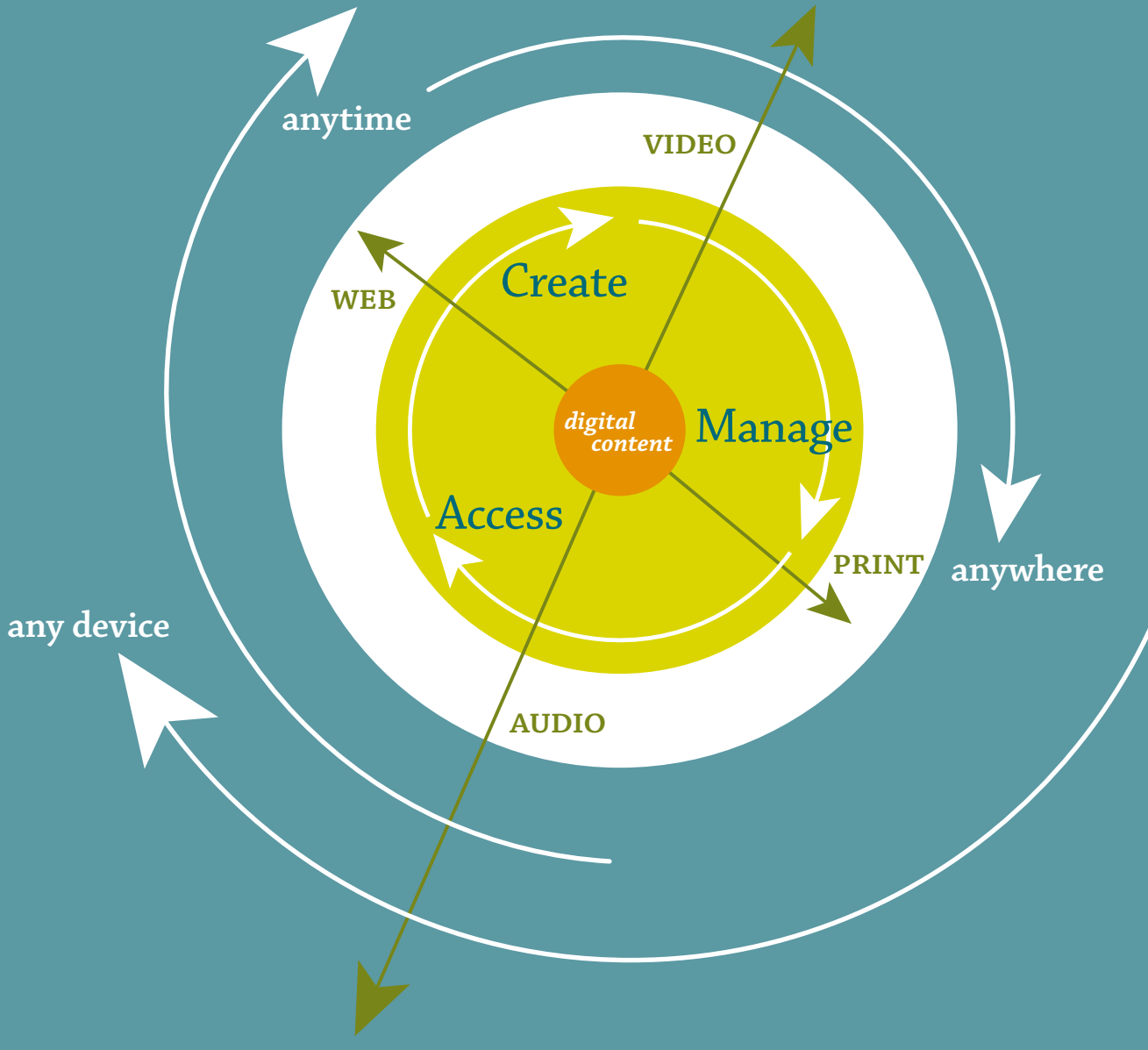
NETWORK PUBLISHING

Creating Value Through Digital Content



ATKEARNEY
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Foreword

Recently A.T. Kearney has seen rapidly increasing interest among our clients in topics such as "digital content," "electronic publishing," and "multi-media." We have also noted the accelerating pace of technology innovation and capital investment in this space. As a result, A.T. Kearney surveyed the space and developed a holistic perspective on the ways in which the Internet and emerging technologies in wireless, imaging, and other areas will transform the way people and organizations create, manage, and access electronic content.

This paper presents our perspective, which we call network publishing*—because in the future everyone will be a publisher and all publishing will be networked. Our intent is not to predict with great precision exactly how and when network publishing will evolve. Nor is it to predict which technologies or companies will win or lose. Rather, it is to help contribute to the development of a common framework to understand what is happening in this space, to assess its potential impact, and to identify near-term actions that different types of participants should begin to take now in order to be prepared for what is coming.*

This study was conducted over a three-month period and involved over fifty interviews and workshops with nearly thirty organizations that span the network publishing ecosystem. We thank our sponsors—Adobe, EDS, Hewlett-Packard, Mayfield, and Nokia—for underwriting this study and providing access to their executives for interviews and workshops. Also, we would like to recognize the contribution of our associates, Stephen Bugman Jr. and Prakash Jothee, in the development of this study. While many contributors added to our knowledge base, the opinions and conclusions expressed herein are solely those of A.T. Kearney. If you would like to discuss opportunities for your organization related to network publishing or simply need more information, please contact us at 408-330-3500 or network.publishing@atkearney.com

John Ciacchella
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Introduction

During the past few years, the new economy generated a lot of excitement and activity. Companies invested billions in new Internet-based systems, dot-coms challenged traditional "brick and mortar" companies, and venture capitalists poured money into a plethora of dot-com businesses. When the Internet bubble burst, many executives began asking themselves whether the promises of the knowledge economy were broken.

In reality, a number of companies have captured significant economic benefits by successfully leveraging their business knowledge using the Internet. For example, Pfizer Inc. generated additional revenues of $142 million over four years[1] by improving the speed with which it brings its "new drug knowledge" to the market. At the heart of its success was its submission of electronic documents to obtain rapid regulatory approvals for new drugs. In 2000, *The Wall Street Journal* created a new revenue source hitting $40 million[2] using its "business news knowledge" to create WSJ.com, which has over 400,000 paying subscribers. Cisco saves $320 million[3] a year using its "customer support knowledge" to create an on-line, self-service customer support center that enables customers to obtain help on technical problems without having to wait on the phone for customer service representatives.

The process of leveraging business knowledge is made up of three components—content, process, and people. Content is raw information; process refers to the activities and technologies that enable the creation, management, and dissemination of content; and people are the knowledge workers who run the process and eventually benefit from it.

This study is about the processes and technologies that people will use in the future to create, manage, deliver, and access digital content. These processes used to be called publishing, and they were used by media companies and newspapers that "pushed" content to end users who had limited ability to access what they wanted. Now these processes are known as "network publishing." In the future, everyone will be a network publisher, and publishing will be more about "pulling" information than about "pushing." End users will be able to determine the specific content they want and access that content at any time from any place on any device. This study describes what network publishing will be, how it will impact you, and the players and technologies that will make it a reality.

1 "Enterprise Value Award: Prescription Strength," Mindy Blodgett, *CIO Magazine*, February 1, 2000.
2 "Smart Business 50," Don Steinberg, Desiree de Myer, John Galvin, and Kayte VanScoy, *Smart Business*, November 2000.
3 "Cisco's New Commerce Push", Lauri Orlov and Ted Schadler, *Forrester Brief*, March 10, 1999.

"Publishing activities consume 12% to 15% of typical corporate revenues." –DATAWARE TECHNOLOGIES

Digital Content and Publishing Today

For the purpose of this study, digital content is defined as electronic information that is used by anyone in everyday business and personal life. Examples include digital versions of documents, publications, forms, receipts, tickets, designs, contracts, video, audio, and emails. Digital content can be created in several media types such as print, video, audio, Web, and other composite forms. This study excludes specialized types of digital content, such as source code for software applications, because the tools and technologies required for software development are very different from those for creating digital content used by people. This study also excludes digital content that is used only in machine-to-machine, back-office interactions.

Publishing is the process of creating, managing, and delivering content. Anyone who creates, manages, and delivers content is a publisher. Publishers include large and small businesses, dot-coms, educational institutions, governments, and individuals.

Currently, several key trends are reshaping publishing. The proliferation of standardized operating systems and low-cost, easy-to-use content creation tools, such as Microsoft Word, have given the word "publishing" a whole new meaning. Organizations and individuals now have the ability to publish their own content through various tools such as email and Web sites. The resulting growth in the number of publishers is exemplified by the fact that there are an estimated 85 million licensed copies of Microsoft Office, which is perhaps the world's most popular publishing software.

This growth in the number of publishers has led to an explosion in the volume and types of digital content. The number of Web pages, which stood at five billion in 2000, is expected to increase to over 40 billion by 2003—translating to roughly six and a half Web pages per living person on the planet (see Figure 1). The Internet has also lowered the barriers for digital content distribution by connecting hundreds of millions of content publishers and users to each other.

Another key trend is the proliferation of new specialized appliances for Internet access that is creating a demand for content tailored for each of these devices. These devices include mobile phones, personal data assistants (PDAs), and email stations. An explosion of point technology solutions and lack of compatible standards from technology suppliers is making it cumbersome and confusing for publishers to determine what works and what doesn't.

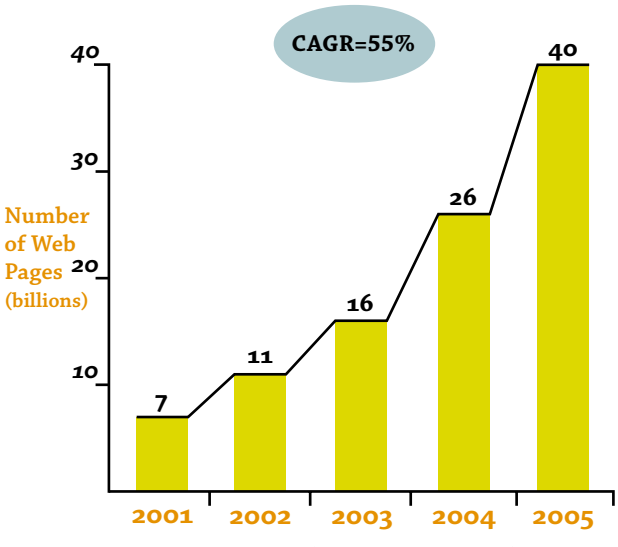
These trends are creating several challenges for the growing number of publishers. The key challenges include the following:

- Different workflows for different media types, which create costly duplication of efforts
- Reliance on manual and inefficient processes for content assembly, syndication and real-time updating, making it difficult to keep information accurate and reliable
- Significant resources required to integrate point technology solutions to address the publishing process
- Difficulty in meeting end users' needs for personalized content that can be accessed quickly anytime, anywhere, and on any device.

These challenges have several implications. First, the cost of publishing is significant and rising. It is estimated that 12 to 15 percent of a typical corporation's revenues is spent on various publishing activities,[4] most of which require some form of digital content. In addition, Web sites are becoming more complex and costlier to maintain because Web pages continue to multiply and a growing number of end users are demanding personalized content that they can access conveniently from multiple devices.

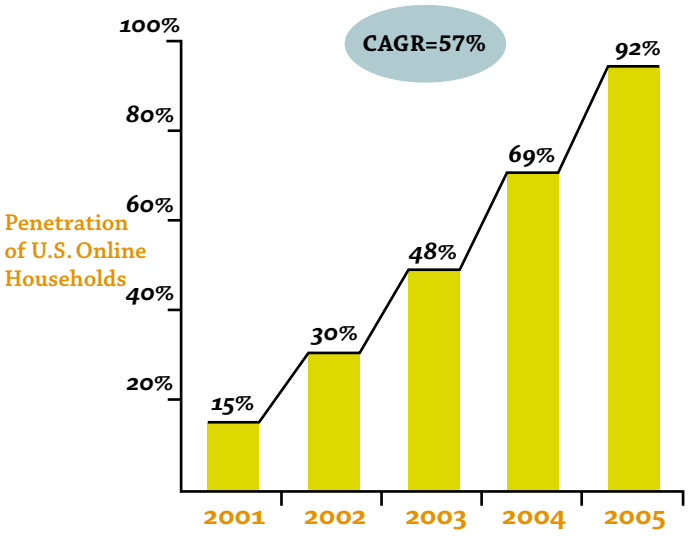
Second, publishers are finding it difficult to keep up with growing end user demands for rich, high-quality viewing experiences, real-time updates, and multi-platform

FIGURE 1: Growth of Worldwide Web Pages



Source: Forrester Research, Inc., A.T. Kearney Analysis

FIGURE 2: Growth of Consumers' Demand for Online Rich Media



Source: Forrester Research, Inc.

4 "Electronic Publishing and Competitive Advantage: Meeting the 'Instant Information' Challenge," Dataware Technologies Corporate Executive Briefing.

"Network publishing will allow companies to create competitive advantage by using digital content more effectively."

—BRUCE CHIZEN, PRESIDENT AND CHIEF EXECUTIVE OFFICER, ADOBE SYSTEMS

access. As broadband and wireless access grows, end users will increasingly demand richer media over the Internet (see Figure 2). Publishers' failure to meet this growing demand will result in poor customer satisfaction and lost revenue.

Third, the benefits of all this publishing activity continue to be elusive for many organizations. For some organizations, it is the inability to make content compelling enough to convert Web surfers into paying customers. For others, it is the inability to make their customer-support Web sites useful enough to lower call center costs.

To summarize, digital content is becoming integral to how organizations and individuals share information, collaborate, and conduct commerce (see Figure 3). As businesses and people become more information-centric, we will witness an explosion of digital content that will drive major changes around us. Digital content will become key to a company's ability to develop and expand commerce, foster collaboration within and between organizations, personalize sales and customer service, and disseminate information both internally and externally. While digital content will become core to all business activities, very few companies have figured out how to capture value from their publishing activities.

Network publishing is an emerging paradigm that will address the challenges that publishers face. It will help publishers realize the benefits of the new information economy and improve methods to leverage digital content using the Internet.

FIGURE 3: The Growing Importance of Digital Content

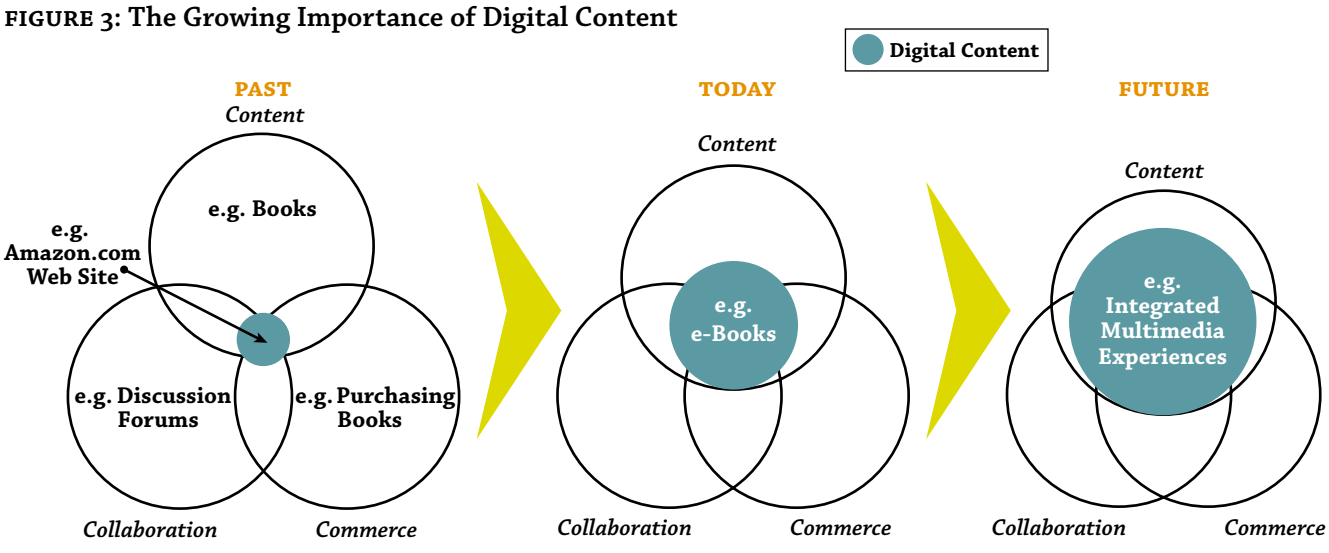
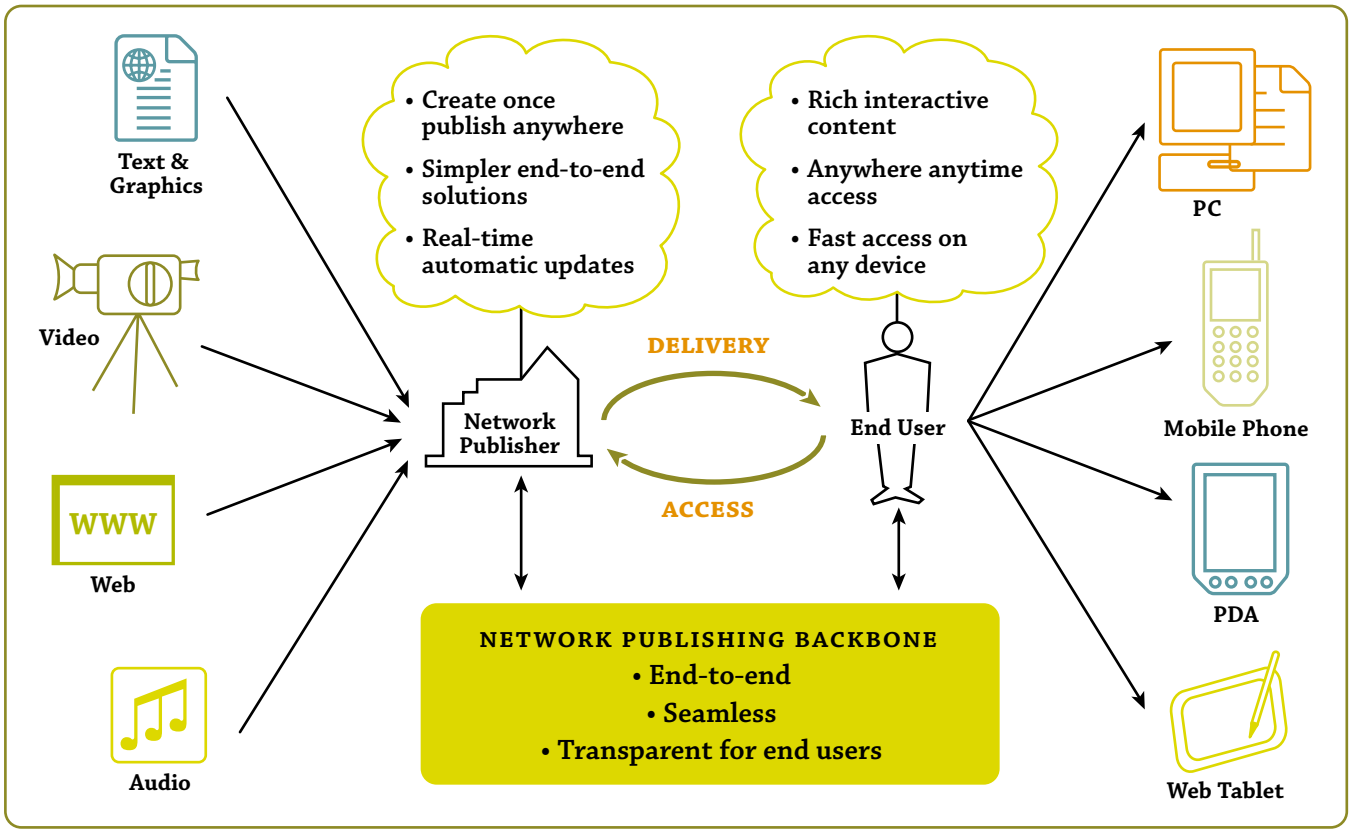


FIGURE 4: The Network Publishing Concept



The Network Publishing Concept

Network publishing is an emerging set of processes and technologies that people will use to create, manage, and access digital content over the Internet (see Figures 4 and 5).

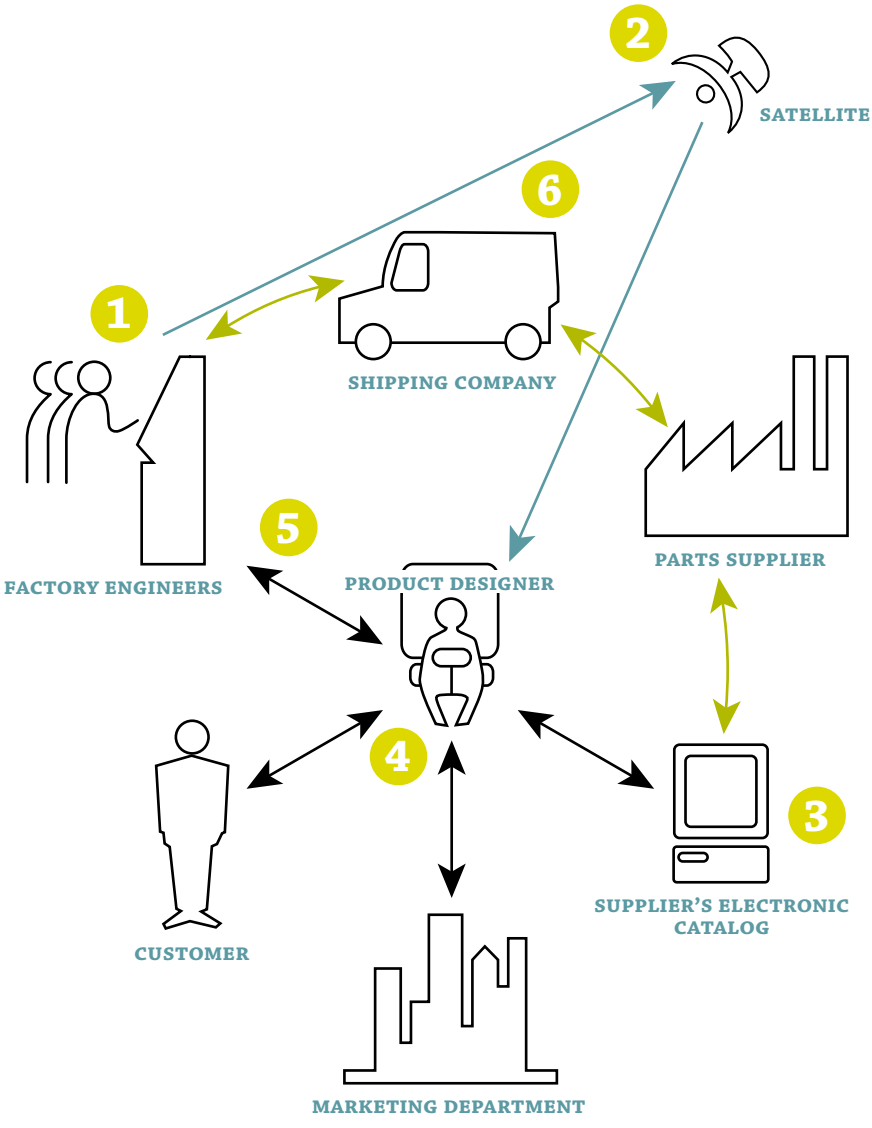
In this future vision, publishers will be able to:

- Create digital content once and publish it anytime, anywhere, on any device
- Integrate multiple digital content workflows together for greater efficiency
- Use simpler, integrated end-to-end technology solutions
- Easily assemble and syndicate content from multiple sources
- Enable real-time updating of information to keep it current, accurate, and reliable.

Such efficiency and flexibility will result in lower costs, higher customer satisfaction, and new revenue streams for businesses.

Network publishing will allow businesses to create more shareholder value and not-for-profit organizations to be more cost-effective in achieving their goals.

FIGURE 5: Example of Network Publishing for Businesses



Situation

A manufacturing company is testing the design of a new product by having its factory manufacture a few samples of the new design. The factory has very high set-up costs for the process, so it is critical that the test concludes quickly and positively.

1. Factory engineers identify the problem in the prototype and create a multimedia file that depicts the problem
2. Video is transmitted to product designer
3. Product designer comes up with alternative design and checks the suppliers catalog for real-time price and availability information
4. Product designer consults with the marketing department and customer to get their approval for the design change
5. Product design change is submitted to the engineers at the factory
6. New part is automatically being shipped to the factory

Network Publishing enables a group of workers to collaborate quickly and more effectively, resulting in faster time to market and lower costs.

End users will be able to:

- Access rich, interactive content and enjoy high-quality viewing and listening experiences
- Access content anytime, anywhere, on any device
- Pay easily for what they value and ignore what they do not.

As society becomes more information-intensive and digital content becomes more synonymous with information, network publishing will play a key role in transforming our lives. It is not an overstatement to say that network publishing will allow businesses to create more shareholder value, enable governments to govern more effectively, enable educational institutions to spread their reach beyond their physical boundaries, and allow not-for-profit organizations to be more cost-effective in achieving their goals. Network publishing will allow consumers to take more control over their lives, be more connected with their social networks, and use their time more efficiently.

The Network Publishing Ecosystem

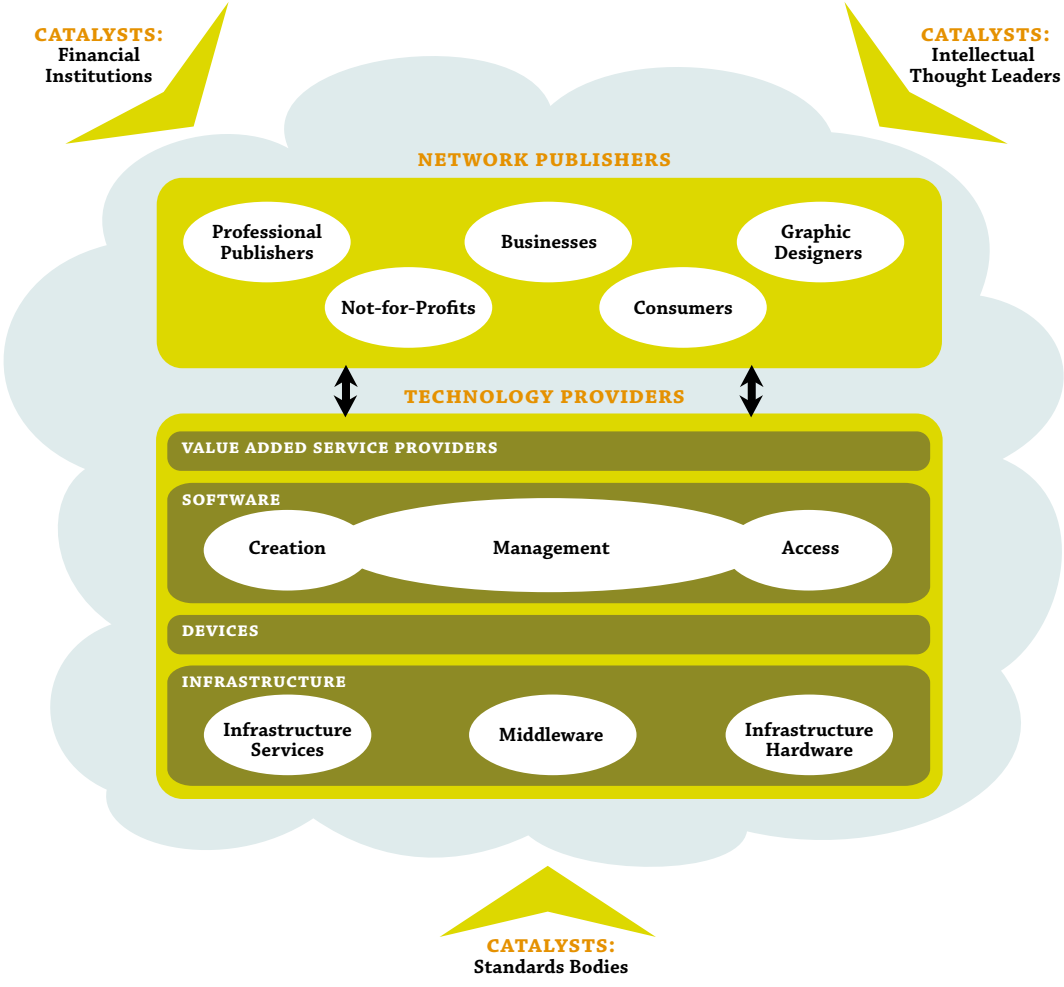
Building solutions to deliver the significant benefits of network publishing is beyond any individual company. Rather, an ecosystem of publishers, technology providers (products and services), and catalysts is beginning to emerge and cooperate to build network publishing solutions that maximize the use, power and efficiency of digital content (see Figures 6 and 7).

Publishers in this ecosystem are comprised of professional publishers, graphic designers, businesses, not-for-profits, and consumers. Leveraging the benefits from digital content is critical for all publishers, including traditional publishers and large enterprises. For example, the largest publisher in the world is not a publishing company such as McGraw Hill or Random House, but rather the U.S. Federal Government. In addition, large enterprises such as IBM and General Motors are voluminous publishers in their own right. These organizations can dramatically reduce their publishing costs by efficiently locating and repurposing existing content. Because publishers will greatly benefit from network publishing, they are critical to this ecosystem and create the demand for more efficient solutions to leverage digital content.

Technology providers include companies that supply the necessary technology services, software tools, devices, and infrastructure that enable publishers to process digital content more easily. Service providers offer services that make it easier to process digital content. Software vendors build the software necessary for creating, managing and accessing digital content more efficiently. Device manufac-

An ecosystem of publishers, technology providers, and catalysts is beginning to emerge to build network publishing solutions that maximize the power and efficiency of digital content.

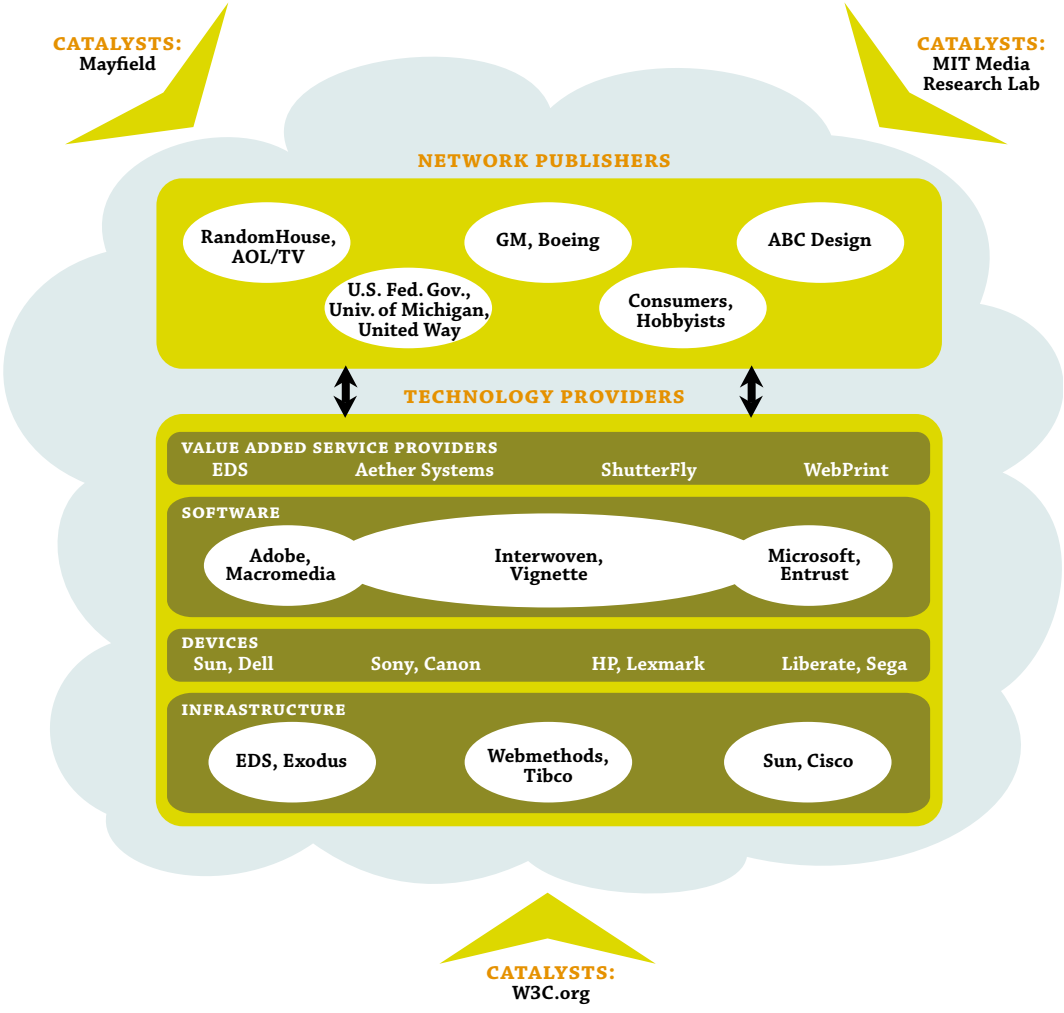
FIGURE 6: The Network Publishing Ecosystem



turers design and build the devices that create and access digital content. Infrastructure providers enable the underlying Internet backbone that is critical to network publishing.

The network publisher and provider categories are not distinctly separated in the network publishing ecosystem. For example, AOL (Netscape) Time Warner and Yahoo! are major publishers that also offer the services and tools necessary for network publishing.

FIGURE 7: Sample Participants in the Network Publishing Ecosystem



External catalysts—industry thought leaders, financial institutions and private equity providers, and standards organizations –provide the stimulus and support necessary for the evolution of the entire ecosystem.

Realizing the benefits from network publishing requires expertise from each of the different categories. Partnering and leveraging across these categories of players is crucial to making network publishing a reality.

The largest publisher in the world is not a publishing company such as McGraw Hill or Random House, but rather the U.S. Federal Government.

Network Publishers

There are many types of publishers with different needs and challenges. The benefits of network publishing will vary based on the publishing setting, role of publishing and publisher's business model (see Figure 8). Identifying these segments is important to understanding where the benefits of network publishing can be found.

Publishers have diverse publishing needs and challenges. The benefits these groups will capture differ by type and degree. Identifying segments with similar uses of and needs for publishing will help providers of network publishing solutions tailor their offerings to specific markets.

Publishing occurs in either a professional or a personal setting. In a professional setting, publishing either forms the core function of the organization (e.g., advertising) or supports the organization's core function (e.g., making cars).

Case Study: Tufts University
The Health Sciences Database (HSDB) at Tufts University is a prime example of how network publishing provides benefits in education. Prior to the creation of the database, students competed for a limited number of laboratory slides and "on reserve" library materials. Heavy use of these resources resulted in broken slides and equipment, totaling close to $200,000 per year in replacement costs. Health sciences faculty were challenged to create and update course materials in a timely way because of the explosive growth of medical knowledge and scientific discoveries.

The HSDB has resolved these issues and provided additional benefits. Because slides, reserve materials, and other content are now digitized and stored in a central database, students can access information remotely via the Internet at any time; and they can save their notes in an online, personal folder for later retrieval and review. Finding information is easier and faster because all entries into the system are indexed by standardized search terms.

Faculty members benefit from the modular nature of stored content, which facilitates updating and ensures that the most recent health science findings are incorporated into lecture notes. Because the system stores content from various media on one platform, multimedia repurposing is possible. Faculty across disciplines collaborate more frequently and link to each other's course materials. As a result of collaboration and reuse of course content, the HSBD has increased the faculty's productivity, reducing class preparation time by 10 percent.

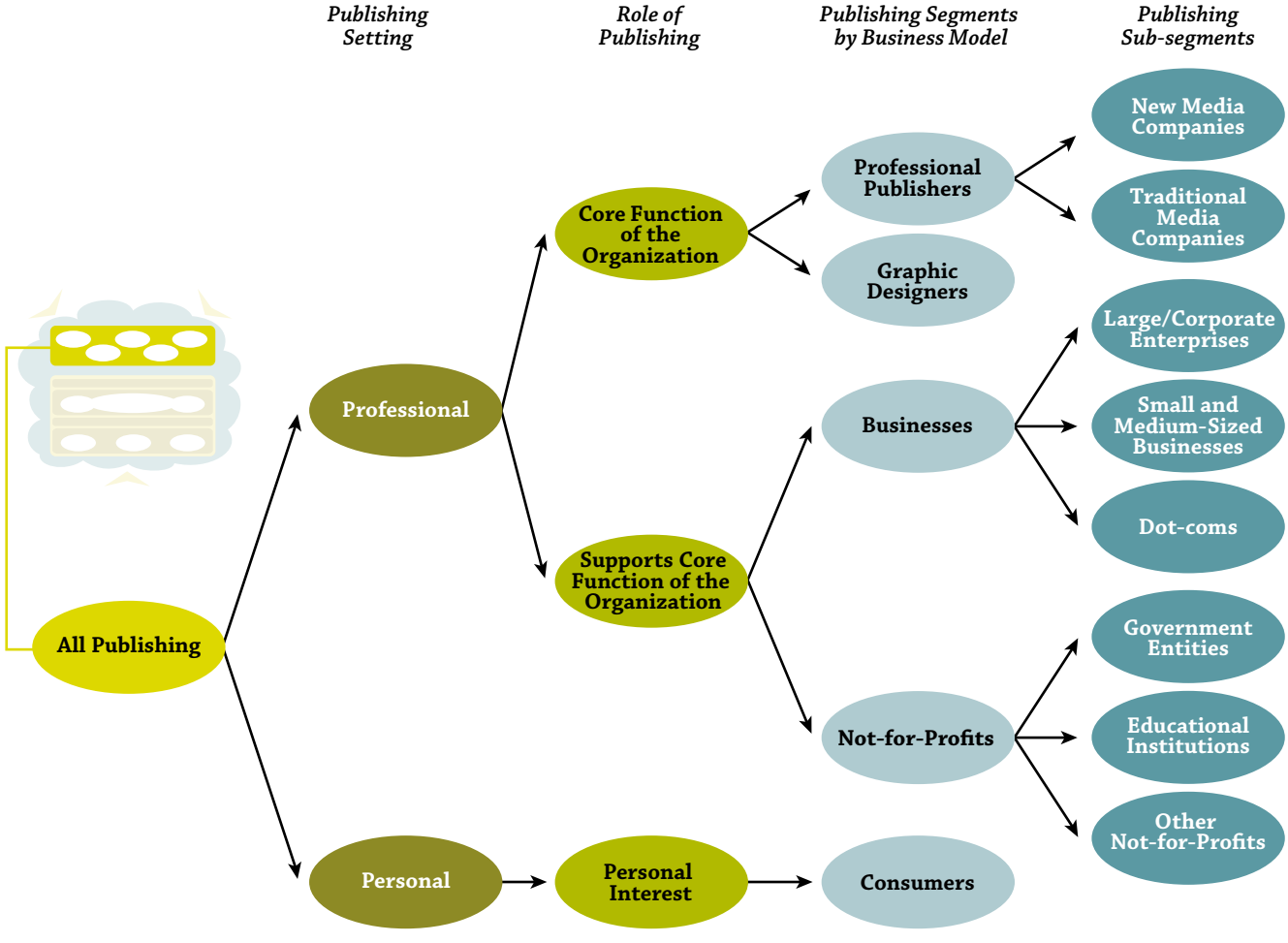
Tufts will continue to refine the HSDB by providing wireless connectivity to the database through handheld devices and developing templates that will allow greater repurposing of existing content.

Sources: "Rx for Learning," by Angela Genusa, CIO Magazine, February 1, 2001, pp. 102-110; Interview with Bruce A. Metz, Vice President, Information Technology and Chief Information Officer, Tufts University

Core publishing is performed to generate the bulk of an organization's revenue through the distribution and sale of content. Publishers in this group offer either products or services and fall into one of two segments: professional publishers and graphic designers. Professional publishers, including new media companies such as AOL Time Warner and Yahoo!, and traditional media companies such as Random House and The New York Times, sell content as a product to end users. Graphic designers provide creative services to corporations and other organizations.

Publishers that use publishing to support their core functions are further divided according to those with for-profit and those with not-for-profit business models.

FIGURE 8: Types of Publishers



Workforce inefficiencies related to publishing will cost organizations across the globe approximately $750 billion in 2001.

For-profit organizations, or businesses, are further segmented into large enterprises, small and medium-sized businesses (SMBs), and dot-coms. Size has important implications for the purchasing of network publishing tools and services. Large enterprises have greater resources to purchase and implement complete end-to-end solutions, while SMBs may buy point solutions that address their most acute needs. Dot-coms tend to be early adopters that leverage the newest information technology in their online business models.

Not-for-profits use publishing to support their core missions. Governments and educational institutions are highlighted because of the volume and importance of publishing to their operations. Governments are voluminous publishers and are accorded particular recognition due to their size and the diversity of their activities. Educational institutions are an important publishing sub-segment because publishing is intimately tied to their missions to disseminate knowledge. Other not-for-profits include churches and service organizations. These organizations use published content in varying degrees to raise funds or build awareness for their core missions.

In the personal setting, publishing is performed to support personal interests. Personal publishers are consumers who publish for their own enjoyment.

Economic Benefits to Publishers

A.T. Kearney estimates that workforce inefficiencies related to publishing will cost organizations across the globe approximately $750 billion in 2001. Knowledge workers (those who use information technology to collect, analyze and communicate knowledge) waste between 15 and 25 percent of their time engaged in non-productive publishing activities, while other workers waste two to three percent of their time. Hence, even today, the potential benefits of using network publishing tools and technology are enormous.

Economic benefits will vary by publishing segment. For example, professional publishers will capture both revenue and cost benefits. They will have opportunities to create new revenue models such as e-books and syndicated content services such as Yahoo! and iSyndicate. In addition, professional publishers will be able to increase usage by offering personalized content to existing and new users. Integrated media workflows and effective repurposing technologies will enable professional publishers to reduce costs associated with duplicative work and re-creation of existing content assets. Graphic designers will also derive the productivity benefits associated with cross-media workflows and more efficient collaboration with customers.

Business publishers will earn additional revenues by offering their products to the market sooner and by increasing the productivity of their operations and collaborative activities. Businesses can also improve their returns on marketing investment

Case Study: Time, Inc.
Time, Inc., which publishes 72 magazines annually, faces the formidable task of integrating content from hundreds of sources in a variety of different formats and media to produce a final document. Time also faces the challenge of managing workflow components such as edits and rewrites, rights management, and final assembly.

Time currently uses expensive and time-consuming manual processes or complicated in-house solutions to accomplish these tasks. However, the company is eager to adopt an open standards-based system that will handle all its document formats and employ meta-data for easy searches of archived content. In addition, the company would like to see a sophisticated workflow management system that scales to hundreds of users and makes it easy to track changes. This unified system should be adaptable to the differing needs of each magazine group within Time.

An early version of such a system is being tested today. In partnership with Adobe Systems, Time is piloting a next-generation, Web-based content creation and management system. Based on Adobe InScope, the system has capabilities in workflow management and meta-data for digital rights and asset management. The system integrates seamlessly with Adobe creation applications for print, graphics, and Web publishing. As this solution is introduced across its divisions, Time expects its new "network publishing" system to result in significant cost savings, improved quality and productivity enhancements.

Source: Interview with Jeff Fulton, IT Director for the Fortune Group at Time, Inc; press release for Adobe InScope.

through more effective repurposing and more efficient collaboration of corporate marketing programs. Furthermore, network publishing reduces customer support, training, and human resources administration costs by leveraging digital content and reducing the amount of time it takes for end users to access content when they need it.

Not-for-profits can also dramatically benefit from network publishing. Educational institutions such as universities can generate new revenue from effective repurposing and disaggregation of existing content assets and intellectual capital. Network publishing also improves faculty productivity when creating class materials and preparing for lectures because content is more accessible. Faculty may also become publishers in their own right and sell their intellectual capital to consumers and colleagues all over the world.

Finally, consumers will benefit in terms of convenience, time management, and connectivity to others. Network publishing allows consumers to access personalized content whenever they want and wherever they are. This allows them to spend less time looking for content they want and spending more time using it. Moreover, consumers can make decisions faster because they have real-time access to the knowledge they need. For example, individual investors may reduce their portfolio

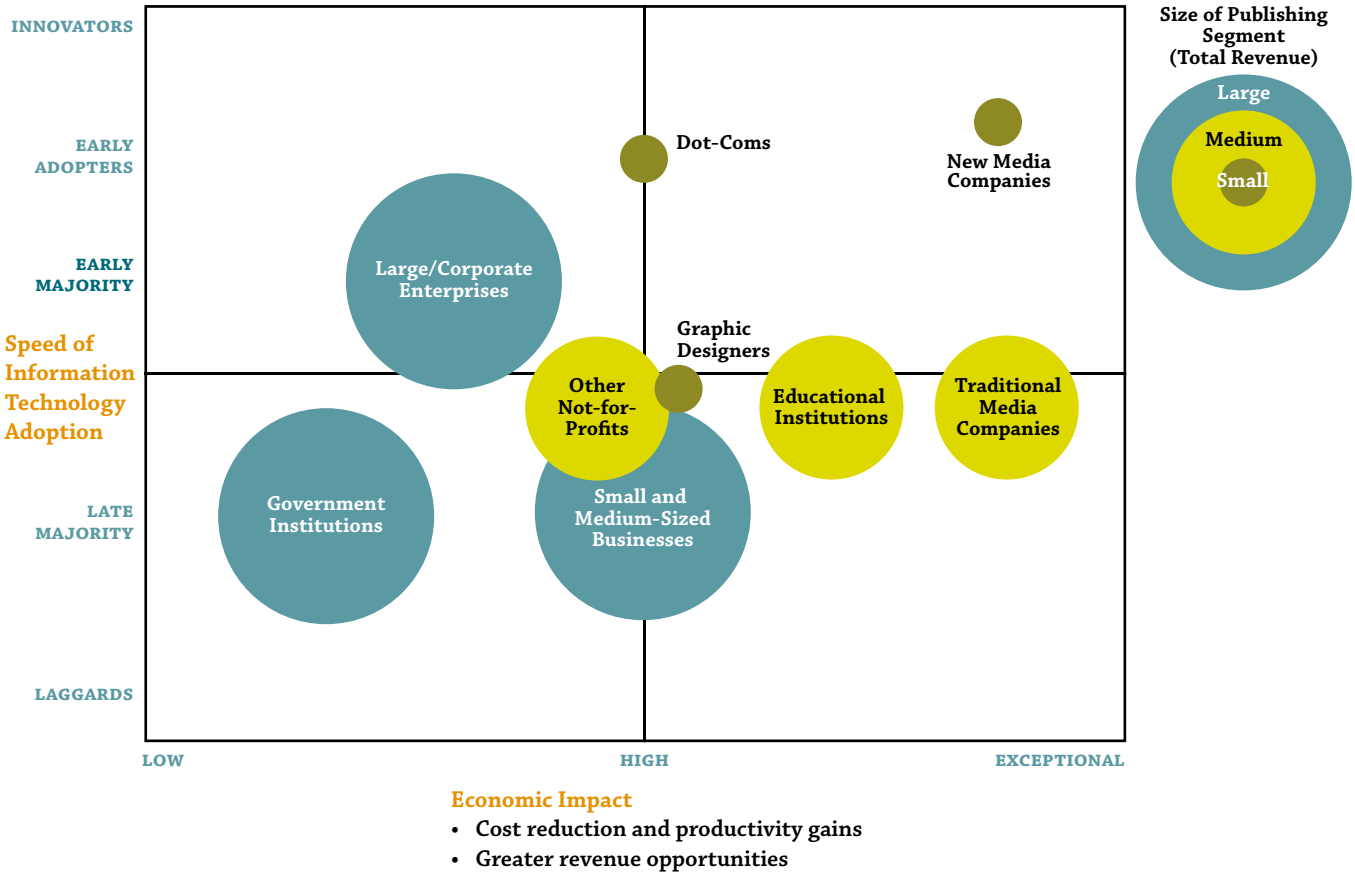
The network publishing market for technology providers will be over $250 billion in 2004.

losses by accessing relevant content in real-time and using that content to make investment decisions.

Attractiveness of Publishing Segments

Market size, adoption rates, and economic impact will determine the attractiveness of publishing segments (see Figure 9). The size of each publishing segment is measured by total annual revenue and indicates the potential market for network publishing solutions in each segment. The market opportunity is proportional to the revenue base of each segment. Organizations with higher revenues will be able to afford more expensive, but complete, network publishing solutions, while smaller organizations may target point solutions that are less expensive and address certain areas for improvement.

FIGURE 9: Attractiveness of Publishing Segments



The historical speed of information technology adoption can be used to gauge a publisher's receptiveness toward network publishing and the most likely segments to adopt network publishing solutions first.

Finally, economic impact indicates the approximate percentage improvement in profitability for those organizations that implement network publishing solutions. This impact is determined by the size of an organization and the amount of publishing that occurs as a proportion of total organizational activities. For example, traditional media companies and other not-for-profits are similar in aggregate size, but traditional media companies may experience higher impacts on profitability because their publishing activities form a larger proportion of total organizational activities than those of not-for profits.

New media companies are expected to be the initial proof points for network publishing tools and services. These companies have the relationships with consumers and mix of media to benefit from both enhanced revenue opportunities and cost savings. In addition, these companies have been early adopters of information technology.

However, the initial proof points provide relatively small markets for network publishing. As network publishing grows in acceptance, large enterprises, traditional media companies, and educational institutions will become more attractive markets. Large enterprises, attracted by the opportunity to reduce costs and increase productivity, will form a large market opportunity for providers of network publishing tools and services. Traditional media companies will realize the enormous benefits of new revenue streams and reduced costs. Educational institutions will be able to more effectively drive their missions with network publishing. As network publishing spreads through these segments, late adopters such as governments and small businesses will become important markets for providers.

Network Publishing Technology Providers

The technology providers in the network publishing ecosystem are developing the necessary information technology (hardware and software) tools and services to enable network publishing. A.T. Kearney estimates that the network publishing market for technology providers will be over $250 billion in 2004, or approximately one-fifth of all worldwide IT related spending (see Figure 10).

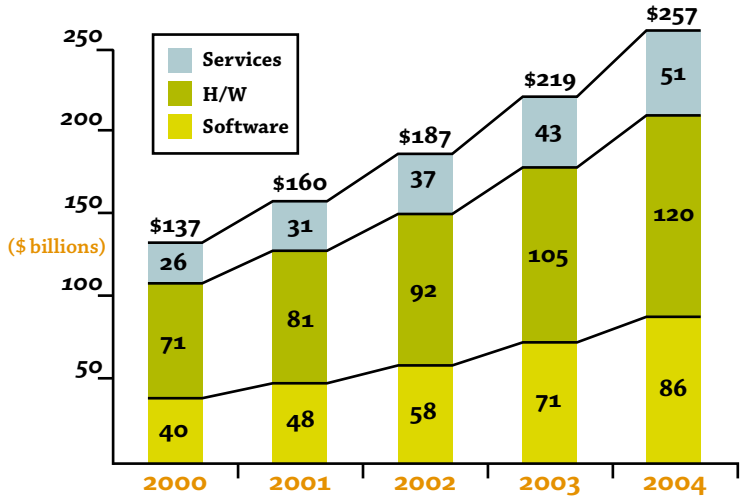
Network publishing product and service providers consist of four major categories and several sub-categories (see Figure 11). The section below describes the various categories and sub-categories, their trends, and their impact on the overall ecosystem.[5]

5 Please note that the sub-categories are based on distinct types of functionality and examples of products and services highlight those functionality types. These examples are not intended to be complete descriptions of the products or services.

"Network publishing will allow content to be created and published on any device, ultimately making all information accessible anywhere."

–ANSSI VANJOKI, EXECUTIVE VICE PRESIDENT, NOKIA CORPORATION

FIGURE 10: Global Network Publishing Opportunity for Technology Providers



Product/Service Example: WebPrint
WebPrint is a marketplace service for the transformation of the digital printing industry, providing customer branded e-commerce infrastructure solutions for on-demand printers. WebPrint's partnerships with leading print providers, including Sir Speedy, PIP, and Office Depot, has put WebPrint's technology into the hands of millions of users, giving them the ability to print to more than 1000 print locations nationwide.

WebPrint's desktop-to-delivery solutions allow a printer's customers to submit a job directly from their application to the printing location of their choice as easily as sending the document to their desktop printer. The customer can use any standard document creation program. When the customer submits a job, the document is converted by the WebPrint system into an industry standard Adobe PDF file, and the customer is given an accurate proof of the document on-line. After the buyer has reviewed the document, a print-ready file is automatically priced and sent over the Internet to the printer's location. Sent along with the file are the buyer's instructions—the type and color of paper to be used, the choice of binding or cover stock to use, as well as quantities and delivery instructions to the printing location of their choice. Using WebPrint's solution, a printer's customers are ensured that the documents are printed, bound, and finished as intended, without the problems that often plague customer-prepared files.

Sources: WebPrint Web site, press releases and interviews

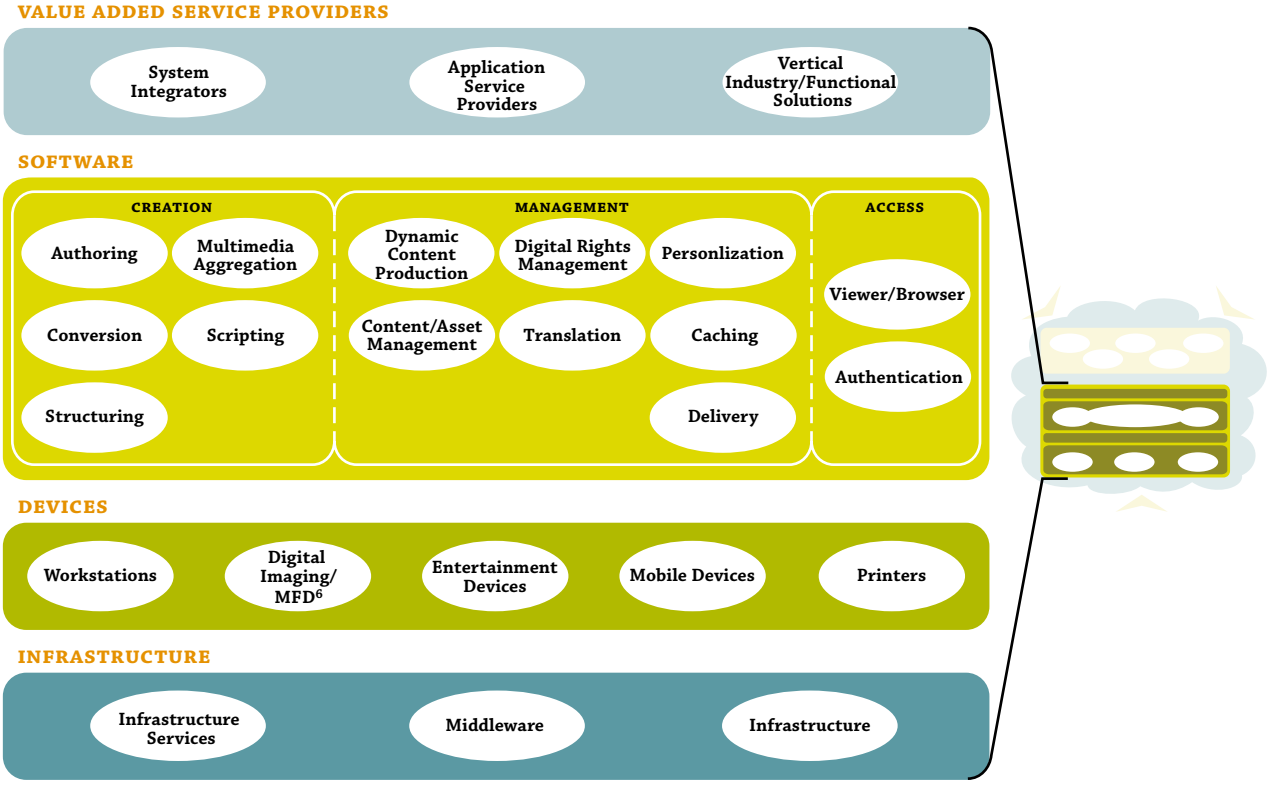
Value Added Service Providers

This category offers a complete set of technology services around the software, hardware, and infrastructure components of network publishing solutions that are customized and tailored to the needs of network publishers and end users. This category includes:

- System integrators, such as EDS, IBM, and the "Big 5" information technology services firms, that provide services for solution design, implementation, and ongoing systems management
- Application service providers, such as Keynote, Aether systems and Akamai, that provide services for managing Web sites, mobile applications, and delivery
- Industry/functional service providers, such as Shutterfly and WebPrint, that offer services for digital imaging and printing services.

As the outsourcing of non-core activities and functions for companies becomes more important, the value-added service providers will play a critical role in the

FIGURE 11: Network Publishing Technology Providers



6 MFD stands for multi-function devices.

Overall, content management tools are likely to be high-value generators in the software provider category.

Product/Service Example: Interwoven
Interwoven is a leading provider of enterprise-class management software and services. Its solutions control the development, management, and deployment of Web content for companies such as General Electric, General Motors, and Cisco Systems. Through its robust capabilities in collaborative authoring, workflow, and versioning, Interwoven is already addressing the content management aspect of network publishing. The company is currently partnering with several vendors (ATG, BroadVision and InterWorld) to broaden its offerings for the network publishing market.

Interwoven's content/asset management system has a hybrid architecture that handles database content and file assets such as high-resolution graphics, audio, video/animation, and application code – all in a single, open standards-based environment. TeamSite, Interwoven's flagship product, enables hundreds of thousands of contributors to work collaboratively by offering the following key functions: powerful and flexible open standards-based integrated processes and workflows; and versatile templating that enables effective management and repurposing of digital content assets for multi-channel delivery, including wireless.

Using TeamSite, publishers can accelerate time-to-market and revenue opportunities for published material, improve quality, lower operating costs, establish a differentiated presence on the Internet, and attract and retain more end users.

Sources: Giga Information Report on Content Management, March 2000; Interwoven Web site and annual report

network publishing ecosystem. The application service provider and industry/functional service provider categories are still emerging, compared to the system integrators category. Due to the relative immaturity of the category, many of the application and industry/function services categories currently provide a subset of the end-to-end network publishing solutions. As these categories grow and become more accepted, there will be an increase in new types of network publishing services.

Software Vendors
Software vendors are a critical category of network publishing providers because they provide the technology functionality necessary to process digital content. They can be segmented into three major categories around creation, management, and access.

The creation category includes applications for creating digital content in all media types and digitizing legacy content that can then be delivered through multiple channels. This category includes:

- Authoring tools include software such as Adobe's Illustrator and Photoshop for high-quality text and graphics; Microsoft Word for word processing; Avid's Pro Music for creating and editing audio; and Pinnacle Systems' AlladinPro for structuring, editing, and enhancing video

- Conversion applications such as HP's scanning utility software for converting one media type into another media type
- Structuring tools such as Adobe's FrameMaker, which creates overall layout, tags and links relevant pieces of content
- Aggregation tools including Adobe's GoLive and Macromedia's Director that offer basic functionality for combining content from various media
- Scripting utilities like Allaire's (Macromedia) Coldfusion and IBM WebSphere that allow more contextual and interactive content to be developed.

Content management software makers provide the tools that are primarily server-based and offer a framework for integrating and automating all the key processes around digital content creation, aggregation, personalization, and delivery of content through multiple channels. This category includes:

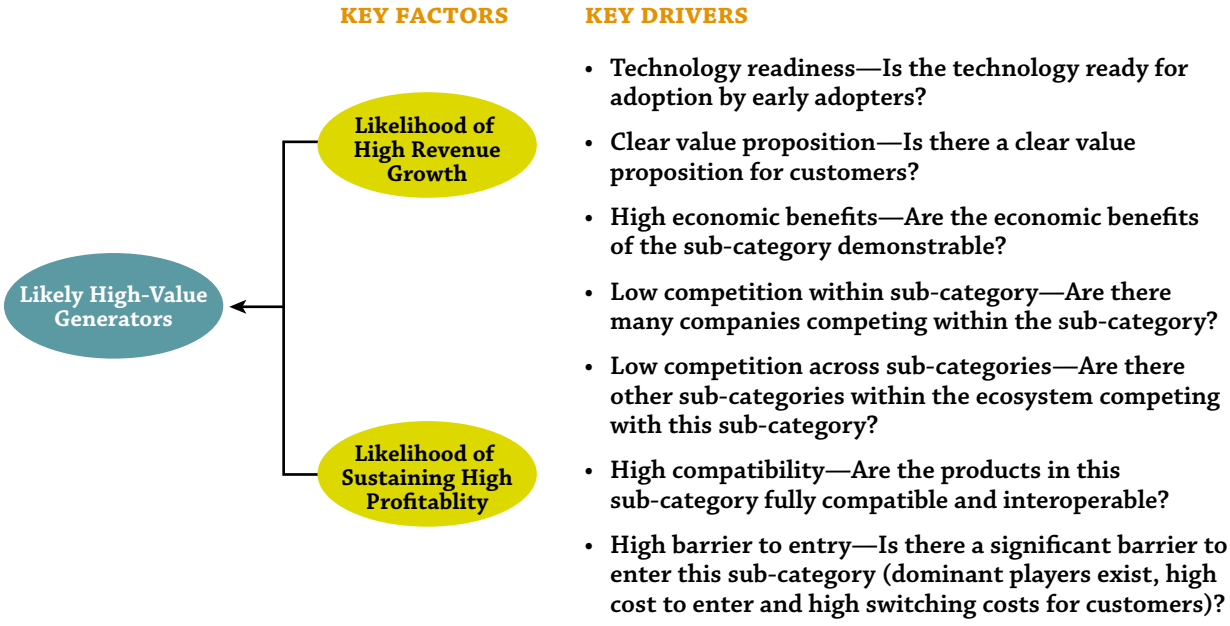
- Dynamic content production tools for server/system generated content, such as Macromedia's Generator or TrueSpectra's Image Server
- Content/asset management solutions that provide workflow and tagging mechanisms to manage content more effectively, such as Interwoven's TeamSite or Vignette's Content Management Server. This category also includes functionality to manage/customize content for global reach, as provided by Idiom and Global Sight
- Digital Rights Management solutions, such as InterTrust's Commerce DRM platform or Content Guard's Rights management suite, that enable protection and copyrighting content
- Translation software solutions from InfoSpace or AvantGo that can covert content meant for a particular channel for another device or channel
- Personalization software solutions, from ePiphany or Blue Martini, that provide the ability to customize and personalize content for a particular individual or group
- Caching software solutions from providers such as Akamai and Inktomi for optimizing digital content delivery through the Internet
- Delivery software from providers like AlterEgo Networks, BEA Software and RealNetworks that develop application server tools to present digital content for multiple channels and devices for all types of media.

Access software provider products include tools that reside on devices to access digital content. They fall into two major sub-categories:

- Viewer software includes tools such as browsers and players for viewing content. This sub-category includes products such as Microsoft's Internet Explorer, Adobe's Acrobat and eBook reader, and RealNetworks' media player
- Authentication tools include software to ensure that digital content is securely delivered to the appropriate device or end user and include products from Verisign and Entrust.

"Extending network publishing to the wireless world requires an increasingly complex infrastructure to handle various wireless devices and the problems associated with the limited capabilities of bandwidth." –ROBIN VASAN, GENERAL PARTNER, MAYFIELD

FIGURE 12: Methodology for Analyzing Likely High-Value Generators



Although some sub-categories might win over others, it does not imply how well individual companies will perform in their respective sub-categories.

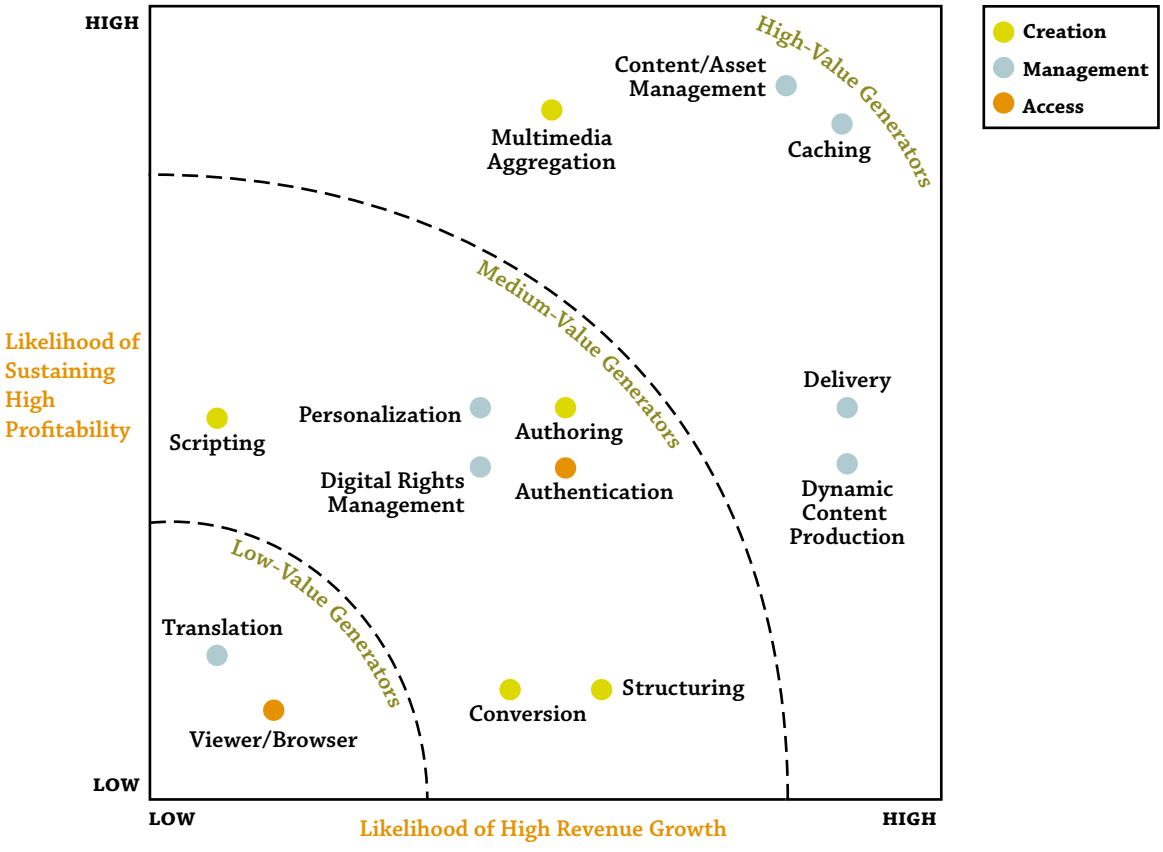
The software category is made up of many point solutions. The overall trend is towards greater integration and larger and more complete software applications. However, some categories will be positioned to generate more value than others in the next two to three years. Overall, content management tools are likely to be high-value generators in the software provider category (see Figures 12 and 13).

Device Manufacturers

Device manufacturers provide the hardware appliances that enable publishers to create and access digital content. These devices are linked to the Internet through wireless or wire line infrastructure. Key categories of device makers include:

- Workstation manufacturers, such as Dell and Sun, that manufacture personal computers and workstations to help users create digital content
- Digital imaging and multifunctional device (MFD) makers such as Sony, which makes digital cameras, and HP and Canon, which manufacture integrated fax, printer, and digital scanners

FIGURE 13: Likely High-Value Generators in the Software Provider Category



Note: (1) Viewer/Browser has a revenue impact on Delivery, but in this analysis, viewers/browers are evaluated as an independent sub-category.

- Entertainment device makers, such as Sony, Liberate, and Sega, that create devices like televisions, interactive TV set-top boxes and gaming consoles, respectively
- Mobile device makers, such as Nokia for wireless phones and Palm for PDAs, and manufacturers for eBook readers such as NuvoMedia and Franklin
- Printer manufacturers, such as HP and Canon, that build inkjet and laser printers.

Devices are important to network publishing because they provide the gateway for publishers to create content and for end users to access content. Key trends in this sector include an increase in the proliferation of mobile devices, an increasing ability to share content directly across devices (e.g., printing from a cell phone or digital camera), and greater functionality of devices. Along with miniaturization

"Network publishing will transform the way we communicate by providing easy access to rich, personalized information and simple solutions that work for the customer." –BILL MCGLYNN, VICE PRESIDENT AND GENERAL MANAGER, COMMERCIAL PRINTING, HEWLETT-PACKARD

Product/Service Example: Nokia
Nokia is a leading provider of mobile phones, as well as mobile, broadband, and IP network infrastructure and related services. It also develops mobile Internet applications and solutions for operators and Internet service providers. The company is participating in the device segment of the network publishing market by developing sophisticated mobile phones and other access devices for all major analog and digital standards.

Nokia's 9210 Communicator is an integrated multimedia mobile device for professionals that combines phone, fax, email, calendar, imaging, and utilizes the Wireless Area Protocol (an open wireless communication standard) for Internet connectivity. With a high-quality color display, it offers easy navigation and input. The device is capable of high data speeds for messaging, imaging, and for audio and video clips. It also supports the most commonly used office applications, making it possible to create Microsoft Word and Excel documents and view PowerPoint files. It features contacts, calendar, and email synchronization with Lotus Notes, Lotus Organizer and Microsoft Outlook.

The Nokia 9210 utilizes a Symbian operating system, a software platform that serves as the basis for wireless information devices. This allows interoperability between various mobile devices and enables direct device-to-device communication. With the Nokia 9210 Communicator, business users can be more collaborative, enhance productivity, and enjoy a richer viewing experience.

Sources: Nokia's Web site and 2000 annual report

and multi-functionalization, these trends will provide key opportunities for device manufacturers in the network publishing provider ecosystem to build devices that are smaller and more powerful.

Infrastructure Providers
The infrastructure provider category includes the hardware, software, and services that form the backbone for network publishing:

- Middleware provides the software and services that form the underlying glue for multiple systems to communicate more effectively. Some of the key segments in this category include enterprise application integration platform vendors such as WebMethods for intra-enterprise system integration and Vitria, which provides the conduit for communication between companies and the tools required for conversion from one standard to another (e.g., EDI to XML)
- Infrastructure service providers offer the underlying services that are necessary for network publishing. Key service areas include data center facilities, storage services, Internet access and hosting services. For example, EDS offers the Intelligent Network Foundation (INF) that provides networking services to support the needs and requirements of network publishing ecosystem participants. Other vendors in this sub-category include Exodus and Qwest Communications

- Infrastructure hardware providers design and manufacture the hardware required for network publishing. Some of the key products include servers from vendors like HP, Dell and Sun; storage systems from HP, EMC, Hitachi; and networking equipment from Cisco, Nortel and Nokia.

Infrastructure provides the platform for network publishing. As digital content becomes more complex, dense, and increasingly includes multimedia, there is a growing importance of increased bandwidth and lower latency. As the Internet evolves, the infrastructure is being extended, refined and optimized to handle more complex digital content. As this enhancement is realized, new computing models (e.g., peer-to-peer) will begin to emerge.

Network Publishing Catalysts

Network publishing catalysts are industry thought leaders, financial institutions and private equity providers, and standards organizations that stimulate and provide guidance to the entire network publishing ecosystem.

Industry thought leaders include universities and research labs, such as the MIT Media Research Lab, which focus their research on the intersection of content and computation. Key research activities that may impact network publishing include digital publishing, spatial imaging, interactive cinema, media and networks, and speech interfaces.

Financial institutions and private equity groups provide the network publishing ecosystem with the financial stimulus to grow. They provide funding, expertise, and networking for entrepreneurs to bring new concepts to market. Many venture capitalists see this ecosystem as the next wave of the Internet and are making significant investments in start-up companies in the areas of digital content management and wireless.

Standards bodies play an extremely important role in the network publishing ecosystem because they govern the standards that provide mechanisms to communicate and collaborate effectively through interoperable technologies across the entire ecosystem. The World Wide Web Consortium (W3C) is an example of a standards governing body that oversees the development of interoperable technologies for the Internet to leverage its full potential around commerce, communication, and collective understanding.

The SGML family of standards, especially XML and its derivatives, is beginning to dominate this ecosystem. Some of the key standards that will play an important role in this ecosystem to ensure that digital content is leveraged more effectively are:

"The XML family of standards and associated specifications are quickly becoming the foundation of IT and will have a significant impact on enterprises' strategic positions."

—GARTNER RESEARCH[7]

Example of XML Use
A simple example of the everyday use of search engines demonstrates the power of XML in the future. Forrester research found that 92 percent of all searches produced results that did not produce the relevant information requested. Currently, search engines are limited in their accuracy and precision because of their dependence on analyzing natural language text passages, an extremely difficult process. XML-defined metadata (data that defines data) can embed structured information within data streams that can be used to discern the underlying meaning of the searched material and avoid the difficulties of full text analysis. As it evolves to become a dominant standard, XML will facilitate more efficient tagging of content. This will result in customized and personalized searches for the end user.

Sources: "Guided Search for eCommerce," Forrester Research, January 1999

- XML (Extensible Markup Language): A meta language derived from SGML for structuring and transmitting content including text, graphics, and other types of digital content
- XSL (Extensible Style Language): Provides instructions for formatting XML data and documents
- SVG (Scalable Vector Graphics): A standard based on XML that addresses the problem of sharing many sophisticated images, enabling more rapid graphical information transfer by using plain text representation technology
- SMIL (Synchronized Multimedia Integration Language): An XML-based standard that provides an author with the ability to describe the temporal behavior of an online multimedia presentation
- PDF (Portable Document Format): Allows for accurate and graphically rich layouts to be shared efficiently (complementary to XML).

In addition to standards, parsers (tools that are standalone or part of a client application that interprets specific instructions) are required to check for form integrity and validity of the document type definitions. Some of the parsers that will emerge in this ecosystem are Java, which will be available for multiple types of clients, and WAP, specifically for wireless devices.

XML and its family of standards can be used by many applications to create and manipulate digital content and to support data interchange and application integration. The proliferation and standardization of XML-based products and services will enable fully interoperable and compatible network publishing solutions.

7 "XML: The Inner Workings to Future E-Commerce Success," R. Knox and D. Hess, February 8, 2001; TU-12-9528.

The Future of Network Publishing

Impact of Network Publishing

As network publishing grows and matures, new products, services, and business models will emerge. Examples of emerging network publishing products and services include:

- Internet protocol printing solutions in which end users will not have to worry about printer drivers
- More efficient and focused Internet search engines that allow end users to find content more easily
- XML-based content syndication services that will allow end users to control their inflow of publications
- Cell phones that will allow users to take pictures and print directly to a printer
- E-book readers that will allow travelers to download high-fidelity travel guides and maps, using wireless devices.

Network publishing will lead to the creation of new business models. Examples include:

- Content disaggregation that will allow end users to buy a chapter from a book or a single song from an album
- Content syndication by which a new class of aggregators will provide content search and aggregation services for a fee to knowledge workers
- Super-distribution that will enable end users to exchange copyrighted digital content through mobile devices while simultaneously ensuring payment to copyright owners
- A more efficient market for consumer information wherein consumers will be able to charge a fair price in return for sharing information about their buying preferences and habits (or pay a premium for securing their personal information).

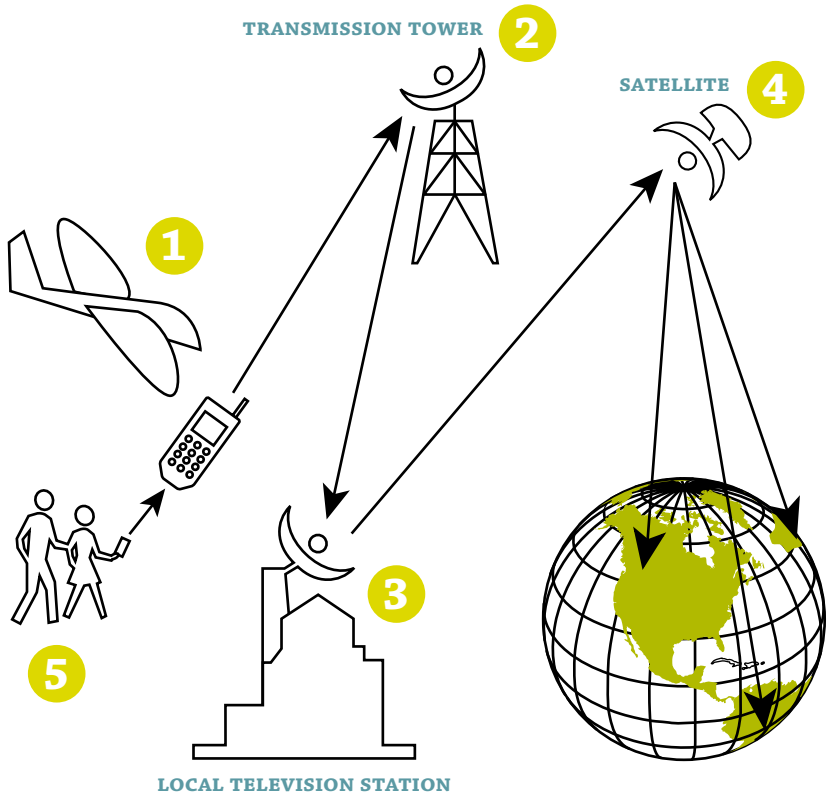
These new products and services will make the process of creating and managing content easier and more efficient for publishers. End users will benefit from the ability to access any kind of content from an array of devices. Companies that learn how to leverage knowledge over the Internet using digital content will thrive on the basis of new business models; those who don't learn the digital content game will lag behind.

The new products, services, and business models will also impact our world on a global basis. Boundaries between people will decrease as communication and collaboration become easier and more efficient. Consumers will be able to access real-time content from any location around the globe and have it delivered in a personalized fashion that takes into account cultural differences such as language. Moreover, the real-time nature of content will increase human productivity and provide us with more time for ourselves.

The growth of digital content and its increasing importance to collaboration and commerce will make the world more knowledge-oriented.

Market efficiency should dramatically improve as visibility into worldwide events occurs in real time (see Figure 14). Those with real-time access to content will be able to make quicker decisions, especially in the commercial realm. In addition, the growth of digital content and its increasing importance to collaboration and commerce will make the world more knowledge-oriented. Hence, network publishing will dramatically influence how we interact with each other, how we make decisions, and how we organize our lives.

FIGURE 14: Example of Network Publishing for Individuals



Situation

It is a sunny day in Lisbon, Portugal, and many people are outside enjoying the afternoon. Some are using their integrated mobile devices to watch television programs.

1. **Walking through the park, many people observe a plane making an emergency landing and film it with their cell phone video recorders**
2. **Cell phones provide real-time transmission to transmission tower, which transmits to a local television station that pays for breaking news video**
3. **In real-time, station verifies location and authenticity of video through GPS and other technologies embedded in cell phones**
4. **Then station chooses best video, edits, and transmits to satellite, which transmits video worldwide (viewers see the event as it is occurring)**
5. **People in park observe the video played on a news program that is broadcast to and viewed on their cell phones, just seconds after recording began**

Network Publishing allows anyone with a mobile device to become a publisher who can create and deliver content in real-time.

Critical Success Factors

The big question about network publishing is not "Will it happen?" but rather, "When will it happen?" The following factors will be critical in determining the speed with which network publishing will become pervasive:

1. **Providers must form effective partnerships with various participants in the network publishing ecosystem.** Because an end-to-end solution involves the development of many complex technologies, it is unlikely that one provider will be able to spread its resources effectively to develop all necessary network publishing tools and services. Instead, providers should focus on their core competencies and partner with other providers to collaborate on end-to-end network publishing solutions.
2. **The various standards in the network publishing ecosystem must be compatible or interoperable.** As the number of products and services increases, the underlying standards will also increase. To have effective network publishing solutions that address all content types, media types, and access devices, those underlying standards must be tied together to ensure seamless creation, management, and access of content. This will be difficult because of the complex power interplays between the various providers in the ecosystem.
3. **A few anchor network publishers must initiate the adoption process through market leadership.** Early adopters of network publishing, likely to come from new media companies, will serve as proof points to the rest of the market that network publishing can deliver higher revenues while reducing operational and administrative costs. Cost benefits will drive initial adoption, while revenue benefits will increase as the mass consumer market is tapped.
4. **Visionary technology companies must be willing to make long-term investments in network publishing.** Potential providers of network publishing products and services must have a long-term vision for exploiting the network publishing opportunity. Partnerships between network publishers and various technology companies will enhance the development of network publishing and provide proof points for the entire market.
5. **Publishers must tap the mass consumer market using new profitable business models.** A network publishing world includes businesses, not-for-profits, and mass consumers. Tapping the mass consumer market is necessary to complete the adoption of network publishing products and services while providing publishers with new revenue streams to offset their investments in information technology.
6. **Key technologies must be developed to address broadband and compression issues.** Infrastructure players and device manufacturers must ensure that end users have the necessary bandwidth and compression technologies to view any media type on any device.

Conclusion

Network publishing participants have an opportunity to reap the substantial benefits of this exciting new market. Although the exact timing and specific evolutionary path of network publishing will only become clearer over time, certain broad imperatives are already becoming obvious for network publishers and providers.

Network publishers should identify where they can more effectively leverage digital content using the Internet. For universities, it could be their vast intellectual capital; for a consumer goods company, it could be information on consumer preferences; and for a complex machinery manufacturer, it could be a knowledge base about machine operations and troubleshooting. In addition, publishers should determine the potential opportunity to create a competitive advantage or improve the top or bottom line by leveraging knowledge. Finally, they must work with network publishing providers to develop and implement digital content solutions that provide clear and compelling economic benefits.

Providers of network publishing products and services should identify what roles they want to play in the network publishing ecosystem. There are three basic choices—create a niche product or service, dominate a category, or aggressively develop/acquire new capabilities to create end-to-end solutions across categories. Moreover, providers should begin working with publishers to develop and implement network publishing solutions. Anchor customers that successfully demonstrate the economic benefits of network publishing solutions will act as proof points and success stories to drive more rapid adoption in other publishing segments.

Realizing the vision of network publishing will require significant resources and efforts from ecosystem participants, but the economic benefits for all parties will justify their investments.

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