Clash of the Titans: Impact of Convergence and Divergence on Digital Media

by

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Submitted to the Alfred P. Sloan School of Management
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ABSTRACT

In last decade, the world was bewildered by the dazzling array of choices and offerings of digital technology. While digital convergence has created new possibilities in digital media, it has also created great uncertainty, fragmentation and threats to traditional media. This blossoming of innovations, as I will examine in this thesis, originates not only from the conversion of analog media into the digital domain, but more from a convergence of industries which results in a clash of technologies and cultures.

This thesis explores the phenomenon of digital convergence and divergence and examines their impact on digital media. The questions this thesis seeks to answer are: What *exactly* is digital convergence? Is digital technology a kind of unifying glue as some may claim, or is it turning out to be a catalyst for greater differentiation? What kinds of dynamics will emerge when traditional industries play in each other's familiar turfs? And what kinds of strategies should digital media producers adopt in response?

Observations seem to point towards a trend of initial chaos, greater divergence and severe technological fragmentation in the market. However, in that light, the results of this study suggest that collaboration between industry players to establish common standards, as well as the production of content to fit the locality, context and the consumption experience will be the keys to success in the world of digital convergence.

To the loving memory of

Dr. Alexandre Chao Kwang Howe
1965 – 2003

My mentor, friend and brother.

Acknowledgements

Finishing this thesis and the Management of Technology program would not have been possible without the love and support of my wife, Ren Sing, and my daughter, Karis. Their sacrifices for coming to Boston with me, enduring the harsh winter and being away from family and friends are appreciated from the deepest of my heart.

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Appreciation goes to Walter Bender, Director of the MIT Media Lab, for graciously agreeing to be my Thesis Reader and providing his valuable insights.

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Many thanks are due also to my father, mother, sister and grandma, who are so crucial in their support and love back home.

Finally, this thesis is dedicated to the loving memory of Dr. Alexandre Chao Kwang Howe. Alex was my mentor, faithful friend and loving brother. My life has been blessed so much during these 20 years of friendship with him. Without his love, I will not be the person I am today. Though he passed away on April 22, 2003, Alex will always live in my heart.

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1 Introduction

> "Convergence is not about a single device that you use for everything. Convergence is not having fewer companies that own everything. In truth, convergence will create more devices of different shapes and sizes -- from small handheld computers to those with giant screens. And that, in turn, will create more opportunities for more specialized companies."
>
> – Bill Gates, Keynote Speech at CES 2000

Technology is one of the primary engines of change in industries and societies. Throughout history, technology has been a major determinant of the mechanism of information transfer between people. From the invention of the Gutenberg movable type machine, to the use of telegraph, the telephone and the rise of radio and television, it is undeniable that technology has always been the foundation from which we derive not only the capabilities to produce and transmit information, but also the capabilities to assemble, store, manage and retrieve information. As technology advances, the ability to produce and disseminate information generally improves in lockstep.

In the 1980s and 1990s, we witnessed a rapid increase in performance of digital processing. With ever greater computing power, the preferred medium of transmitting information shifted from analog frequencies and physical material to the logical, virtual domain of digital. Print, voice and video products were increasingly digitized and distributed as bits and bytes were manipulated by computers. Recently, the popularity and rise of the Internet provided the digital bedrock where vast amounts of information cut across the barriers that had once been limited by the shortfalls of the physical or analog medium. The World Wide Web then created an exponential growth in the amount of information available on web pages delivered by computer servers. Consequently, consumers began to embrace the Web as another channel of information delivery. Usage of the Internet increased manifolds towards the end of the 20th century. This phenomenon is illustrated in Figure 1-1.

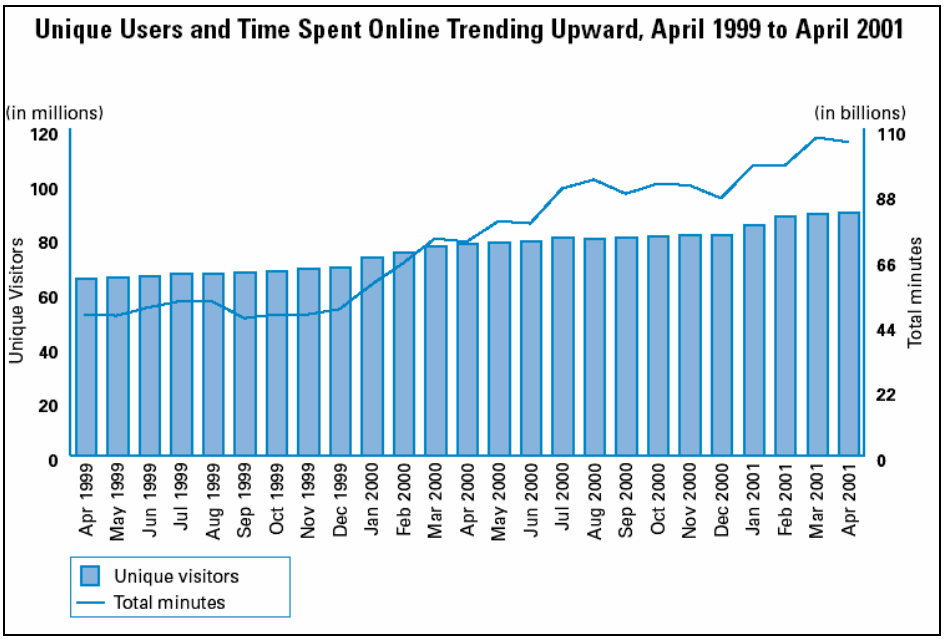


Figure 1-1: Usage of Internet increases between 1999 and 2001. Source: Jupiter Media Metrix 2002.

With new Internet capabilities and habits of consumers changing, consumption patterns of traditional mass media were significantly impacted. A survey by Jupiter Media Metrix showed in Figure 1-2 revealed that the Internet had triggered a decrease in consumption of traditional content; the worse hit being TV consumption, which decreased by 40% yearly between 1998 and 2002. Other common mass media channels like radio, newspaper and magazines were also not spared, albeit to a lesser degree.

Even as industries were reeling from the rise of the Internet as the de facto distribution channel for digital content, another phenomenon which used the Internet as a stepping stone was slowly emerging in a more subtle way that could impact them even more than what the Internet had wrought.

That phenomenon is digital convergence.

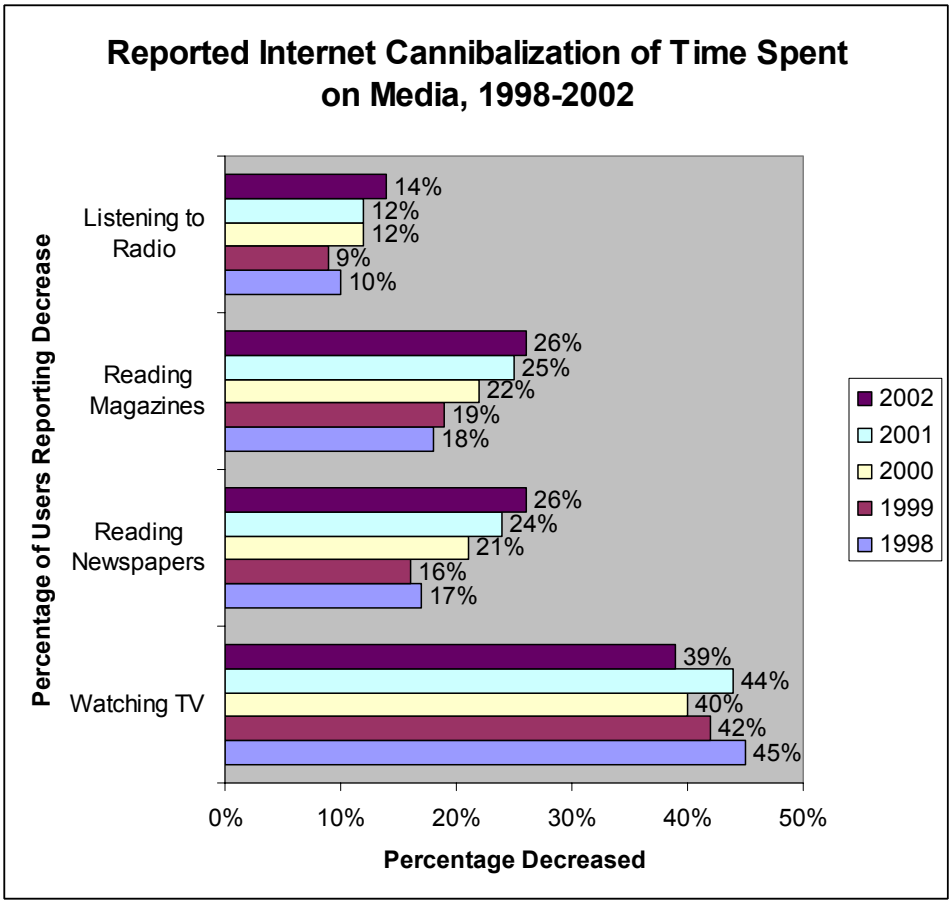


Figure 1-2: Cannibalization of Traditional Media by the Internet, 1998-2002. Source: Jupiter Media Metrix/NPD Report 2003.

1.1 The Promises and Pitfalls of Convergence

What *exactly* is Digital Convergence? Is digital technology a kind of unifying glue as some may claim, or is it turning out to be a catalyst for greater differentiation, as Bill Gates has announced in the opening quote?

Digital convergence may seem like a misnomer, because today's digital landscape is far from being unified or whole. Perhaps what Bill Gates said is true. The market today is littered with divergence and fragmentation: we see new digital devices that do not share common standards; we have an explosion of choices for consumers using digital technologies; we are confused by the myriad of platforms being offered as our 'information appliance'. Nonetheless, industrial juggernauts are pursuing the idea that

Bill Gates rejected. They continue to envision digital convergence as a single, do-it-all kind of device or service. Meanwhile, traditional media conglomerates are tightening their grip on content and continue to merge and acquire to form even bigger conglomerates to manage the digital revolution. PCs, Blackberries, Smartphones, PDAs, set-top boxes and even game consoles like Playstations and X-boxes, are all competing aggressively to become the dominant platform for the center of digital information in the life of an average person. Will information and entertainment from a few controlled media outlets flow to the individual through a single digital gateway? Is that the future of digital convergence?

A reality check reveals that so far, generally accepted digital gateways of such a nature is nowhere in sight. The holy grail of digital convergence, *the* Device or Killer App or Service that could unify the world of telecommunications, computing and media technologies – the emblem of digital convergence – is still vaporware.

The very idea of a converged digital world appeals so much because it implies greater simplicity to the consumer and more profits for the producer. Imagine the promise of a phone, television, music player, and computer all rolled up into a single piece of hardware to communicate, collaborate and share information easier, faster and cheaper. For the consumer, convergence will create a single contact point in a person's life for information, entertainment, education and commerce. For the producer, the potential of greater value that can be squeezed out of existing content and be captured through new channels enabled by digital technologies through such a device. In short, convergence promises a Digital Eden for all.

Yet, beyond the hyperbole, there is no clear vision of how this futuristic industry will emerge and play out. When we wake from our digital dream, will we discover that reality is far from the vision we think we saw? Here are some signposts:

On July 30, 2002, Fujifilm and Olympus jointly announced a new digital storage media for digital still cameras -- the xD Picture Card. With the size of a postage stamp, the xD

card was poised to compete directly with other existing storage media, including Compact Flash, Panasonic's Secure Digital, and Sony's Memory Stick and even its predecessor, the Smartmedia. Unsuspecting industry watchers were dumbfounded with the introduction. Since there was already a plethora of media storage offerings in the market, the greatest concern was that the xD card had a unique design that was incompatible with other digital storage media types of its class. With just a simple variation of the same digital technology, the xD card was an unwelcome addition to an increasingly fragmented market.

On the digital telecommunication front in late-2002, the adoption of 2.5G and 3G telecommunication services was greeted with skepticism due to shallow business models and persisting technical issues. One of the major factors was the existence of varied incompatible standards. In 2002, 2.5G services are based on 3 disparate standards: Europe's GSM/GPRS, Qualcomm's CDMA 1XRTT and EDGE. Just as the industry was accepting the overwhelming spread of choices for the next generation 3G standards like W-CDMA, CDMA2000 and 1XEV, China announced in January 2003 that it was developing a competitive 3G standard of its own, known as TD-SCDMA.

The stories are similar in the market of digital devices. Take the Personal Digital Assistance (PDA) as an example. The first PDA, the Newton, was launched by Apple Computer in August of 1993. For the next 10 years, the market had introduced more than 220 new models which ran on 44 unique processors with differing processing speed and memory space. In addition, these handheld devices had 20 different types of screens with varying resolutions and color depth. Even in 2003, at least 5 different operating systems are vying to be the dominant player in the handheld platform. It seems that the PDA market, after 10 years of life, has yet to 'converge'.

The media industry has not been exempted from the effects of convergence and divergence. The greatest threat to traditional media is the unbridled distribution of digital media, which threatens to break down the highly vertically integrated structure of the existing media industry. Peer-to-peer file sharing technologies like Napster, Grokster and

Morpheus have wreaked havoc to the music and movie industry. The claims of the potential loss of revenues for the media conglomerates had triggered law-suits and injunctions. On the broadcasting front, Digital Video Recorder devices like UltimateTV and TiVo are enabling consumers to skip advertisements while watching programs. Such new technical abilities are apparently undermining the long-standing and highly profitable business models of traditional media.

Therefore, it is with both excitement and fear that traditional content providers approach digital technologies. The excitement comes from new business opportunities that may open up with digital convergence, just as Information Technology (IT) has contributed much to the phenomenal productivity gains and new technical possibilities in the 1980s and 1990s. On the other hand, the fear stems from the uncertainty that new digital innovations is bringing. There are already signs of erosion in revenues by smaller but successful Internet players like *eBay* and *Monster*, who are increasingly eating into the advertising pie that was milked for years by incumbent media giants. (See Figure 1-3). Furthermore, traditional publishing and broadcast players are finding it hard to cite any shining examples of successful businesses on the relatively new media platform of the Internet. What further damage would digital convergence bring? How should content providers embrace unfamiliar technological innovations where their years of experience in traditional media do not offer any greater competitive advantage than new comers?

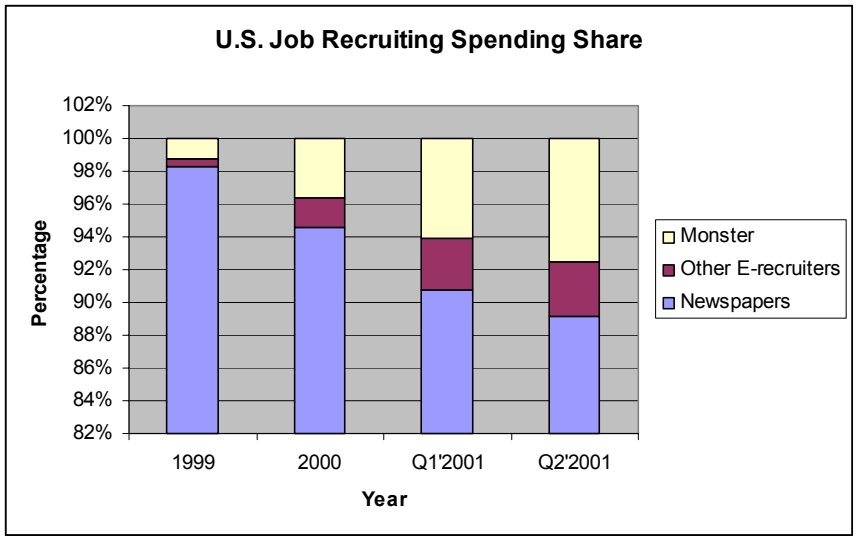


Figure 1-3: U.S. Job Recruiting Spending Share. Source: Adapted from First Union Securities, Company Reports, NAA

1.2 Defining Digital Media

Before we dive into examining the dynamics of digital convergence and divergence in digital media, let us define what digital media is. According to Lev Manovich (2001) in *The Language of New Media*, Digital Media or New Media has the following characteristics:[1]

1. New media is analog media converted to a digital representation. In contrast to analog media, which is continuous, digitally encoded media is discrete.
2. All digital media (text, still images, visual or audio time data, shapes, 3-D spaces) share the same digital code. This allows different media types to be displayed using one machine – a computer – which acts as a multimedia display device.
3. New media allows for random access. In contrast to film or videotape, which store data sequentially, computer storage devices make it possible to access any data element equally fast.
4. Digitization inevitably involves loss of information. In contrast to an analog representation, a digitally encoded representation contains a fixed amount of information.

[1] Manovich, Lev. *The Language of New Media,* MIT Press 2001.

5. In contrast to analog media where each successive copy loses quality, digital encoded media can be copied endlessly without degradation.
6. New media is interactive. In contrast to old media where the order of presentation is fixed, the user can now interact with a media object. In the process of interaction the user can choose which elements to display or which paths to follow, thus generating a unique work. In this way the user becomes the co-author of the work.

I will employ these characteristics defined here to mean digital media throughout this thesis.

1.3 Scope and Methodologies

In this thesis, I will seek to examine the dynamics of digital convergence and divergence from the perspective of a content provider. Although the impact of non-technological factors of convergence will be covered briefly, I will not dwell deep into them. Instead, I will attempt to focus in greater detail on the technological and management issues of digital convergence, in particular to the media industry, which I will limit the scope to music, television, radio, newspapers and movies. I will also touch briefly on distribution networks like telecommunications and wireless technologies wherever it is relevant or appropriate.

The methodologies used in this thesis are based on literature reviews of academic papers, published journals and books, company white papers, and news reports, both online and offline. I have also conducted interviews with selected media firms to understand their positions and views on digital convergence. These views and strategies are used to formulate the concepts in this thesis. The companies I had the privilege to talk with are: Sony, NTT DoCoMo, HBO, The New York Times, Singapore Press Holdings, Reuters, Agence France Presse, British Telecoms, Orange, Google, Boston.com and the British Broadcasting Corporation.

This thesis is divided into the following chapters.

- Chapter 2 explores what digital convergence means. I will create a new framework to understand the dynamics of convergence in digital media.
- Chapter 3 will examine how convergence has impacted the media industry using Michael Porter's Value Chain analysis.
- Chapter 4 goes in depth into digital divergence. I will also attempt to explore the barriers to convergence and the fragmentation of the industries.
- Chapter 5 uses the Systems Dynamics modeling technique to explore various scenarios that might play out in future of media industry in the light of digitization of media.
- I will conclude with Chapter 6 with some propositions of different strategies that digital content providers may adopt in order to create sustainable businesses in digital media and digital convergence.

2 Understanding Digital Convergence

> **con·ver·gence**: k&n-'v&r-j&n(t)s: *noun***:** the act of converging and especially moving toward union or uniformity.
>
> - Merriam-Webster Dictionary

There has been so much talk about digital convergence in the last two decades that it is difficult to separate hype from reality. There are definitely indications of convergence happening in the industry -- major firms have been rolling out products that straddle across industry boundaries and digital networks are carrying all forms of media to the consumers. Amidst the enthusiastic activities surrounding digital convergence, industry analysts and firms have been defining convergence in different ways, usually from a perspective relative to their position in the industry. This myriad of definitions confuses the market and industry players on how they should best respond to this trend. What I hope to do in this chapter is to understand what digital convergence really is. Drawing from interviews and readings across industry publications, I will create a framework as a basis for discussion for the rest of this thesis.

2.1 Historical Background

In 1978, Nicholas Negroponte, the founder of the MIT Media Lab, depicted digital convergence by drawing three overlapping circles to represent the technological convergence of computing, printing and broadcasting. The most rapid growth and innovation, he argued, could be found in the area where the three industries intersect.[2]

[2] Brand, Stewart. *The Media Lab: Inventing the Future at MIT*. New York: Viking Press 1997.

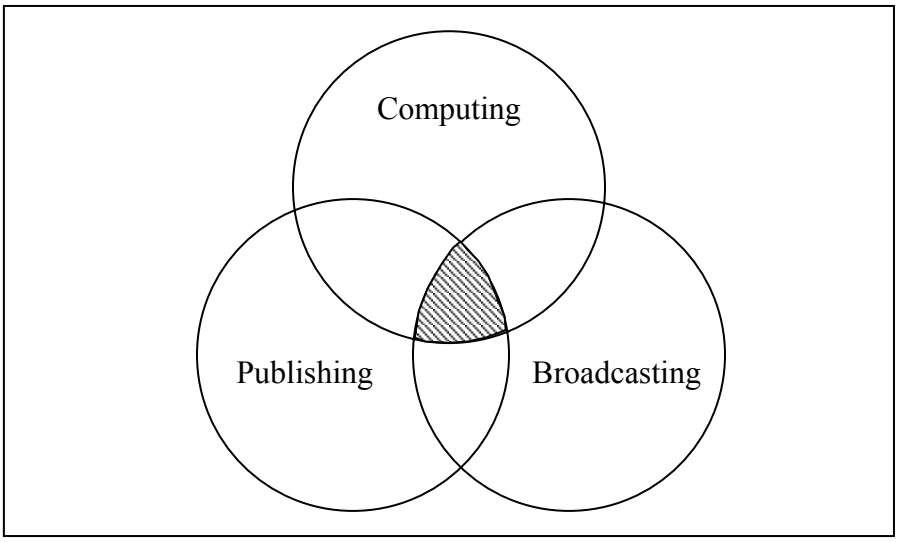


Figure 2-1: Negroponte's Digital Convergence

Milton Mueller (1999) defines convergence as a takeover of all forms of media by digital computers [3], while David Yoffie (1997) defines it as a uniting of the functions of the computer, the telephone and the television set.[4] Other distinguished authors and researchers have called convergence by different names. Marshall McLuhan (1964) called it the "Global Village", while Timothy Todreas (1999) named it the "Digital Era" or the "Great Value Shift", and industrialists like Apple's co-founder Steve Jobs touted it as the "Digital Lifestyle". Many others heralded and discussed the phenomenon of digital convergence in various ways.

2.1.1 NEC's Vision

One development to note was in 1977, Japan's NEC Corporation painted its vision of a converging world of computers and communications -- "C&C" (Computers and Communications) -- which became their corporate slogan.

[3] Mueller, Milton L. *Digital Convergence and Market Structure*, June 1999
[4] Yoffie, David. Ed. *Competing in the Age of Digital Convergence*, HBS Press 1997

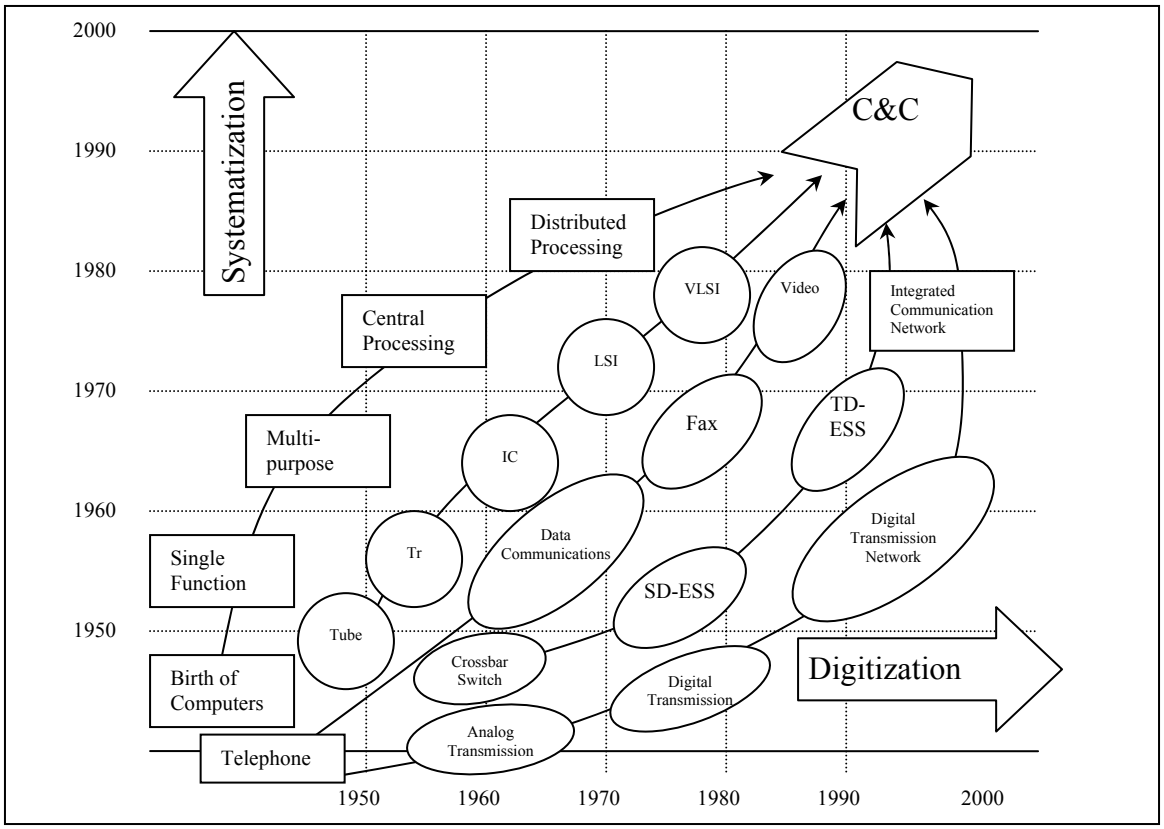


Figure 2-2: Modified from NEC Corporation, The First 80 Years (Tokyo: NEC Corp., 1984), p. 82. © Koji Kobayashi, NEC Corporation.

In that vision as illustrated in figure 2-2, NEC pointed to the semiconductor technology as the driving force towards convergence. Technologies would increase in complexity through the advancement of semiconductor technology of Very-Large-Scale-Integrated (VLSI) circuits. Processing of data would increasingly be distributed and digital networks would be the foundation of distribution. Rich data like video would be digitized and transferred over an "Integrated Communication Network".

2.1.2 Sculley's Vision

A different, yet equally compelling vision of digital convergence was given by John Sculley, past CEO of Apple, in 1991. Sculley predicted that in ten years, the technology world would revolve around "Information Appliances" – a small computer that will unite the technological mishmash of telecommunications, office equipment, consumer

electronics, media and computers.[5] Businesses would take advantage of emerging digital technologies, such as CD-ROMs and virtual reality. Most importantly, in Sculley's vision, convergence means the blurring of industry boundaries in the techno-telecoms world.

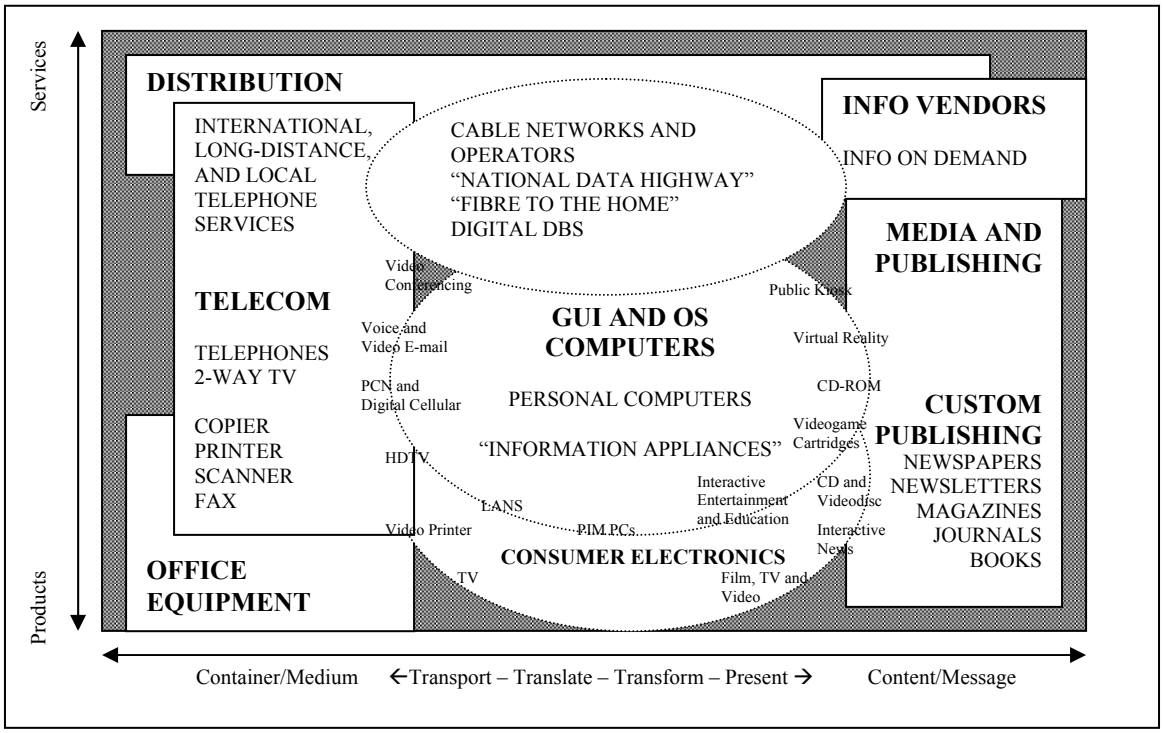


Figure 2-3: Modified from a presentation by John Sculley at Harvard University, Program on Information Resources Policy, 1991

2.1.3 Sony's Vision

A more recent depiction of digital convergence is from Sony. Their idea of convergence focuses on the connectivity of multiple client devices to four gateways: the Personal Computer, Television, Mobile Phone and Game Console.[6] The electronics giant sees the future as a digital world with an array of hardware devices with network services and content, all interconnected by an integrated business model.

[5] Yoffie, David. Ed. *Competing in the Age of Digital Convergence*, HBS Press 1997
[6] Interview with Sony's GM of Strategic Ventures, Hiro Uchida, on January 2003.

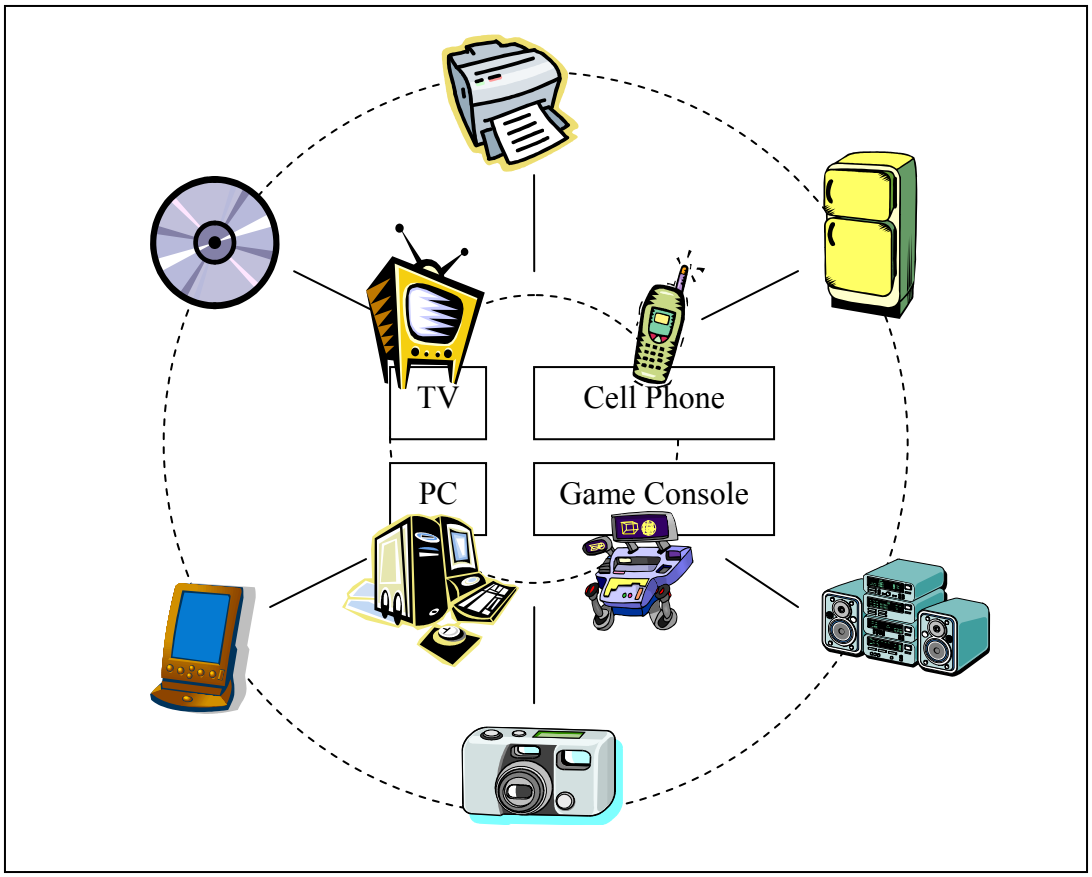


Figure 2-4: Sony's Digital Convergence

2.2 Drivers of Convergence

As analyzed here, I observe that there are 3 main drivers of digital convergence.

1) Increasing Computing Power – "Moore's Law"

2) Network Externalities of Digital Technologies – "Metcalf's law"

3) Changing Structures of Integrated Industries

2.2.1 Moore's Law

The ability of digital systems to handle multimedia content at lower and lower costs is a product of exponential progress in the processing power and memory of Integrated Circuits (IC). This, in turn, depends on the ability to increase the density of transistors on a single chip. Gordon Moore observed in 1965 that the number of transistors in an

integrated circuit would double every 18 months.[7] This axiom – popularly accepted as *Moore's Law,* has stood true till today. A corollary of Moore's law states that the cost of an IC is approximately proportional to the square root of IC complexity, which means that the cost of carrying out any particular task with ICs will be cut in half about once every two years as illustrated in figure 2-5. The increasing computing power of processors not only enabled the rise of Personal Computers, but also became one of the main technological drivers that are pushing industries towards digitization of media and digital convergence.

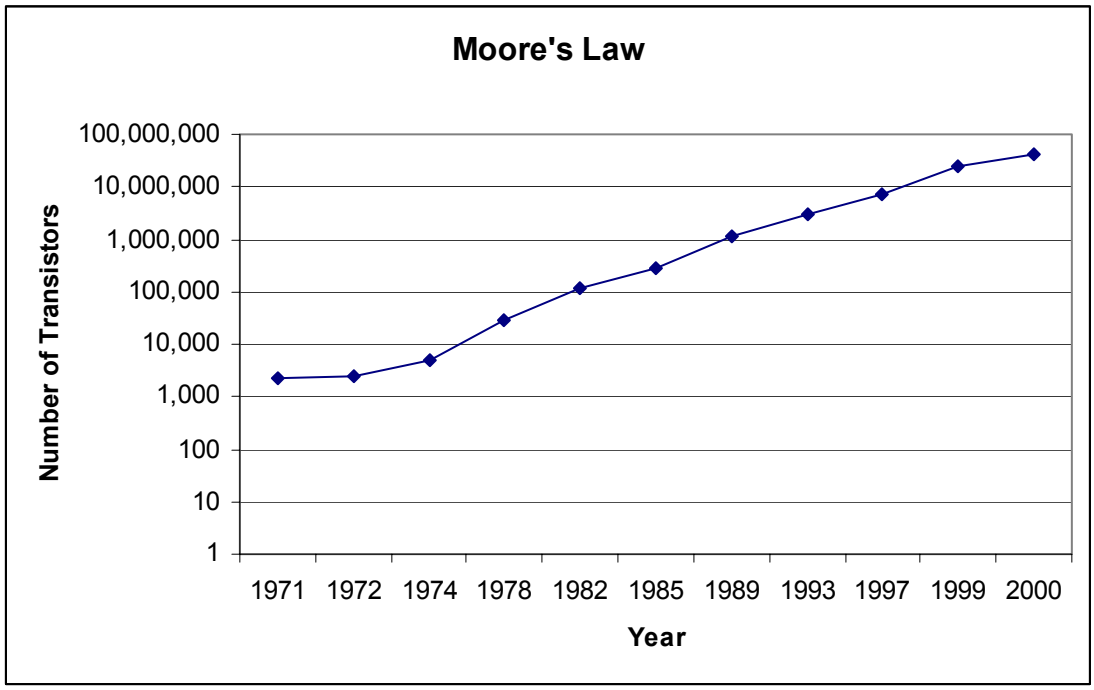


Figure 2-5: Moore's Law. Source: Intel

2.2.2 Metcalf's Law

The second driver of convergence is "network externalities" or "network effects", which comprises the notion that the more end-users a network has, the more valuable the network becomes to the users. *Metcalf's Law*, named after the founder of *3Com* and father of Ethernet, states that the potential value of a network is proportional to the square of the number of connections (i.e., the potential value of N connections equals N-

[7] Moore, Gordon E. *Cramming more components onto integrated circuits*. Fairchild Semiconductor White Paper, 1965.

squared). Network externalities drive progress in transmission network structures. It especially increases the value of many digital products which rely on peer-to-peer functionalities. One example is software. The value of many software applications grows with increases in the installed base. While it is obviously true for application software such as word processors for documents that have to be shared, it is equally true for the groups of software programmers facing the choice of around which operating system they do their development.

2.2.3 Changing Industry Structures

The third driver of digital convergence is the changing structure of industries. Raw technological power is only part of the convergence story. Rules of competition, as well as standards and protocols, are major factors that affect the changing industrial structures. As pointed out by Grove (1996), Tapscott (1997) and others, the computer industry used to "vertically integrated", that is, firms take on the entire value chain of the industry. IBM supplied chips, CPUs, operating systems, applications software, sales, distribution, service, and training for mainframes. DEC did the same for minicomputers. Now industries are more "horizontally integrated", with Intel, Motorola, and others doing chips; Compaq, Dell, Packard Bell, Hewlett-Packard, IBM, and others as Original Equipment Manufacturers (OEMs); Windows, OS/2, Mac, Unix, and others as operating systems, scores of independent software vendors (ISVs), value added resellers (VARs), retail channels, and the like. In this non-vertical industrial structure, companies do what they do best and look for implicit or explicit strategic partners to build whole products for the end users. With this structure, it is much easier to piece components for computers, communications, and content, than it was when companies were expected to stand alone. Essentially, when the industrial structure shifts from vertically to horizontally integrated, the basics of competition changed.

The process of creating common protocols and technical standards for data interchanges is another major factor affecting industrial structure. This is a predominantly socioeconomic process, not a technical one. It involves the coordinated adoption of

compatible technology platforms by a critical mass of producers and consumers. That process is affected by network externalities, product life-cycles as well as regulatory changes.

In many ways, the progress of digital convergence is a story of the rise and fall of specific standards that were designed to bring together various media forms. And as economic theory on standardization has demonstrated, such processes are path-dependent, and may affect tipping points towards various scenarios of equilibrium.

2.3 Defining Digital Convergence

Both academic researchers and industrial leaders have identified one thing in common: digital convergence would bring about a fluidity of technological, structural and industrial boundaries. In this thesis, I suggest that digital convergence occurs at eight levels. I have categorized them into 4 categories, each with 2 levels, as follows:

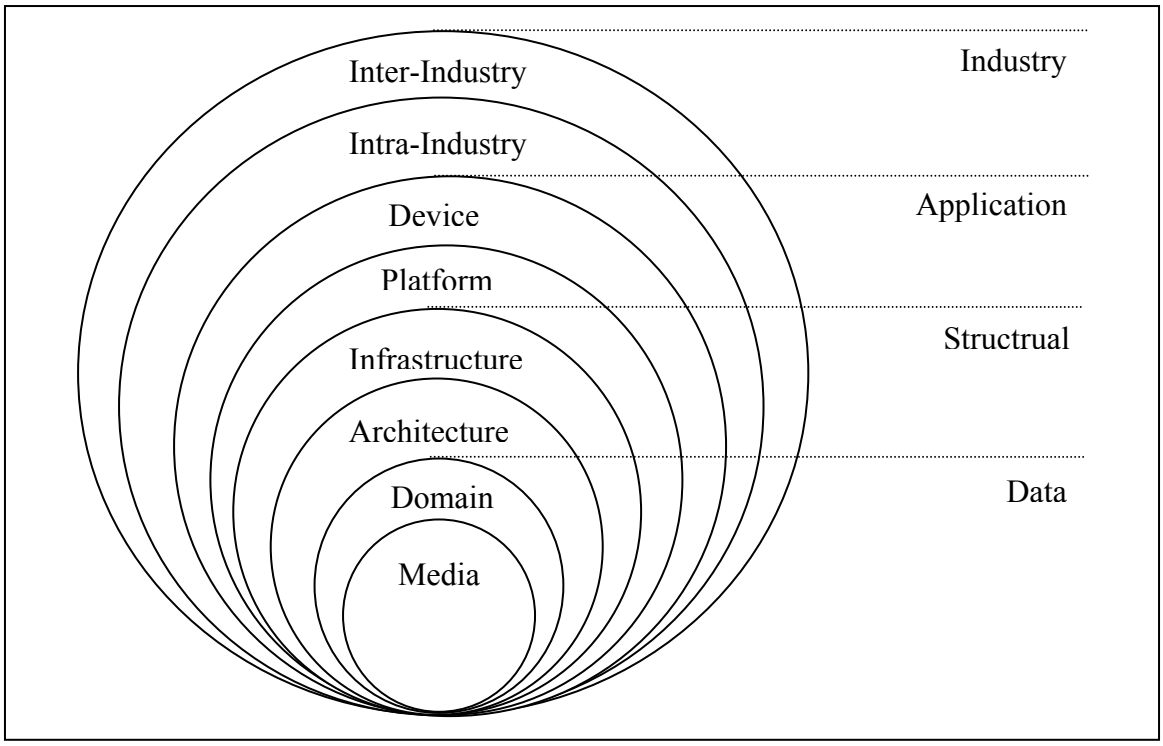


Figure 2-6: Eight Levels of Digital Convergence

2.3.1 Data Convergence

Data Convergence consists of two levels: Media Convergence and Domain Convergence. Level 1: Media Convergence is when light, sound, and motion forms into media (video, music, image, text). Level 2: Domain Convergence is conversion between analog domain (frequency and physical) and digital domain (bits). In most instances, Level 1 and Level 2 convergence happen at the same time. For example, recording a dramatic musical performance where light, sound and motion are stored in real-time as digital video on a hard drive.

Text, numbers, image, motion, sound and video enter the digital domain when they are digitized into bits and bytes. Information that is represented by ink, touch, frequencies and signals shed off their uniqueness when they are converted into streams of mere 1's and 0's. Digital media objects, whether created from scratch on computers (like computer graphics) or converted from analog media sources, are composed of digital code, which are numerical representations. The power of digital is the ability for these encoded data to be described using a mathematical function, stored, manipulated by mathematical algorithms, transferred across any data transport and decoded back into analog information.

Digitization is the process of converting continuous information into discrete, but numerical representation, thereby flattening all forms of information and squeezes them through a 'digital wormhole'.[8] The process of digitization goes through two major steps: the data is first *sampled* at regular intervals, such as a grid of pixels used to represent a digital image, and then *quantified*, which is to assign the digital information with a numerical value drawn from a defined range. The ease of processing and manipulating data is further contributed by *Moore's Law* with the continual increase in computing power.

[8] Collis, Bane and Bradley, *Winners and Losers*. HBS Press, 1997

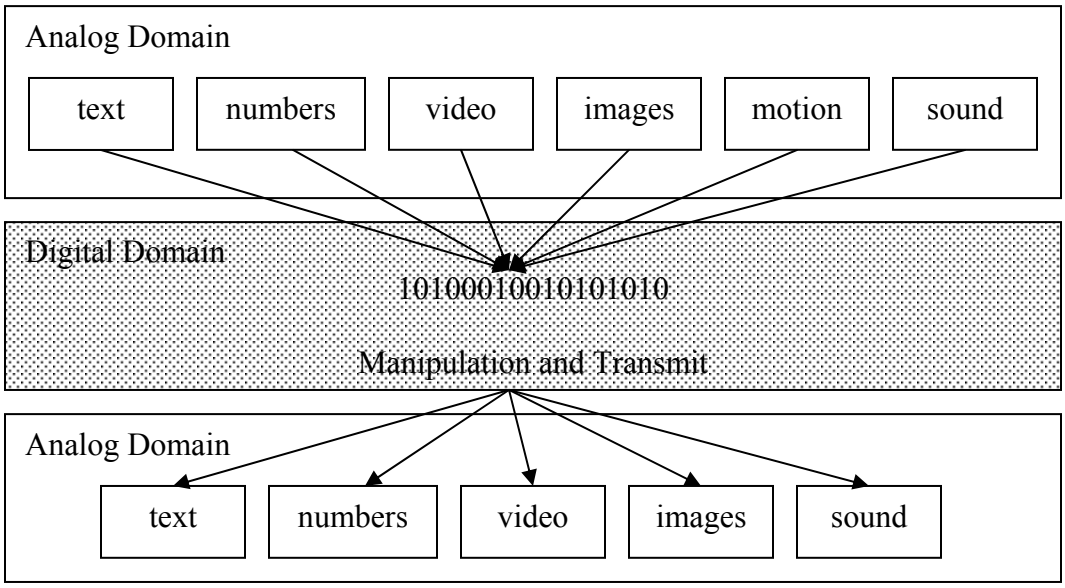


Figure 2-7: Data Convergence

Digital artists and media research labs from all over the world often experiment with these two levels of convergence. One prime example is the MIT Media Lab in Cambridge, Massachusetts. Among other achievements, the projects at the MIT Media Lab constantly pushes new boundaries with radical ways to digitize human expression through non-conventional channels like emotions, facial expressions, voice or touch. By creating interaction with these digitized signals, new ways of human-machine interactions can be invoked.[9] The Boston Cyberarts festival is another example of convergence in this category. Held once a year since 1999, the CyberArts festival displays digital artwork, especially those involve interactivity, music and animation. One example of such interactive displays is "Text Rain", which involves the use of the human silhouette to interact with animations of falling alphabets.[10]

2.3.2 Structural Convergence

Structural Convergence is the convergence of data architectures, as well as networks and distribution channels that would carry digital information.

[9] Brand, Stewart, 1987. *The Media Lab: Inventing the Future at MIT*. New York: Viking Press.
[10] Boston CyberArts Festival, http://www.bostoncyberarts.com

Level 3: Architecture Convergence involved the endogenous manipulation of data to form standard data architectures. Example of such convergence is ASCII, XML, MPEG, and JPEG, all of which are standards that encode data into encapsulated forms. TCP/IP, the basic packet-based data communication technology of the Internet, has survived almost two decades of exponential growth. With the far-reaching effect of the Internet explosion, TCP/IP has become the "protocol of convergence" for many companies and services.

Level 4: Infrastructure Convergence depicts the coming together of networks and distribution infrastructures that would carry these encapsulated formats from one point to another. ISDN and Ethernet paved way for data transfer over voice-centric networks, and intra-organizational private networking respectively. The Internet is probably the most widespread manifestation of a structural convergence, and forms the backbone for all higher levels of digital convergence. The effect of a structural convergence is the transformation of the value chain of the industry: new capabilities and functions are introduced to both producers and consumers of content, and network externalities or *Metcalfe's* Law is the main driver. The value chain is flattened and the distribution bottleneck that used to be the point of value capture by traditional media firms is severely changed and disrupted.

2.3.3 Application Convergence

Application Convergence describes Level 5: Platform Convergence and Level 6: Device Convergence.

Level 5: Platform Convergence is the coming together of a standardized way of programming and packaging of content. Flash and Java for the Internet, Jini for a unified interface for digital devices and the Windows Operating System for the PC are examples of converged platforms.

Level 6: Device Convergence is the trend that a single piece of hardware will become the convergent point of all information accesses. For example, the Smartphone is a candidate of the ultimate converged device with the PC, telephone, PDA, radio, television and music player all rolled into a pocket-able hardware. The set-top box is another potential candidate for such a multi-functional gateway device. Although such degree of convergence might be years away (if at all possible and feasible), we are already seeing trends where devices become more and more powerful with multi-function capabilities, as well as the versatility of running downloadable software.

2.3.4 Industrial Convergence

The industrial level of digital convergence is possibly the most powerful and disruptive. This phenomenon occurs at two levels.

Level 7 is intra-industry, where technologies and application converge within the industry. Intra-industry Convergence is prominent at certain industries like Telecoms and Media. In Telecoms, operators often use multiple technologies to cross deliver voice and data services. Fixed-Line and cellular service often complement each other, and telecoms players are beginning to leverage on these complementarities.

Mergers and acquisitions are common within the media industry, and these are phenomenon of a level 7 convergence. Among many others, the merger between the Time-Life publishing group and the Warner music, film, publishing and theme parks conglomerate to create TimeWarner was an outstanding example. The synergy created is an opportunity to use convergence at level 7 for cross-promotion -- News Corp is the most famous example: 40% of UK newspapers cross-promote the satellite TV platform used by 35% of UK households and the TV channels with 20% share of viewers. They are now poised to do the same with Fox, NY Post and DirecTV in the US.

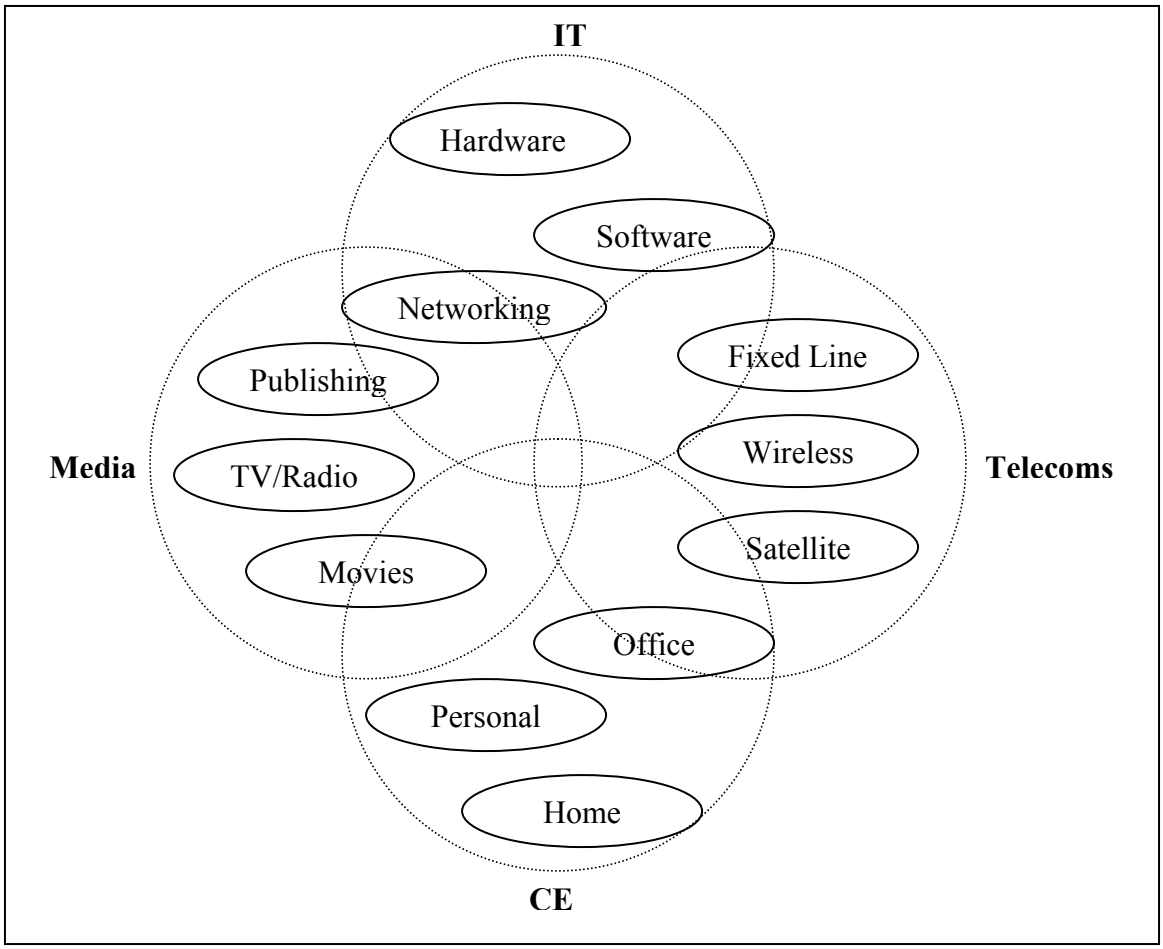


Figure 2-8: Intra-Industry Convergence

Level 8 is perhaps the most interesting and disruptive of all. Inter-Industry Convergence is the coming together of four traditionally distinct, but interrelated industries: Information Technology (IT), Telecommunications, Consumer Electronics (CE) and Media. The clashing of these industries produces cross-fertilization of technologies, as well as, disruption of industries. Figure 2-9 illustrates this definition.

The interaction of these industries is not limited to just technological convergence, but also non-technological factors. I will explore briefly the behavioral, economic, regulatory, social, cultural and global convergence that results.

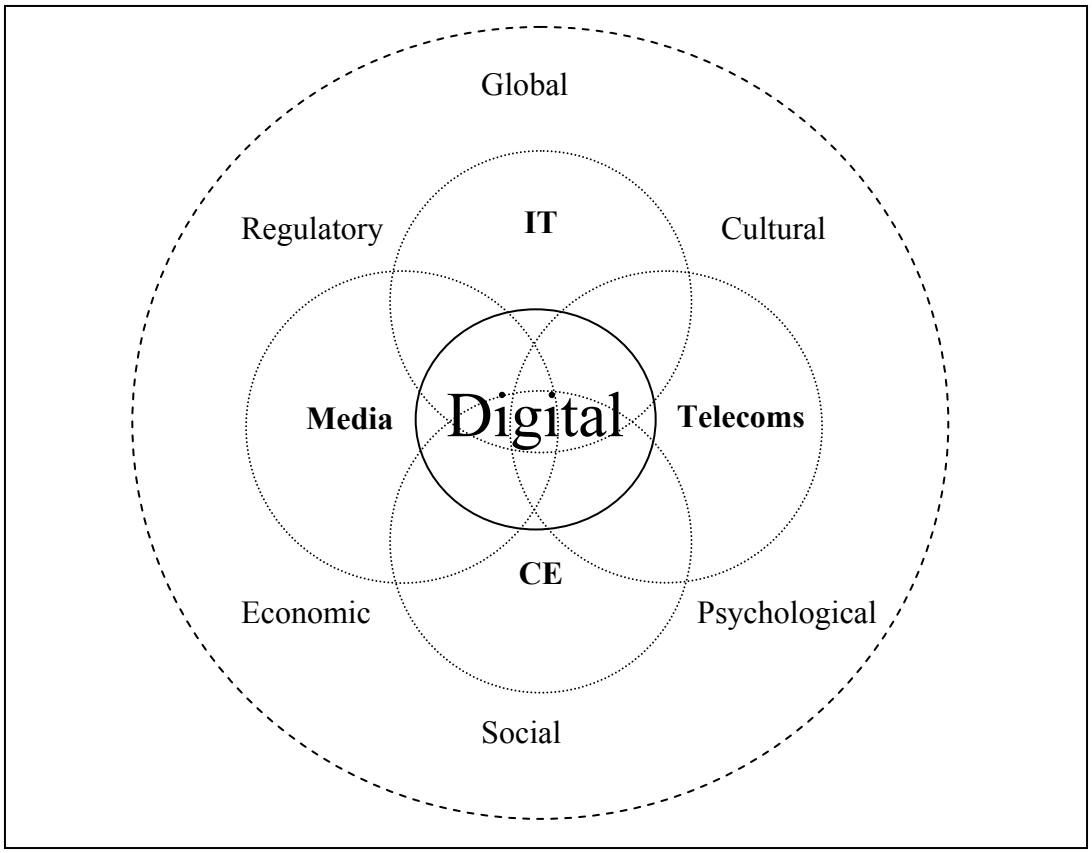


Figure 2-9: Inter-Industry Convergence

2.4 Convergence of Technologies

The heart of digital convergence is the coming together of four industries. Collectively, they are a formidable presence. The merging of industries will have a combined total of at least $2 trillion. In a few years time, it may reach $3 trillion, which is roughly $1 out of every $6 of global GNP.[11]

Each industry brings technical competencies in their traditional space, and offer unique value propositions and complements in the converged space. For example, IT's strength is in its processing power and data storage, Telecoms brings value in voice and communications, CE contributes in physical functionalities and user interface and Media its content.

[11] "The Media Mess," Economist (London), February 1992.

Each industry also have its unique forte of distribution abilities: IT in data networking, Telecoms in cellular and fixed-line distribution, CE in physical distribution and Media in satellite, terrestrial and cable distribution. As shown in figure 2-10, the merging of these technologies brings about new capabilities and creates a diversity of new solutions as technologies are blended together.

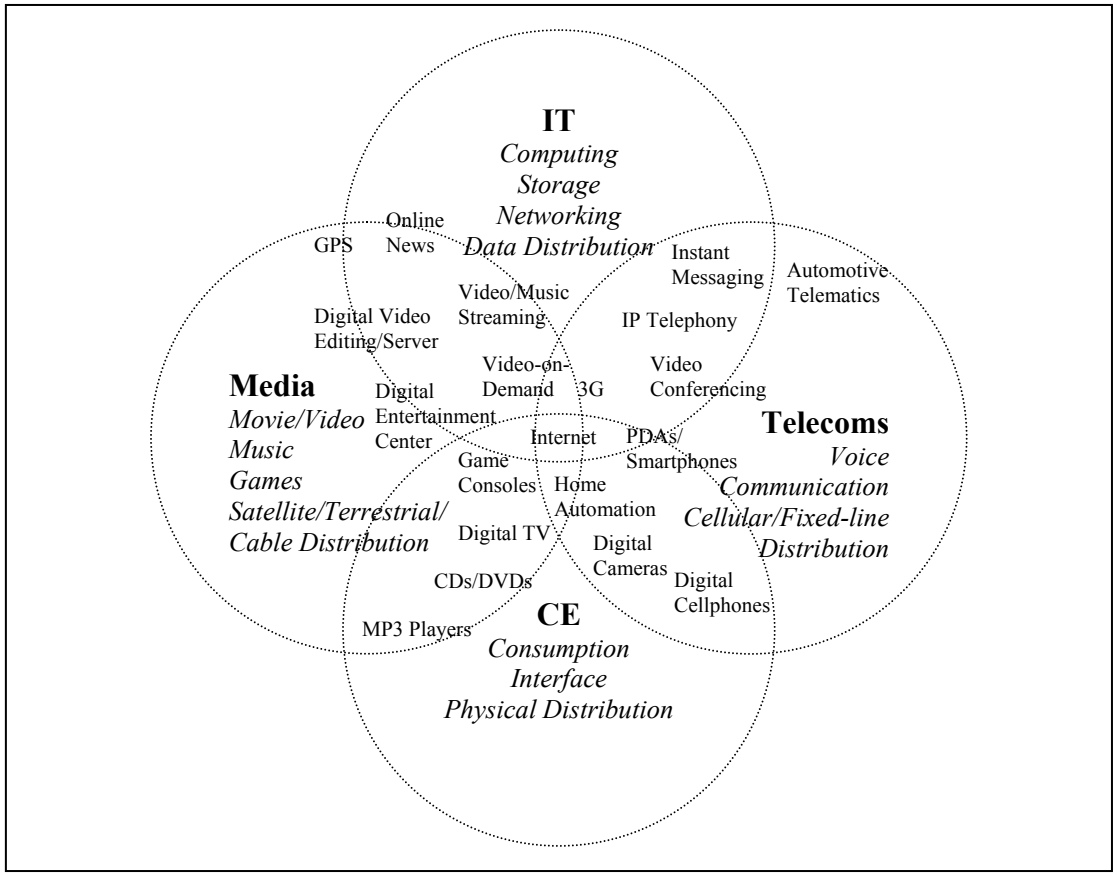


Figure 2-10: Competencies in Digital Convergence

2.4.1 Consumer Electronics and Media

Consumer Electronics and Media have been partners since the rise of radio and television in the 1930s. Digital technologies from the 70s to the 90s could only tighten that partnership. Compact discs, DVDs, digital cameras, digital camcorders, MP3 players, game consoles and digital TVs are just some of the results of digital technology applied to consumer electronics and media. The quality of the media that is produced and consumed has been vastly improved with digital. As such the partnership between CE and Media will continue to advance.

2.4.2 Consumer Electronics and Telecoms

Before digital, the telephone and fax machine are probably the most you can speak of when you want to identify the commonality between the Consumer Electronics and Telecoms industries. However, in recent years, digital technology has created new possibilities between these two industries. Cellular phones, once only used as a voice and communication tool, have now also become a watch, an alarm clock, a radio, a game console, an electronic organizer and even a fashion accessory. With increasing cellular data bandwidth and capabilities, major telecoms players like planning to stream audio and video to make the cellular phone a device with the functions of a television. Newer models of cellular phones already have digital cameras built-in. I foresee the increasing convergence between Telecoms and Consumer Electronics will be more prevalent over time.

2.4.3 Information Technology and Telecoms

One of the first use of the telecoms infrastructure to transmit digital data is through the computer connecting to a network via a modem – a (mo)dulator/(dem)odular. The modem converts 1's and 0's into a series of sound waves to be transmitted over the telephone network, and then converts the sound back into 1's and 0's at the receiving end. The success and proliferation of computer to computer networking through voice dial-up has influenced the creation of newer technologies like ISDN and DSL to achieve even faster connection speeds.

Like many other industries, IT has greatly affected the telecoms industry by both being a complement and a threat. IT has enhanced the Telecoms industry in many ways, in particular, voice switching circuits. Being the core technology of telephone networks, switching circuits are now mostly converted to digital, and are constantly being monitored and controlled by PC workstations and servers for ensuring quality of service and tracking billing of calls. Further, data transmissions among cellular phone users are contributing about 15% of total revenues for the top 20 telecommunication companies

worldwide in 2002.[12] One interesting development to note is also the emerging Smartphone platform, where cellular phones have processors and memories in them and are capable of running downloaded software and applications, much like a computer.

On the darker side, the threat of IT towards the Telecoms industry is real. Instant Messaging and e-mail have become so popular that they are now cheaper substitutes for voice calls. These IT-based tools have even become the dominant and preferred way to communicate in some countries. IP Telephony, which can produce fairly high quality voice calls via the Internet, is also a major threat to the Telecoms industry, and could give traditional phone companies a run for their money.

2.4.4 Information Technology and Media

Just like the telecoms industry, IT has boosted the productivity of the media industry in many ways. Publishers have used computers to do writing and layout of newspapers and books; broadcasters and movie producers use computer to generate computer graphics and create special effects for movies and films. The increasing computing power of the IT industry has enabled content producers to enhance the quality of media. Digital photography and graphics for newspapers, digital editing and storage for TVs, radios and films are just some examples.

Inversely, digital media is infiltrating the computing world through compression and streaming audio and video. Encoded content, be it text, pictures, music or video, can be distributed and viewed on a PC, whether via CDs, DVDs or the Internet. Digital technology and the convergence of the IT and Media industry has therefore created new channels for media producers to distribute their content. Real.com and Movielink.com are examples of such endeavors.

[12] Nokia CEO Presentation at MIT Sloan School of Management in February 2003.

2.4.5 Media and Telecoms

The convergence of Media and Telecoms technologies starts with Video Conferencing -- the ability of a duplex transmission of video and sound over the telephone wires. But true convergence between these two industries happens when cellular phones become the new terminal to receive various forms of media. A few years ago, breaking news in text form is sent via SMS to cellular phones were novel and commonplace. But now, richer content are available: music, screen savers, ring tones, images and games are now downloadable to cellular phones. Video and audio will be next. The consumption of media in the telecommunication platform is becoming a multi-million emerging industry. Just like PCs, the telecommunication platforms will also create new opportunities and new channels for content producers.

2.4.6 Information Technology and Consumer Electronics

Digital cable, digital satellite and Personal Video Recorders, like TiVo and UltimateTV, are examples of using IT technologies in a Consumer Electronics world. So are handheld PCs like Palm or PocketPC and Home Automation devices like the Internet Refrigerator. In fact, the PC has gradually turning into a home or office appliance, as it becomes more stable and easier to use. In fact, IT technologies are used to enhance Consumer Electronics in many ways. Flash memory for digital cameras, game consoles based on PC platforms, digital set-top boxes using hard disk technologies are just some of the numerous examples.

2.5 Non-Technological Convergence

In digital convergence, non-technological factors are often more influential than technological factors. Behavioral, economic, social, cultural, regulatory and global forces will be discussed here.

2.5.1 Psychological

In April 2002, at annual trade show for broadcasters, the attendees of National Broadcaster's Association in Las Vegas gathered under the theme of "The Convergence Marketplace". The attitude of most attendees of moving towards digital is that of fear. Content Producers are fearful that they are unable to protect their intellectual copyright through digital distribution. Broadcasters are afraid that they will not able to withstand competition from digital satellite and cable services. And Media Packagers are concerned of their inability to make adequate return of investments with the heavy financing of new media development, and then eventually discover they are unable to find a sustainable business model. Psychological barriers to creating digital content are strong.

"This digital transition for broadcasting is inevitable", said William Kennard, Chair of the Federal Communications Commission (FCC), mandated by the Congress to manage the transition to digital. "Broadcasters have no choice in the matter. All their competitors are going or have gone digital. Americans have awakened to the power and functionality of digital, and they will never go back to an analog-only world. Analog is over. Delay is not an option. Resistance is futile."

"Convergence is not just about digital technology", he added, "It means finding a new business model for broadcast television in the digital age. I get frustrated when I hear people say broadcasters are stuck with a business model they just will not change. I become more frustrated when people tell me the success of digital television lies in government developing the business model by micro-managing the transition."

These words were spoken at the dawn of the merger between Viacom and The Columbia Broadcasting System (CBS), the commercial TV network built by William S. Paley, who invented a viable business of advertising supporting free broadcasts, the model driving commercial television for 50 years. The important questions, it seems, are how fast digital convergence will happen, and who will become pioneers like Paley who invents a new business models for the digital medium. And whether traditional media player are

able to overcome old mindsets and create 'killer applications' that will reinvent television for the age of broadband and digital media.[13]

Publishers, like broadcasters, also struggle with finding new business models and overcoming mindsets in the transition to digital. The 21st century model for publishing sees content at the centre of the business - created once and re-purposed many times through offline and online environments. The traditional model has been to produce content according to the requirements and the limitations of a specific media. And this means that preparing the same content for different media can be both difficult and costly.

It has often been said that if online versions of physical magazines had to bear the production costs of the content then the online business model would be instantly bankrupt. However, each publisher needs to take a holistic view. Editorial production teams need to adapt to producing content in such a way that it is capable of being distributed through many different channels, be it newsprint, magazine, Internet, hand held devices or interactive TV. Getting production teams to adapt to a new technology environment is one of the greatest challenges facing publishers in embracing digital media.

In the current climate, advertising revenues are falling, and the onslaughts of new online startups are threatening the advertising market publishers have held profitable for so long. This has caused publishers to look for creative ways through which to generate additional revenue streams. An area of particular focus will be the development of integrated subscription models that take into account all the publishing environments through which publishers will reach their readers.

2.5.2 Economic

Economically, digital convergence encourages both horizontal and vertical integration of the industries. As the market expands to include all spheres of related technologies, the

[13] Keynote speech at NAB2002 Las Vegas.

new digital industry could bring about the possibilities of both mega-conglomerates as well as severe fragmentation.

For example, a company like AOL TimeWarner can control interests in a wide array of media, from film, television, books, games, online, music and real estate to countless other sectors. The result will be a restructuring of cultural production around "synergies", and thus the multimedia exploitation of branded properties. Examples of such exploitations in the past are Pokémon, Harry Potter, Tomb Raider, Star Wars.

Sony, in particular, has enough financial muscles to create, not just horizontal synergies, but also vertical integration of the entire digital value chain. By assembling and integrating its own films, music, game console, consumer electronics and PC businesses, it makes sense for the company with such versatility in capabilities to take advantage of the economies of scope. A game running on the cellular phone manufactured by the Sony and Ericsson's partnership, for example, can be based on the "Men in Black II" movie made by Sony's film division and an earlier game developed for Sony's Playstation II game console. With such breadth and depth of expertise, Sony hopes it will fend off even the most powerful rivals.

The repackaging of content is not the only economic force that influences convergence. The fragmentation of the value chain poses another problem. Unlike traditional media where vertically integrated firms control the value chain from production of content to its distribution, the new digital industry introduces different players into the value chain, especially with regards to distribution. Digital content has to be distributed through digital channels, like the Internet or other data networks.

If digital content and its distribution channel are not integrated, the new distribution infrastructure would require that consumers will not only pay for access to the networks, but also separately for content. Such need for multiple payments departs from traditional media's packaged service, where subscribers would only need to pay a single sum to

access both the channel as well as the content. The business model currently proposed by convergence may give an impression of being costlier due to the multiple payments.

For example, Movielink.com, an online movie distribution venture selling downloading of entire movies over broadband internet network requires subscribers to 'rent' a limited selection of movies at about $4.95 per movie. Each movie would require a download time of about 40 minutes over a broadband Cable/DSL connection and expires 24 hours after first viewing. Of course, in order to enjoy the online movies, a broadband access package of a minimum of about $29.95 per month is required. Compared to other business models like Netflix.com, which charges $19.95 per month for unlimited rental of DVDs, and DirecTV, which charges $33.99 per month for the basic package of 110 programming channels, the new Movielink.com business seems more expensive to the consumer as they have multiple bills to pay, rather than just a single bill.

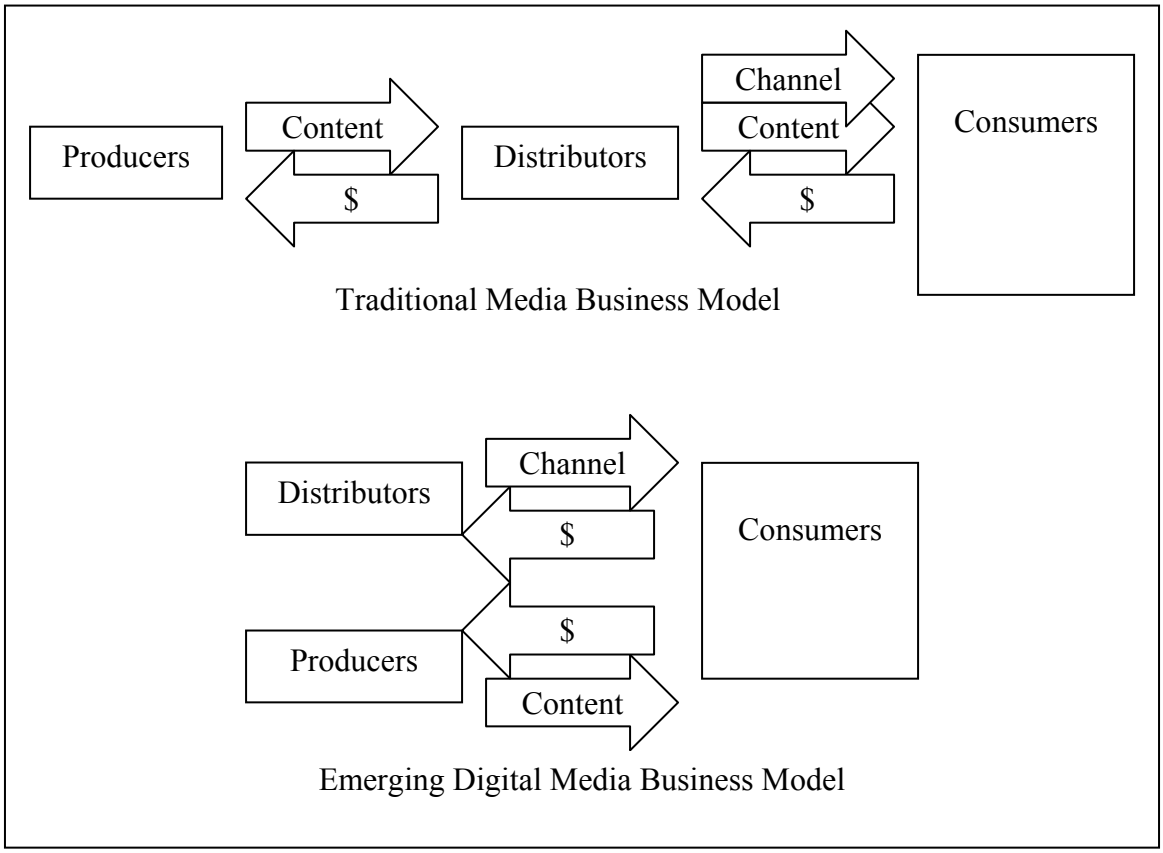


Figure 2-11: Emerging Digital Media Business Model

2.5.3 Social/Behavioral

Consumers' multitasking strategies for navigating the new information environment is a social effect. Social convergence through digital technology is what occurs when a young person watches baseball on a big flat screen high definition digital TV, listen to rock on the MP3 player, word-processing a paper on his PC and sending e-mail to his friends on his handheld. It may occur inside or outside the box, but ultimately, it occurs within the mindset of the user.

This social impact of convergence should not be under-estimated. The change of habits and behaviors and the ability to handle the complexities of new digital device can be obstacles to convergence. For example, can the average consumer absorb the complexity of technologies that convergence will bring? More importantly, how easy will it be for consumers to change their behavior to accept new ways of consuming media, or to embrace the merging of functions into fewer but more complex devices? Although network externalities could boost convergence, would the sophistication it induces hinder adoption? These questions cannot be answered by technology alone.

The social force of consumer acceptance is as unpredictable as the wind. Although there are pretty good guidelines in designing easy-to-use experiences and formulating successful advertising strategies, the embracing of any new product, convergent or otherwise, depend on a myriad of factors that few firms, if any, can get a grip on.

2.5.4 Cultural

The cultural factor describes the explosion of new forms of creativity at the intersections of various media technologies, industries and consumers. Media convergence will foster a new participatory culture by giving average people the tools to produce, archive, annotate, appropriate, repackage and redistribute content. For example, Weblogs or "Blogs" is a publishing tool on the web that allows consumers to publish web pages in the form of web journals easily and instantly. "Blogging" as it is popularly called, entails writers to constantly update their websites with their thoughts and events. In the case of

the US-Iraq war in 2003, many weblogs are set up by journalists at the frontline in Iraq. News was updated on the sites as events unfold. One such popular site is Warblogging.com, where traffic exploded growing from dozens of readers to an average of 60,000 per day and nearly 120,000 on March 20, 2003, the first full day of the war.[14]

The dramatic increase of unfettered journalism in the electronic newsrooms of Weblogs had fulfilled John Milton's vision of the "Open Marketplace of Ideas"[15]. This new capability on the Internet has allows ideas we respect to encounter those ideas we despise. It allows the voices of those rarely heard to mix with those who speak often. It allows racial and ethnic minorities to add their voices to the shifting electronic array. Invoked by digital convergence, such is one kind of cultural change where everyone can have a voice and become publishers with an instant global reach.

Besides affecting individual news makers, media convergence also gives large media conglomerates an opportunity to promote multimedia storytelling and the development of content across multiple channels. As producers more fully exploit the effect of social convergence, storytellers can use each channel to communicate different kinds and various levels of narrative information, using each medium to do what it does best.

2.5.5 Regulatory

Traditionally regulation has been conducted on an industry-specific basis with separate regulatory bodies for radio, television and telecommunications and none for the Internet. Over the past few decades, technology created discrete industries such as broadcasting, telephone, paging, data automation, cable networks, and home entertainment. Each industry was subject to its own unique body of regulations. Indeed, in the case of broadcasting, frequently there are separate regulatory bodies for 'carriage' (economic or infrastructure) issues on the one hand and 'content' (programming) issues on the other hand.

[14] *For Internet's 'Bloggers,' War Is No Cakewalk*, Reuters News Report, April 10, 2003.
[15] Milton, John. *Areopagitica*, 1644

However, convergence is bringing together broadcasting, telecommunications and the Internet and it is merging carriage and content activities. Now, largely through the application of digital techniques, technology has enabled these industries to offer products and services previously offered by the other industries.

Convergence is reshaping the telecommunications business as new products and services are coming to market. As they do, companies and entire industries are being created, evolving into something new, or simply going away.

Convergence is also driving regulatory restructuring. FCC Chairman Michael Powell has recognized that his agency is structured largely according to traditional telecommunications technologies. Powell has announced plans to restructure the agency in light of industry convergence. Convergence demands a rethinking of federal regulation. Converged industries are burdened with their "legacy" regulations, often resulting in a lack of regulatory parity among competitors. For example, originally the concept of "universal service" meant that every household should have some form of telephone service. Telephone companies were forced to subsidize rates for some customers. Today, regulators are considering whether some level of Internet access is included in the concept of Universal Service and, if so, whether cable companies, who provide access via cable modem service, are subject to the same contribution requirements as telephone companies, who provide access via dial-up or DSL service.

Consequently, around the world, governments and regulators are considering the relevance of current regulatory structures in the era of digital convergence of multi-media and how best traditional regulatory structures should be revised. In the UK, for example, the government has published a Communications White Paper which presages a major piece of legislation.[16] The central proposal is that current carriage and content bodies for both broadcasting and telecommunications should be combined into one new, single regulator to be called the Office of Communications or OfCom. The charts below set out

[16] http://www.communicationswhitepaper.gov.uk/

the current and proposed division of regulatory responsibilities for broadcasting, telecommunications and the Internet.

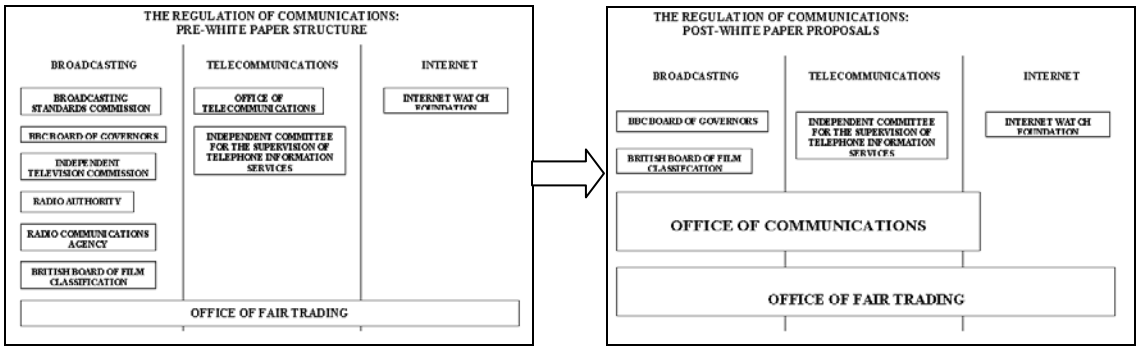


Figure 2-12: Regulatory Convergence in the UK

The regulatory environment in individual countries has a huge impact on the effectiveness of digital convergence. For example, the ability of standards bodies to create or enforce agreed standards depend on the endorsement of regulatory bodies in each national environment. The extent of collaboration among firms to ensure equitable competition in the converging industries is another important factor. In essence, governments and regulatory bodies are in the process of learning to understand and measure the impact of digital convergence. Hopefully, the many looming changes in the regulatory structure would enable equitable distribution of wealth in the digital value chain with fair competition, and promote tighter collaboration among firms to benefit, not just firms, but also consumers.

2.5.6 Global

Due to the ease in distributing digital content, the world is transforming into a cultural hybrid that is a result of the international circulation of media content. For example, the world-music movement produces some of the most interesting contemporary sounds through digital manipulation of sound waves. And in cinema, the global circulation of Asian popular cinema profoundly shapes Hollywood entertainment. Most fundamentally, the Internet has created a multimedia channel where any news and information can be shared globally in an instant.

In his book *Understanding Media*, McLuhan (1964) observed that electronic mass media were collapsing space and time barriers in human communication to enable people to communicate on a global scale.[17] He coined the term "Global Village" to describe this change. The Internet seems have created the first and important step towards enabling this global village, where a digital nervous system emerges, a simultaneous happening where time and space vanish, where electronic media involves everyone simultaneously. Will digital convergence contribute to the next step to bring the McLuhan's vision into fruition? Only time will tell.

2.6 The Clash of the Titans

The clashing of worlds can be observed at CeBIT 2003 in Hanover Germany, a major conference and exhibition for the electronics, computing and telecommunications industries. At the show, Sony Ericsson introduced a new P800 mobile phone that can be an electronic organizer, play video clips and digital music, access the full Internet and handle electronic mail. This pocket-sized gizmo is the statement of digital convergence, blending computing, telecommunications and consumer electronics. Microsoft and Nokia also joined the convergence battle with the introduction of new devices in the likes of game consoles, hand-held computers, mobile phones and a host of others all capable of taking digital photos, connecting to the Internet, playing games, video and music.

Giants in their respective industries, Sony, Microsoft and Nokia represent the apices of success in their respective industries of Consumer Electronics, Information Technology and Telecommunications. It is fascinating to see that all three companies are trying to capture a broad swath of the digital market, in particular home entertainment and personal communication, by creating 'gateway' devices. It seems that each player seeks to steer the future development of consumer technology in a direction that plays to their own strengths and their rival's weaknesses.

[17] McLuhan, Marshall. *Understanding Media.* New York: McGraw Hill, 1964.

Nokia targets specifically at the mobile phone market and hopes that will be the dominant platform on which consumers will spend money and time listening to music, playing games and watch video. The Finnish behemoth envisages the mobile phone as a universal remote control that could direct everything from home heating systems to video recorders. Microsoft, on the other hand, tries to position the PC as the digital nerve center of the home, thereby turning desktop, laptop and even handhelds into all-purpose entertainment machines, controlling or eliminating the need for other devices. Sony sees instead the Television as the center of digital convergence where a network of devices will connect and effortlessly to share photo, video and music files. Game consoles, mobile phones and PCs are also key pillars in the Japanese company's strategy. The electronics giant nonetheless continues to cast its net wide by producing everything from pocket-sized video cameras to giant home cinema systems.

From the following table, each major player has a spread of capabilities in each of the converging industries. And to a matter of degree, Sony seems to be the only company who is able to play the convergent game to its fullest with its greater capability to produce content.

	R&D Budget	**Personal Computers**	**Mobile Phones**	**Consumer Electronics**	**Game Consoles**	**Content**
Microsoft	$4.46 billion	Dominates the software market	Minor supplier of software	Minor supplier of television software	Second-largest supplier of fixed consoles	MSN internet portal, TV channel and games
Nokia	$3.29 billion	No presence	World's biggest supplier	Supplies set-top boxes, but little else	Plans to launch portable console later this year	Games
Sony	$3.23 billion	Sixth-largest supplier of laptops world-wide	Fifth-largest supplier through partnership with Ericsson	One of the leading global suppliers	World's biggest supplier of fixed consoles	Films, music and games

Table 2-1: Sources: companies, WSJ research, Gartner Inc.

3 Digital Convergence and the Media Value Chain

Digital convergence has affected the media industry in many ways. Structural convergence, in particular, has significantly affected the industry's value chain[18]. The value chain is a conceptual model that construes a firm or industry as a bundle of activities that collectively produce value for the end user. In this chapter, I hope to discuss the impact convergence had on the digital media value chain, and trace the transformation of economic flow from the *creation of valu*e by content producers, to the *delivery of value* to the consumer.

3.1 The Traditional Media Value Chain

The value chain of the media industry basically comprises of two parts: the *Content* stages where content is produced and then packaged, and the *Channel* through which the created content is delivered.

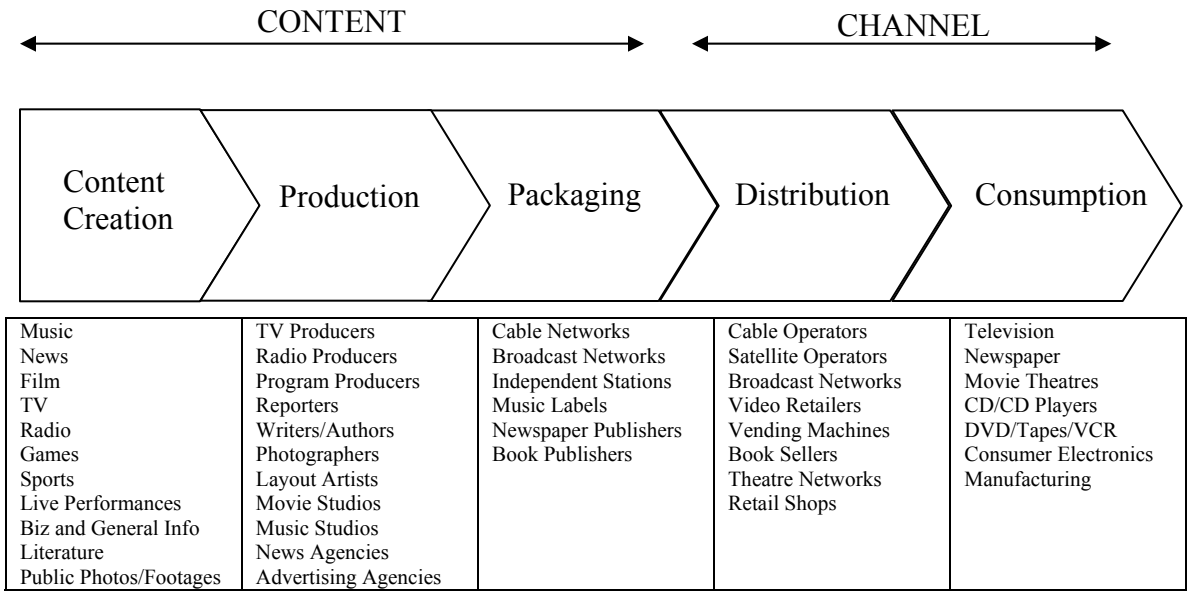


Figure 3-1: The Traditional Media Value Chain

[18] Porter, Michael. *Competitive Advantage: Creating and Sustaining Superior Performance* (New York: Free Press, 1985)

The *Content* part of the value chain consists of the upstream suppliers: the **content creators, producers**, and the **media outlets** that package the content for distribution. The *Channel* comprises of the downstream players: the **carriers** that provide the medium to deliver the content and the **appliances** that present the content to the user. The stages of the value chain are:

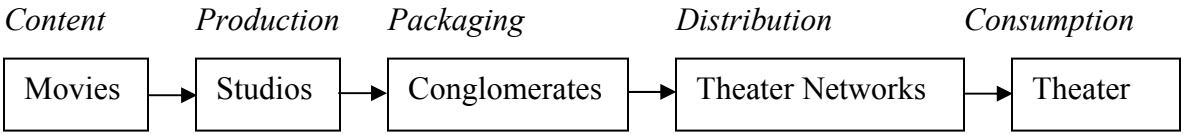
- Content
    - The actual media
    - Content refers to the creation and production of symbolic material that has been encoded in a particular format. Movies, sports, news, book manuscripts, recorded music, and the information on a Web site are all examples of content. So are human speech and money. In general, content refers to material that consumers value in and of itself, either for its entertainment value or for its educational, news, or exchange value.
- Production
    - The media produced and formatted for the channel it is design to be transmitted.
    - Disney, Reuters, New York Times belong to this segment.
- Packaging
    - The selecting and bundling of content, as well as adding integrative and presentational functions to create and promote a finished product for consumers. Packagers reduce search costs for consumers and also provide a quality control and assurance function.
    - AOL Time Warner, Bloomberg, Disney, Google, New York Times are packagers of content.
- Distribution
    - The physical infrastructure that supports the transport of information. Telephone transmission networks, cable TV systems, or, more generically, optical fiber, co-axial copper cable, communication via radio frequencies, or vehicular transportation are examples of different types of distribution carriage.

- AT&T, CableVision, Direct Broadcast Satellite (DBS), are examples of networks.

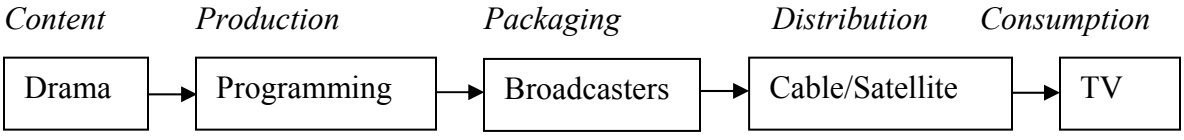
- Consumption
  - Any of a variety of local devices employed to capture and display information. This includes equipment manufacturers who create hardware devices and consumer products that enable telecommunication and information processing.
  - Apple, Lucent, Motorola, Panasonic, Sony, are some examples that produce terminals for consumption.

Traditionally, content progresses linearly from the creator through the producer and 'media packager', who would eventually be delivered to the consumer via various delivery channels. This traditional model of mass media is defined by a *one-to-many paradigm*, where centrally produced, standardized information and entertainment products distributed to large audiences via separate paths.

Examples: movies produced by production studios are packaged by large movie conglomerates like Universal and Paramount and then distributed to the network of movie theaters, which displays the movie to the consumer.

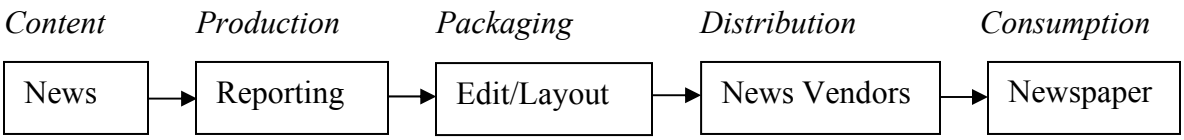


For the case of television, shows and drama which form programming are packaged by TV broadcasters or networks and then delivered via cable or satellite to the consumer via the television.



In the newspaper world, news events are gathered from various sources, including news agencies, reporters and even the public. The news publisher would package or 'layout'

the pages and deliver the printed newspapers to the consumer via the various channels like newsstands and newspaper vendors.



In the traditional model, each unique type of content is usually handled by a single media distribution outlet.

3.2 The Traditional Source of Revenue

In the pre-Digital era, money stopped at the *Channel*. Distribution of media was an extraordinarily lucrative enterprise. The ability to distribute information en masse propelled the media industry to become one of the most profitable industries in the economic history of the world.

The reasons are simple: distributors had little or no competition. The barriers of entry were high due to legislative restrictions, high fixed cost and complex technologies. In the pre-digital age, municipals usually grant very few licenses to broadcast or publish for political or economic reasons. Therefore, any company whose sales depend on advertising will seek the most cost effective channels through which to announce new products and promote sales. The radio, television and newspaper medium, which possess the ability to mass distribute information and have much control over the distribution network, are natural candidates. In the film and music industries, the stories are similar: the large music labels and movie conglomerates would control the physical distribution channels for music albums and films. As a result, players involved in controlling the distribution through these complementary assets could command high profit margins through substantial markups or advertisements. Value is captured downstream for content that is produced upstream.

For example, the Gannett group -- a diversified news and information company that publishes newspapers, operates broadcasting stations and is engaged in marketing, commercial printing, a newswire service, data service and news programming -- runs

USA Today, the United States' most widely circulated newspaper with a circulation of 2.3 million. From 1992 to 2001, circulation revenues for the Gannett Group only contributed about 20% of their total operating revenues, whereas advertising revenues contributed in excess of 60%.

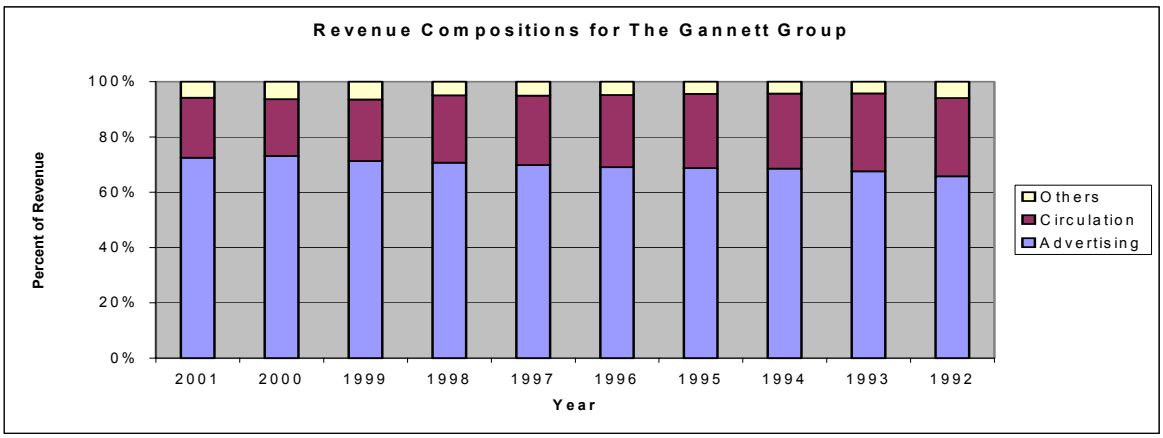


Figure 3-2: Revenue Distribution of the Gannett Group. Source: Gannett Group Annual Report.

Apparently, many other traditional media players have similar revenue distribution. It is no wonder that for decades, content producers basked in oligopoly market where controlling the distribution channels through broadcast and cable were the cornerstone of their business.

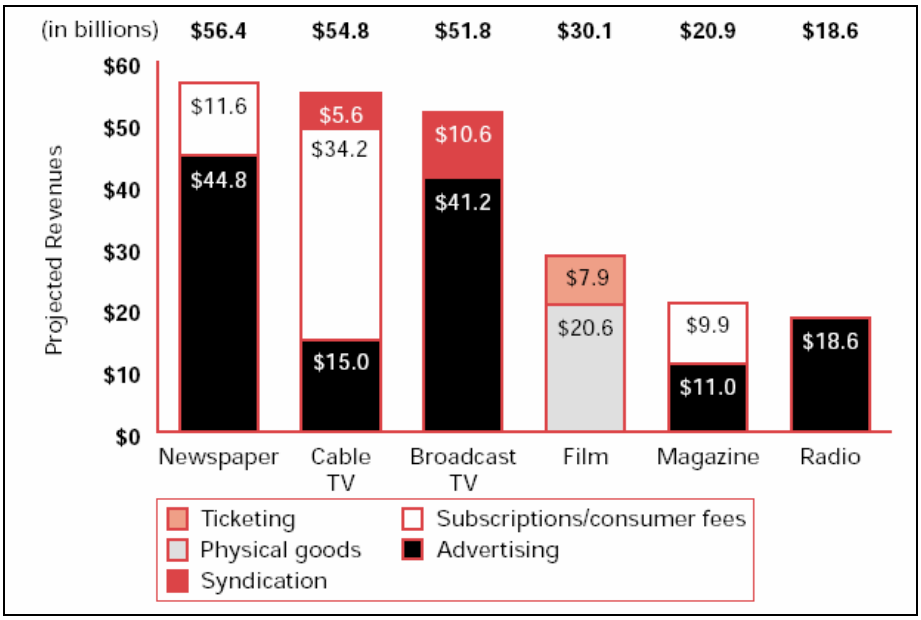


Figure 3-3: US Traditional Media Revenue Mix in 2003. Source: Jupiter Research 2003.

3.3 The Media Value System

The Media Industry would not be completely understood without the dynamics of the inter-relations with other value chains that affects the primary content value chain. The interactions between these value chains form the **Media Value System**, are illustrated as follows:

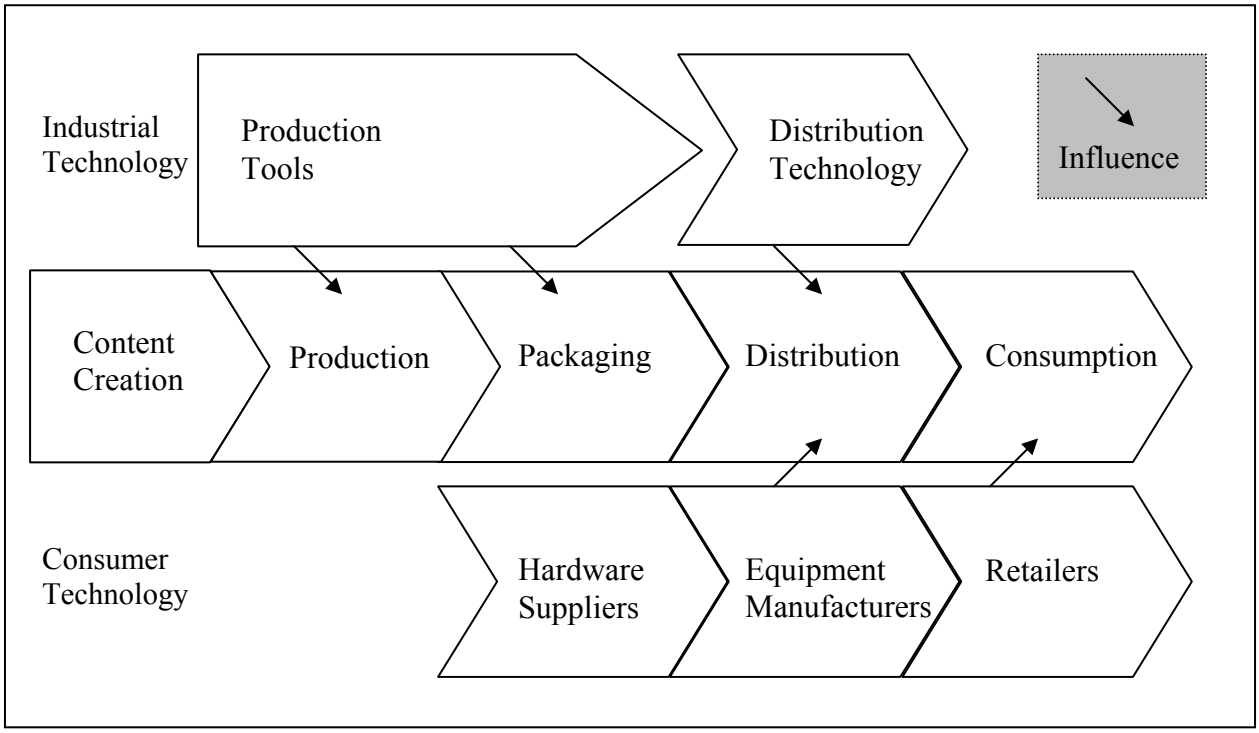


Figure 3-4: The Media Value System

Two additional value chains are identified to have substantial influence over the primary media value chain: Industry Technology and Consumer Technology. The **Industrial Technology Value Chain** traces the technologies that facilitate the Media Value Chain in the Production, Packaging and Distribution stages. For example, **the Production Technologies** pipeline consists of tools and systems that create content like Video Cameras, Editing and Tape systems for Broadcast, and Still Cameras, Layout systems and Journalist writing tools for Publishing. **Distribution Technologies** are tools and systems that assist in the delivery or transmission of the content. For example, cables, transmission antennas for Broadcast, and for Publishing, these are the delivery trucks and vending machines. Affecting the consumer and the display of content is the **Consumer**

Technology Value Chain -- the pipeline that would result in the appliance which the consumer would use to receive the packaged content. For example, television manufacturers and electronic equipment retailers will be part of this value chain.

3.4 The Arrival of Digital Technology

Conventional media technologies form a foundation that enabled digital technologies to evolve rapidly over the past few decades. The introduction of computers and information technology in 1980s, for example, transformed the tools in the Newsroom. Reporters and editors migrated from typewriters to word processors, resulting in the boosting of productivity and enhancing of newspaper designs and layouts. Stories could be written and edited more quickly, then sent electronically to production facilities as part of a continuous computer-driven process. Graphics and layout artists could proofread their designs and artistic creations with laser printers before it was finalized on the newspaper print template. Likewise, digital technologies affected the production toolsets of broadcasters. Television stations moved away from cumbersome analog signals for generating screen graphics to digital character generators which provided flexibility and greater functionality. Video servers replace video cassettes to provide automation and greater control over broadcasts.

The main drivers of the use of digital tools for media production are the rapid increasing computing power and the dramatic decline in the cost of processing and memory and storage capacity, together with the parallel advances in transmission technology. Radio technologies couple with leaps of bandwidth capabilities are enabled by fiber optics and compression capabilities.[19] As such, digital tools not only assisted the lowering of costs and boosting productivity and revenues in traditional media, they also begin to diffuse into packaging and the distribution channels of the value chain. The telecommunication infrastructure that was designed for analog signals gradually turned into digital carriers as it is used for transmitting bits and bytes. Domain convergence (2.3.1) from analog to

[19] M. Fahey, "From Local to Global: Surveying the Fiber Landscape", , *Telecommunications* (Americas Edition) 1993

digital has enabled all three types of information – voice, video and data—to be distributed on the same network. Thus, digital technologies begin to transform the downstream channels, which were once dominated by non-digital technologies. For example:

- Phone networks, which are designed for analog (voice) transmission, begin transferring digital information through the use of modems (*mo*dulators/*dem*odulators).
- Magnetic/Optical media, such as floppy disks and CDs, are used to record digital data.
- Electromagnetic waves are used to transmit digital information.
- Digital multimedia technologies use conventional speaker systems to create sound.
- Computer monitors use a variation of television picture-tube technology where electron beams energize red, green, and blue phosphors for each display pixel.
- Computer hardware and software drive all sorts of printing processes, from desktop inkjet printing to high-quality camera-ready magazine layouts.
- Metropolitan cable networks are being adapted for computer-based Internet access.

3.5 Structural Convergence: The Digital Channels

Before the middle of the 20th century, the communications industry had its own economic logic and regulatory framework. The telephone business had nothing to do with television, television was distinct from radio, and radio was unlike print. Even within the television industry, the terrestrial broadcast side of the business operated under an economic and regulatory framework that was more or less separate from the cable side of the business.

As digital technology takes dominance as the mode of transmission, the model that defined traditional media distribution began to change. Technology gradually brings us onto a cusp of a Digital Era in which content is delivered to consumers through multiple channels into the work life and the home. As the telecommunication infrastructure is

being used to bring content through these new digital channels in addition to satellite, microwave and cable, regulatory bodies began to treat them not as separate businesses, but a convergence of content into a single 'digital' business – since content can flow through any digital channel, it will not matter which channel a firm uses or owns.

Further, the advancement of Internet and wireless technologies and a proliferation of new personal devices are beginning to demand that content has to be 'liquid' to fit the appliance that displays it. In a 'liquid' content world, each type of content will flow through many different media through various carriage technologies (for example, cable, xDSL and wireless) and be displayed effectively via a host of appliances ranging from a wall television to the miniature screen on your cellular phone. From the value chain perspective, we can see three immediate results from the digitization of media channels with the 'liquidization' of content:

First, the hold to the distribution channel by traditional media players is greatly affected. New entrants are introduced to this new way of transporting content and they begin to increase competitive intensity, put pressure on margins, and reduce profits. In other words, commoditization begins to take over. Media players, struggling to capture value in this new environment, are forced to shift its value capture upstream. The question is how far upstream? Technology has little effect on the content creation stage: the performance of a dance, a Mozart sonata, or a football game is still going to be the same regardless of media technology. It is foreseeable, therefore, that packaging and production of digital content would likely to be where the capture of value will happen.

Second, while digitization destroys proprietary hold on distribution channels, it also creates enhancement and greater value in content production. As channels multiply, competition will intensify for purchasing and transmitting the best content. Channels will likely to offer more money to content providers at the expense of the margins of distribution.

The third effect of digitization is repackaging, which we have discussed briefly in chapter 2. Digital content could be repackaged with greater ease and be sold through multiple new channels not possible before digitization. Take the movie industry for example. A movie was sold to broadcasters after it had been exhibited in theatres and then would be shelved. In the Digital Era, the same movie can be sold through cable operators, repackaged into Video Tapes, DVDs, channeled through satellite distributors, hotels, airlines, public television and telecommunication companies. It can even be distributed to non-video media like print, retailing and audio.

3.6 Convergence in Substitutes and Complements

Before we discuss about the digital media value chain that evolved from digital convergence, it is useful to highlight a framework to understand the kinds of convergence that has impacted the media industry. Greenstein and Khanna (1997) proposed two kinds of convergence with relate to the changes on the industry level: convergence in substitutes and convergence in complements.[20]

Two products converge in substitutes when users consider either product interchangeable with the other. Convergence in substitutes occurs when different firms develop products with features that become increasingly similar to the features of certain other products. For example, the PC was the result of convergence in substitute to mainframes and minicomputers in the 1970s with the technical innovation of the microprocessor. In the same way, online newspapers are increasingly becoming a convergence in substitute to the printed newspaper, although the general acceptance of online papers is still slow due to certain technological and behavioral hurdles.

Convergence in Complements happens when two products work better together than separately or when they work better together now than they worked together formerly. This phenomenon happens when different firms develop products or subsystems within a standard bundle that can increasingly work together to form a larger system. New

[20] Greenstein, S. and Khanna, T., *What Does Industry Convergence Mean?*. HBS Press 1997.

functions can be performed when components work together. An example of a firm that leverages this convergence in complements well is *Amazon*. *Amazon*'s website is built with numerous features to create a valuable resource for shoppers, and is an excellent complement to the business of selling products like books and CDs.

3.7 The Digital Media Value System

With this understanding of the effects of digitization and convergence, let us take a closer look at the media value chain and examine how it is affected by digital technology.

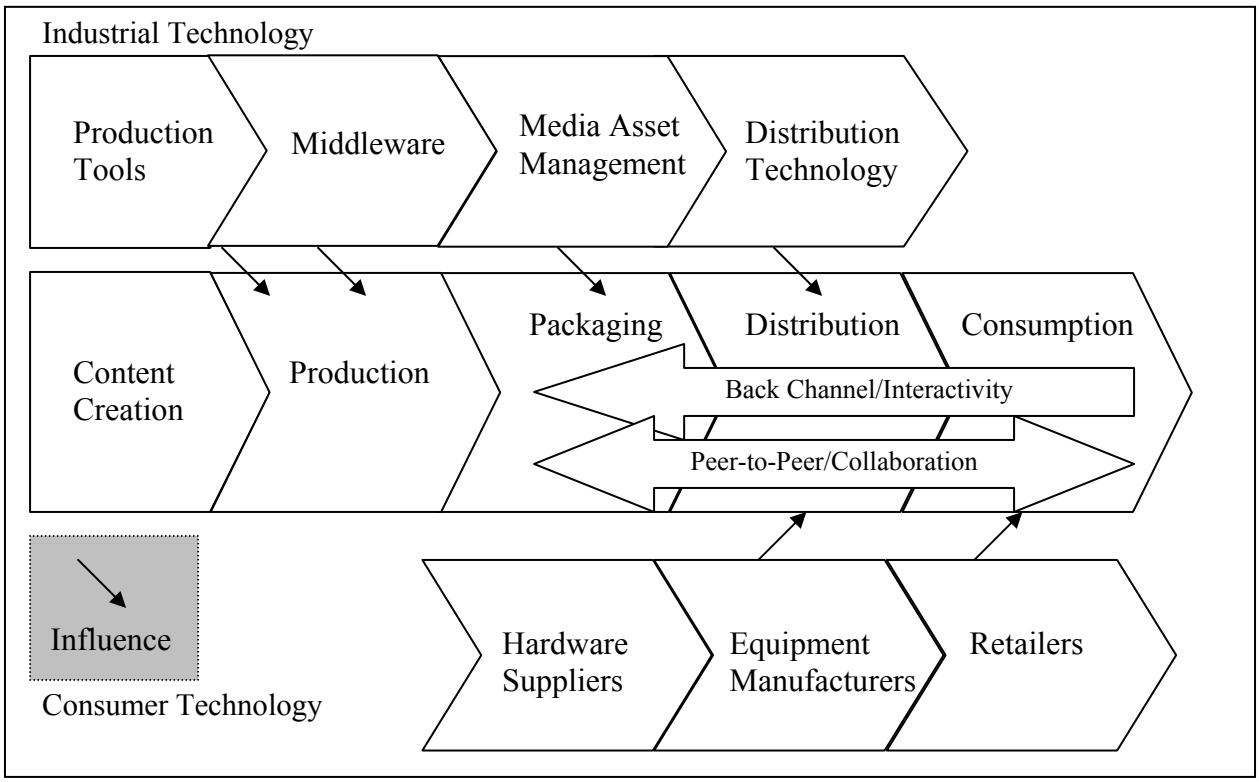
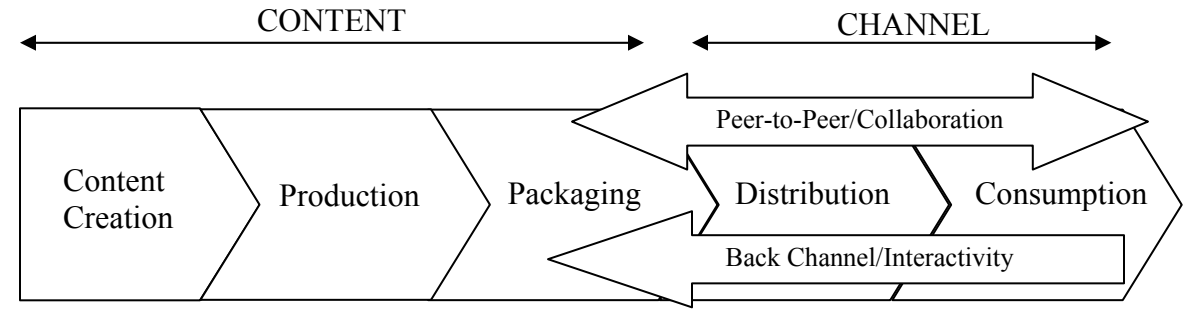


Figure 3-5: The Digital Media Value System

Digital convergence has introduced new players and new dimensions to the Digital Media Value System. New types of equipment are needed to produce and distribute digital content, just as new appliances and devices have to be completely redesigned for new ways to display and consume them, as illustrated in figure 3-5.



Music News Film TV Radio Games Sports Live Performances Biz and General Info Literature Public Photos/Footages Columnists	Design and Programming Companies Various Small Firms	Portals Virtual Communities Content Aggregators	Internet Service Providers Digital Cable and Satellite Service Providers Cellular Phone Service Providers	Digital TV Personal Computer Personal Video Recorder Digital Set-Top Box Smart Phone Personal Digital Assistant Game Console Home Gateway MP3 Players Security Consumer Electronics Manufacturing

Figure 3-6: The Digital Media Value Chain

The Internet, with its broadband backbone, packet-switching technology, and computer terminal as the display device, is evolving to be the best model for understanding the effect of digital convergence on the value chain. The World Wide Web with its multimedia content therefore serves as good model for what will become of the media industry of the future. There are two important impacts of digital convergence on the value chain will be discussed here: Verticalization and Horizontalization

3.8 Verticalization: The Impact of Interactivity and Collaboration

The traditional media business starts with content creators, the actual people or software that generates content. Content creators are music stars, sports leagues, writers, cartoonists, actors and the directors who create and make video, software, movies, printed material, or anything that can be transmitted digitally over the Internet to users. Content creators often have their own sites on the Web; for example, the National Football League, the Metropolitan Opera, and even advertisers all have sites that visitors can visit. In the traditional media business, the next stages in the value chain were program producers and packagers, the firms that employed the creators and completed the

production process. These firms still exist in the era of digital convergence, but only to service traditional media and in a limited way, digital media. Digital content creators no longer need to be dependent on producers and packagers to produce or package their content. If creators merely want a presence on the Web, all they have to do is to hire designers and programmers in order to distribute their own content.

New players, like *Google* or *Yahoo* become dominant in the Packager space, as they leverage on Internet technologies to enable search and aggregation of content. Like broadcast stations or cable companies in the traditional media space, these new digital players become 'portals' where users could easily search, identify and package their *own* content from all that is available on the Web. This '**Verticalization'** of the value chain, where content leaps over stages to reach the consumer, is a result of two most distinct changes in the new Digital Media Value: **Interactivity** and **Collaboration**. These two capabilities, offered only through digital technology, depart greatly from the one-to-many model of traditional broadcasting. They represent significant shifts from traditional media patterns with their centralized production and one-way distribution to large audiences.

Interactivity gives consumers access to a wider range of two-way services that allows them to control both the mode and timing of delivery. With this new 'back channel', consumers have more control what services they receive, when they receive the services, and the form of each service. Essentially, interactivity is information and entertainment on demand. The hyperlink feature of the Internet is one such example, and home shopping channels on cable TV is another.

A related feature to Interactivity is the ability for consumers of content to share information. Peer-to-peer or Collaboration technologies use the digital channel to open up a new paradigm of communication where groups of users can interact, not just with the content, but with each other. In this paradigm, consumers become content creators for other consumers. Virtual communities are formed. The platform which digital media is delivered also becomes a channel of communication for consumers. Forum pages, chat rooms and weblogs are perfect examples of such features.

As economic analysts John Browning and Spencer Reiss point out, "Old media divides the world into producers and consumers: we are either the authors or the readers, broadcasters or viewers, entertainers or audiences, one-to-many communications in the jargon. New (digital) media, by contrast, gives everybody a chance to speak as well as to listen. Many speak to many – and many speak back."[21]

3.9 Horizontalization: The Emergence of Middleware and Media Asset Management

The '**Horizontalization'** of the media value chain, is in essence, an intra-Industry convergence (2.3.4). The media industry is facing competition from other media that was traditionally distinct. Up until digital convergence, television was separated from print and radio in the sense that each offered a product with different features and different reception equipment. While all three media formats represented the evening news, newspaper did it with text and pictures, radio with audio, and television with video.

Obviously, there is still competition among traditional media as they compete both for consumers and advertisers. There is limited amount of time, money and attention in a day for an individual consumer to receive any form of media, and therefore media formats do compete for advertisers who choose among them to reach viewers. So far, the media formats had settled into a pattern of reasonable coexistence. For example, in the US, television assumes the dominant place as provider of news and entertainment throughout the day and particularly in the morning and evening. It is also the best vehicle for national advertising campaigns. Morning newspapers still are a major source of news and provide advertisers a large, but un-segmented, local audience. Magazines reach national and often highly targeted niche audiences. Radio is the best medium for drivers on the road and people who are exercising or working while they consume the media. In addition, each media type also offers advertisers the opportunity to take advantage of their different functionality: Print, for example, gives an opportunity to present detailed

[21] "Encyclopedia of the New Economy," *Wired*, May 1998, p. 105

information, while the presentation on television is more dynamic and suited for actual demonstration of the product.

Digitization will become the great equalizer as newspapers, magazines, radio stations and television compete on a common platform and infrastructure: the Internet. No longer limited to text and pictures or audio, print and radio can compete using any format for their content that they choose. New media formats like Flash animations and other interactive designs appear in this new media platform where traditional media players have no competitive advantage in.

Because of this Horizontalization of media, many traditional content providers are feeling uncertain about their competitiveness in the new space. An interview with the Technical Director of the Agence France-Presse (AFP) in Washington DC reveals that a traditional news agency like AFP is not positioned to compete effectively in digital convergence. AFP does not possess any competency in providing video news, and therefore compared with rivals like CNN or Reuters, the agency admits that they do not have any comparative advantage in this area. Although AFP sees the oncoming trend of digital convergence and prides itself for its journalistic excellence in news in the form of text stories and photos, they feel that investments into video technology and capabilities will be too resource intensive. Currently, there are no plans to make such investments. However, AFP do intend to investment in a firm-wide new digital asset management system to streamline their digital media flow, which consists mainly text and photos.[22]

My observations reveal that because of this flood of competition that result from digitization and the rise of the Internet, a host of middleware technologies and media asset management players have wedged in between production and distribution technology. Digital content, in its various forms, has created in content producers and packagers a deep awareness of the need to manage it well. Unlike traditional media like paper or tape which have physical presence, digital content are virtual. Thus, there is a

[22] Interview with Joseph Soares, Technical Director for North America, Agence France-Presse, March 25th, 2003

huge demand for fast networks and large and efficient digital storage systems, which Middleware and Media Asset Management are created for. Middleware and Media Asset Management system represents the phenomenon of level 3 and level 4 convergences.

Middleware organizes data *internally* by encoding and compressing bit streams, creating an efficient system to transfer bits of data over networks. By adhering to standards like XML and MPEG, these digital information structures reduce bandwidth and processing costs. Middleware is where Platform Convergence happens. Technologies like Java, Jini, Liberate and OpenTV are platforms from which content can be enhanced by software to be packaged and programmed for delivery on specialized hardware.

Media Asset Management, on the other hand, manipulates and organizes the data *externally* through storing, editing, indexing, searching and creating digital hierarchies. It also manages Digital Rights, which is extremely important in the digital realm. Current players in this field are Sony, Documentum and Microsoft.

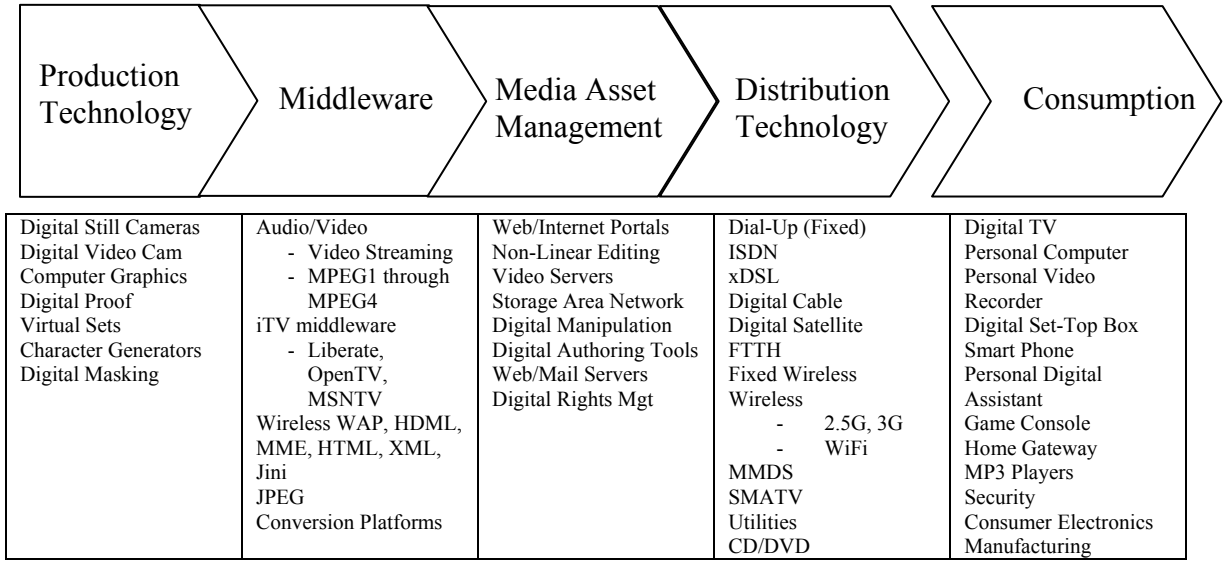


Figure 3-7: Digital Media Industrial Technology Value Chain

As illustrated in the figure 3-6 and 3-7, we can see that digital technology has brought greater diversity and complexity to the flow. The main reason is that the new value chain utilizes not just traditional media and telecommunication infrastructures, but also new digital protocols, standards and technologies.

3.10 Impact of Convergence on the Media Industry

For the media industry, embracing digital technology has been a mixed bag. The music industry had great success in their migration from LPs and cassettes to digital compact disc, only to be supplanted by MP3s and the likes of Napster about a decade later. Newspaper publishers improved newspaper quality by leaps and bounds through the use of information and digital technology in the last decade. But their audiotex and videotext as well as most online efforts faced failure.[23] Likewise, filmmakers and broadcasters used incredible digital tools to create computer graphics and special effects for their productions, but when they attempted to deliver video-on-demand or digital television, they faced great challenges in cost and infrastructure.

3.10.1 Media

The media industry's move to digital has had many uncertainties. Let's look at each media types in turn and briefly explore their current state.

3.10.1.1 Music

The music industry sat and watched the growth of the Internet, the appearance of MP3 files and the explosion of Napster. Created by Shawn Fanning, a college student at Northeastern University in Massachusetts, the file sharing program was released in June 1999, and in a short span of 6 months, Napster grew from one to 18.7 million users.[24]

Napster's proposition is simple: users download its free software, which indexes MP3 music files on the user's hard drive and makes them visible to other Napster users when connected to the Internet. From there, all it takes is a simple title or artist search to find other users from whom to download MP3 files. Users typically may find the latest hits through the free network, allowing them to download and listen to the music without paying.

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[23] Ettema, J., 'Interactive electronic text in the United States: can videotex ever go home again?', in j. Salvalggio and J. Bryant (eds), *Media Use in the Information Age: Emerging Patterns of Adoption and Consumer Use*. Hillsdale, NJ.

[24] Source: Media Metrix SoftUsage Report 2000

The music industry's slowness to act was followed by legal posturing rather than quickly implemented strategies. Although there was no proven links of Napster's services to the loss of revenues in the music industry, RIAA wanted Napster pay the penalty of US$100,000 per song downloaded from its peer-to-peer service. Eventually, Napster was legally hobbled, and five major music companies — Sony, Vivendi Universal, AOL Time Warner, EMI Group and Bertelsmann — began to address the Internet issue. However, it wasn't until 2002 that two digital initiatives sprung forth: *Pressplay*, owned by Sony and Vivendi Universal and *MusicNet*, owned by AOL TimeWarner, EMI Group, Bertelsmann and RealNetworks. Both are download subscription services that use the two competing player standards: Microsoft's MediaPlayer and RealNetwork's Real Player, respectively. And both also set forth to compete with other digital music download service in existence, like *listen.com*'s *Rhapsody* and *mp3.com*. Though their moves sounded promising, the problem with their initial online business models is that it is based on the label's existing physical distribution value chain. Many analysts give the two online subscription services little chance for early success, given their limitations.[25] *MusicNet* users can download songs, but can't transfer the files to other devices like handheld MP3 players and even other computers, while *PressPlay* won't even give subscribers a file to keep. Neither had music from all five of the big record companies and neither will be free.

Less than a year later in August 2002, *Pressplay* announced that it would allow subscribers to burn "unlimited" amounts of songs on to blank CDs and to transfer the music to a range of portable devices. They have succumbed to the pressure of criticisms that it was not providing a viable alternative to the free, illicit music swapping networks such as Morpheus, Kazaa, Gnutella and the now-defunct Napster.

So far, *Pressplay* and *MusicNet* have had limited successes. The music conglomerates realize that licensing individual songs could be the business model of the future. An independent music service *FullAudio.com* became operational in March 2003 to make all the songs from all five major music companies available. Run by Clear Channel

[25] David Bloom, "Industrial Evolution," The Cleveland Scene, November 1, 2001.

Communications, which owns 1,225 radio stations across America, this service will let individual Clear Channel stations create genre-specific services targeted to its listeners. Those stations have the option of building in an on-demand pay service alongside the free streaming option some stations currently employ.

Apple Computer, a computer company, attempted another form of online music service in April 2003. Apple offered an initial selection 200,000 downloadable songs from all 5 music conglomerates in a service package without subscription. Priced at 99 cents per download, songs can be burned on CDs or downloaded into the user's MP3 players like the iPod. While this is a radical move, especially from a computer company, it is uncertain if such a business model will take off as it competes with the file-sharing networks which offers illicit free music. Nevertheless, Apple Computer's move into offering an online music service underscores the phenomenon of a level 8 industrial convergence. In this case, an IT company is offering services traditionally controlled by media firms.

3.10.1.2 News

News has always been presented to the people as information, but with entities such as CNN, the news has become 24-hour entertainment, not a time-slotted information session. The advent of the Internet added another dimension for the news disseminating an infinite amount of news to anyone at any time, since news is the most pervasive content -- it appeals to all consumers and is the easiest to disseminate across a number of different media and appliances.

Digital technology allows news producers to come from almost anywhere, especially public. Major disasters like September 11 and the Columbia explosion see much video footage originate from amateur video users, rather than from professional video journalists. The Internet has created an explosion of news-related websites, many of them focused on a specific niche. For example, *tomshardware.com* is a popular site created by a computer hardware enthusiast who updates it with news and reviews of the latest computer hardware and nothing else. Another example of non-conventional digital

news is Weblogs. Sites like *blogspot.com* created easy interfaces for non-programmers to post personal diaries and thoughts for free. For example, many of the reports of the US-Iraq war in 2003 were posted on weblog sites -- one particular instance to note is the accounts of an Iraqi by the pen-name 'Raed' who reports the war in lurid detail from within Iraq on his weblog site at *dear_raed.blogspot.com*.

With digitization of news, consumers are receiving alerts and reports of news through more ways than one. Because text news can be easily atomized, Email and Short Message System (SMS) on cellular phones are new dominant ways to receive short news that comprise of headlines and short summaries. Blackberry devices, which are designed for text email use and short text messages, have proved to be a popular device for receiving breaking news in text form, particularly in the U.S.

3.10.1.3 Films/Movies

The movie industry represents a content group that has seen their content distribution and methodology change more dramatically than any others in the content business. From the beginning of the 20th century, the movie industry has seen its revenue from box offices decrease from 100 percent of the total to approximately 25 percent. Over the past 50 years, North American movie revenue has changed to include foreign markets, network television, made-for-TV movies, network syndication, pay TV and home video/rentals. Currently, the movie studios' biggest revenue source is the home video/rental market and sale of DVDs.

The following seven studios and members of the Motion Picture Association of America (MPAA) primarily drive the movie industry:

- Walt Disney
- Sony
- MGM
- Viacom's Paramount
- News Corp.'s 20th Century Fox
- Vivendi Universal

- AOL Time Warner's Warner Brothers

Although the current business model has worked well, the movie industry sees pressure from the following three perspectives:

- A general pressure from its present distribution channels to shorten the cycles.
- The proponents of video-on-demand require the model to change to include them early into the schedule, preferably directly after the theater release.
- Illegal copies on the Web and VideoCDs in foreign markets are major problems; in 2001 the MPAA estimated that 1 million films was pirated each day.

The movie industry's content will be one of the most sought after in the digital media convergence market, but unless it reacts quickly, a Napster-like phenomenon may be in the future. On 16 August 2001, MGM, Viacom's Paramount, Sony, Vivendi Universal and AOL Time Warner entered into a joint venture to distribute movies over broadband (cable and DSL) to U.S. Internet users. Launched as *Movielink.com* in November 2002, their first forays into the market will not be a significant revenue producer, as the movies will be distributed to a PC for watching or from a PC through a connection to a television. On 5 September 2001, Disney and News Corp.'s 20th Century Fox followed suit with a similar venture called *Movies.com*. However, *Movies.com* turns out eventually to be just a website promoting theatrical releases.

Both these ventures are the movie studios' "placeholder" in the market to test the market, establish bargaining power with the cable operators and change their method of sharing revenue. This is a first step, allowing the studios to establish the mechanism for operational systems (such as billing) and royalty rights, and to solidify their positioning.

3.10.1.4 Broadcast/Programming

The content, which goes to TV and radio media outlets, is programming. The programming that broadcasters do is predominantly news and sports. Most of the content assembled by the network broadcasters is acquired from the TV production groups of major movie studios. Television, which movie studios thought was going to put them out

of business, has done quite the opposite, providing revenue to studios for TV programming, made-for-TV movies and movies themselves.

In a digital convergence environment, the broadcasters' news and sports programming has significant value, but potentially, the local programming (news, weather, sports and community events) may have equal or greater value.

3.10.1.5 Video Games

Although video games are one of the newest content types, in a short period it has obtained such a significant stature that it is a force to be reckoned with.

Video game software has already demonstrated that it is portable to the Internet: Sony's EverQuest is the Internet's top-ranked multiplayer game with more than 360,000 subscribers paying a $10 monthly fee. During peak periods, the game has as many as 80,000 subscribers playing simultaneously.

3.10.1.6 Sports

Sports is content that seems to know no bounds. Examples are as follows:

- Professional baseball — Thirty teams and 2,500 games a year.
- Professional football — Thirty-one teams and 250 games.
- Professional hockey — Thirty teams and 1,200 games
- Professional basketball — Twenty-nine teams and 1,200 games

Most, if not all these games are televised, and this is only a small segment of the total and is North American-centric, excluding the most-watched sport of all — soccer. Television is by no means the only media and appliance that present sport entertainment to the consumer; scores come on the Internet and on your cell phone. The number of games, teams and sports has grown because of revenue coming from television and cable. It is no surprise that a number of major players in the digital media convergence value chain own their own sports team.

3.10.1.7 Live Performances

Live performances would seem to be a minor element in the content convergence value chain; however, only some select live performances might be significant. With the fragmentation of the media, from two or three channels to hundreds, it has become difficult for advertisers to reach a mass audience.

A few live sporting events, such as the Super Bowl, Olympics and final games of the World Cup (soccer), reach this mass audience, but other than these events, there are few non-sporting ones that do. Live events, such as the Oscars, and special musical and political events will be events that can reach a mass audience and, as time progresses, the cost of acquiring these events will probably increase dramatically.

3.10.1.8 Business Information

Business information covers a spectrum of content ranging from business analysis and stock market forecasts to weather, travel and maps. Although radio and television increased the dissemination of this content, nothing has compared to the Internet, which broke down all the geographic constraints encumbering the other media. Only the number of media and the appliances presenting it equals the diversity of this category.

Even with information explosion, premier and real-time content like those of Bloomberg and Reuters Business Breaking News will always be sold due to its value in time sensitivity, and will unlikely to be free.

3.10.1.9 Literature

The literature publishing industry is effectively composed of books, newspapers and magazines. The content for the newspapers and magazines comes from the above-mentioned categories of news, sports, and business and general information.

Since the Gutenberg Bible in 1452, the book industry has not dramatically changed compared with the other content types. Most of the change has been in the marketing of books, although there is the concept of e-books in which the content can be downloaded

from the Web and read on an electronic tablet. However, this technology has not received widespread acceptance.

3.10.2 The Media Packagers

The media packagers assemble content for the consumer. This simplification is accurate but at the same time is an understatement. In “Understanding Media” (1964), Marshall McLuhan’s classic statement was that “the medium is the message.” The form or media it comes in impacts a message.

Most of the media forms are relatively new: Radios came in the 1920s, television in the 1950s, cable in the 1970s and the Internet in the 1990s. One media has not replaced another but just added another dimension of content distribution to the consumer. One should not expect the Internet to cause the demise of any of the media. While one media hasn’t replaced another, significant interrelationships exist. Another of McLuhan’s thoughts has proved to be extremely accurate: “Content of any medium is always another medium.” A book or even a comic will become a movie. A movie may spawn music CDs, such as “Grease,” or a video game, such as “Jurassic Park.” Or a video game may be turned into a movie, such as "Final Fantasy." Let us briefly examine the major types of media packagers in the content convergence value chain.

3.10.2.1 TV and Radio Broadcasting

Thirty years ago, only two or three TV channels existed, while hundreds exist now. The number of major U.S. broadcast networks (such as CBS, NBC and ABC) has not increased significantly, but rather, cable or specialty channels provided by the cable or satellite provider has added the numbers. Since the early 1970s, three new technologies — cable, satellite and the Internet — have impacted broadcast television’s value chain. These technologies will continue to change the broadcasters’ value chain.

Consumers obtain the TV signal either via cable, satellite or free over-the-air signal. Although cable and satellite have made significant inroads, free over-the-air television is

significant. In the United States, 81 million TV sets receive their signal in this manner, and 21 percent of TV households rely exclusively on free TV, according to the National Association of Broadcasters.

Broadcasters' primary competition is cable companies and their fragmenting of the audiences with specialty channels. Also, VCRs and DVDs reduce TV viewing hours, and the same can be said for the Internet. Broadcasters are used to playing a ratings game, in which a point can be worth tens of millions of dollars. They are required to know who their audiences are and what to do to reach a specific demographic audience. This viewer knowledge is one of their key strengths to compete against an ever-expanding list of competitors.

Their other strengths are a recognizable brand in a hundreds-of-channels market, audience numbers, local content through affiliates, and sports and news content, but for most of them, their parent provides the strength. Of the four American networks, three are part of vertically integrated content and media companies, which include the following:

- CBS is part of Viacom.
- ABC is part of Walt Disney.
- Fox is part of News Corp.
- NBC is part of General Electric and is the only non-vertically integrated content and media company.

Radio's role would seem to be lessening, but it has local content and the best penetration rates of any media type — effectively 100 percent of the homes and 100 percent of automobiles. Radio will not go away; rather, it will flourish in the local markets.

3.10.2.2 Cable Networks

Originally, cable channels simply provided a better picture than the free over-the-air original signal. In the 1970s, the FCC restrictions began to lessen, and cable networks commenced. The success of the cable networks has been significant such that cable

networks' market share is rapidly approaching 50 percent. Cable networks obtain revenue in two ways — advertising and a per-customer license fee from the cable system.

Fourteen of the top 20 cable networks are part of the movie studios controlled by Disney, Viacom, Vivendi and AOL Time Warner.

3.10.2.3 Satellite Networks

U.S. satellite operators (EchoStar and General Motors' Hughes Electronics' DirecTV) and Canada's (Bell Canada Enterprises' ExpressVu and Shaw's Star Choice) have made no significant network endeavors; they simply have transposed cable networks over to satellite. In Europe, quite a different picture emerges with Vivendi's Canal+. Along with its satellite distribution (distribution of Canal+ is 42 percent satellite, 44 percent over the air and 14 percent cable), it is the European leader in production of film and TV programs. Canal+'s StudioCanal is active in France, Spain, Germany, United Kingdom, Italy and Benelux. News Corp.'s British Sky Broadcasting Group (BSkyB) (36.2 percent ownership), the largest satellite operator in Europe, has a number of endeavors in the network business. Along with its own channels — SkyTravel and .tv — it has joint ventures with A&E Network, QVC, Viacom and Granada. As with most of the satellite players, BSkyB is significantly involved with sports and, along with Granada and Manchester United, owns MUTV.

3.10.2.4 Newspaper, Magazine and Book Publishing

Newspapers and magazines — similar to television — have seen a fragmentation of their audiences, but they continue to be the centerpiece of media activities in many countries. More newspapers and magazines have evolved over the past quarter century. Also, similar to the TV industry, the publishing business has been part of the corporate vertical integration process.

In a content convergence environment, newspaper publishers bring brand identity and local community and in a fragmented market, these two attributes bring with them significant equity. Even so, the newspaper industry is increasingly finding it hard to

attract younger readers. In part, this is due to the proliferation of alternative news sources, particularly television cable-news channels and the Internet. Also, it could also be attributed to the fast moving and volatile lifestyles of young adults, who are caught up by job changes, two-income households, child care, divorce and frequent relocations.

The changing demographics of readers pose a challenging problem to newspaper publisher over and above their technological hurdles. However, even with the increasing use of digital technologies and Internet by consumers, the newspaper industry will be a force in the digital media environment if they can shed their old mindset and embrace the new capabilities that digital technologies bring. Although news aggregators with innovative business models may arise, like in the case of *Google* which we will discussed in section 4.1.4, newspaper publishers can bring unique experiences and strong resources to the production and distribution of digital information for both business and home consumers. With appropriate and creative strategies, newspaper publishers can leverage on its strong editorial power, and deliver quality electronic journalism to consumers.

The magazine industry is also in a state of transition, sharing with newspapers created by demographic shifts, the competition for advertising dollars, and challenges from digital technologies. Newspapers have a certain advantage in the new environment in that they usually operate within a limited geographic area and so can adjust their content on a daily basis. Magazines deal with larger, more varied audiences that usually spread across a wider geographic domain, and therefore reader's attitudes and preferences are often harden to define.

Although most magazine production is now computer driven and new printing techniques have allowed magazine publishers to tailor issues to customize their content for smaller groups of readers, their attempt in electronic magazines, which were delivered initially on CD-ROMs, were plagued with failures. The magazine industry had also tried to use the Internet to display their wares and secure subscribers, but mostly to supplement their print product. There is still no direct vision of how magazine publishers can play in

digital convergence, but I suspect it will be tightly linked to how book publishing will fare in the digital arena.

Book publishing has been the least effected by new technologies and appliances as the industry is big and diverse. The technical ability to add sound, graphics and animation to the printed word is creating a new kind of literature that will take readers beyond the linear story-telling of traditional books. Some experts foresee digital books will only remotely resemble the traditional product.

The emerging technology of e-books might present this new scenario. With new powerful pocket devices and new software, hundreds of books are being converted into electronic format and downloaded to PDAs for reading. PocketPC devices from Microsoft or PDAs from Palm are attracting book readers with its portability and versatility. Meanwhile, software companies like Adobe are adapting their Acrobat reader software to cater for this potential exploding market. Currently, there are thousands of titles available as digital downloads for these pocket devices available from websites like *ebooks.com*. Although there are also dedicated e-book readers available in the form of tablets, but they are not as popular.

With such technologies, old-line book publishers will have to confront competition not just within their spheres, but also from some formidable outsiders. As digital convergence matures, they will have to contend with major computer and software companies such as Palm, Apple and Microsoft, all of which have set up digital publishing subsidiaries. Competition may also come from electronic device manufacturers like Sony and Matsushita, which are interested in controlling the publications software needed to support their hardware.

3.11 Fragmentation of Media

The number of media types has increased with the introduction of the Internet. However, the Internet has not created the biggest change to media. In the past 40 years, the greatest

change has been the fragmenting of audiences with a greater proliferation of media outlets: TV channels have grown from three to hundreds, and a few magazines have grown to thousands. The media outlets have become much more demographic and lifestyle oriented, matching their content to the consumer type. Seemingly no matter what your interest or hobby is, there is a TV channel or magazine for you. Advertisers have naturally followed this trend, if not fostering it, trying to get the biggest bang for the advertising dollar by using the media outlet that best reaches their demographic-defined customer.

Fractured audiences make it difficult for the media outlets; while at the same time have fostered specialty media that address a specific lifestyle or demographic category. In turn, the Internet brings a totally different situation, for it can effectively fracture an audience into units of one.

We will examine and discuss this issue of fragmentation or digital divergence in the next chapter.

4 The Divergence of Digital Convergence

Digital Convergence and the collision of industries have revolutionized entertainment and information access by changing the supply-chain landscape of digital media. Traditionally, media suppliers and consumers have been separated by great distances, requiring considerable time and money to reach. As we have seen in Chapter 3, today's production, distribution and content are becoming increasingly linked in powerful ways, and traditional distribution bottleneck can be broken easily with technology. Further, the convergence in substitutes and complements as discussed in section 3.2.2 plays a major role in the divergence of the converged value chain. As such, content providers are taking slow and cautious steps in embracing digital technologies.

The main criteria for content producers to rely on digital distribution is that the delivery mechanism must be able to reach the mainstream and the content be protected from unauthorized use. Ubiquitous access must be achieved and content must copyright protected so that value can be effectively captured along the value chain. These conditions must be met before any new technology can offer compelling reasons for the industry to embrace it. Therefore, the technological infrastructure must overcome issues involving bandwidth, common standards, cost effectiveness, functionality, security, and user friendliness. Craig Barrett, President and CEO of Intel, emphasized the strategic importance of three of these issues (ease of use, security, and bandwidth).[26] While technological developments are a critical component of digital convergence, he added that it is important to remember that technology should remain in service of the story or information to be shared. Technology is not a goal in itself and its significance is ultimately based in the content and the application it carries.

4.1 Factors leading to Digital Divergence

In the world of digital technology, bandwidth, common standards, cost effectiveness, functionality, security and user-friendliness are the main barriers of convergence truly

[26] Intel Developers Forum Keynote 1999

happening. Because of these barriers, the converging industry is currently not observed as a coherent whole as we should expect from convergence, but rather, we see fragmentation of service and divergence of channels in many areas. The eventual result of this phenomenon of Digital *Div*ergence is a larger and fragmented industry that spans across information, entertainment and communication realms. Digital Divergence is contributed by four factors:

1. The changed nature of information through digitization.
2. The explosion of digital channels available where information can flow to the user.
3. The volatility of the converging industries poses a challenge in defining standards and in the emergence of dominant platforms.
4. As the size and scope of the converging industries are gigantic, the coming together of these industries causes clashes of incompatible technological and industrial structures, promoting cross-industry technological disruption.

We shall examine these factors in detail.

4.1.1 The Changed Nature of Information through Digitization

From our framework of digital convergence (2.3.1), we discussed the effect of Data Convergence, where light, sound and motion are encoded as a stream of bits. Content, in the form of text, video, music, image, stock quotes, books, databases, are collapsed into pure bits of information when they are digitalized. Once information becomes digital, its nature is changed in the following ways:

1) Digital information can be easily processed and modified with software algorithms.
2) The cost of making perfect reproductions of digital information is near zero.
3) Data once encoded in bits becomes indifferent to the channel through which it is transmitted, and can be distributed quickly, easily and cheaply.
4) Because of these characteristics, digital information can be easily commoditized.

4.1.1.1 Ease of Manipulation

Once you gather a stream of digital bits, regardless of the content that it represents, you can change it easily via a computer program. The ease of manipulation of digital information opens up a wide range of possibilities to which content can be created, packaged and modified. Information encoded or transferred in the analog domain like radio or television frequency signals cannot be modified easily. Neither can one change the headline of a newspaper once the ink is absorbed into the paper. Digital information, on the other hand, is not physical, but virtual. Therefore, a simple processing algorithm is all one needs to modify the content.

There are three ways manipulation of Digital Information contributes to divergence:
1) Repackaging
2) Compression
3) Asynchronicity

4.1.1.1.1 Repackaging

With the ability to be modified, digital information can be morphed and repackaged into various forms easily. Examples:

- A movie encoded for DVD playback can be 'transcoded' into streaming media for the Internet at a smaller resolution and lower quality.
- Once a news story printed on the newspaper is changed into digital text, it can be enhanced by adding hyperlinks and word-wrapped on the screen for a richer reading experience.
- Digital music playback can be altered real-time in an infinite numbers of ways through software controls.

Due to its ease of manipulation through software algorithms, digital content opens up new consumption methods and increases channel possibilities through the repurposing of content.

4.1.1.1.2 Compression

Clever software algorithms are often used to compress digital data, so that the same information can be represented with less number of bits. This ability for data to be compressed increases the amount of information that can be transported over a network. For example, compressed digital video television signals transmitted in an abbreviated format can dramatically reduce the amount of frequency bandwidth required without substantially degrading the quality of the received pictures and sound. Digitally compressed video via MPEG technology is causing a dramatic decline in the operational costs for TV service providers. The result has been a global explosion in the number of new satellite delivered Digital Satellite TV services, including, news, sports, movies, Pay Per View (PPV) special events, educational programming, and narrowcast offerings that can target the needs of small segments within any potential viewing audience.

4.1.1.1.3 Asynchronicity

The ability for digital data to be sliced up into blocks of bits and then reassembled at another location is the fundamental technology behind the success of Code Division Multiple Access (CDMA). Using digital encoding "spread spectrum" radio frequency techniques, CDMA provides encryption of digitalized voice data and enables an increase in the number of concurrent users on the same frequency band.

TCP/IP, the technological foundation of the Internet, also leverages on this property of Asynchronicity. Digital information is disassembled into data packets, transmitted over the Internet, and reassembled back at the destination. Packets can collide with each other while being transmitted, or they simply go missing. As such, digital data can be re-sent and re-assembled non-sequentially.

4.1.1.2 Near-Zero Reproduction Costs

Information is costly to produce, but cheap to reproduce. The production of content is a high fixed cost affair and requires value-add of time, money and talent from the author or producer. But once the production of content is completed and digitized, it can be copied

at an extremely low marginal cost. For example, million dollar movies once digitized and produced on DVDs, the duplication costs are negligible.

This ability for digital information to reproduce at such a low cost poses a problem for the media industry in digital piracy. Digital copies are perfect copies of the original. Further, there is no natural limited to the number of copies reproduced. Illicit CDs can be produced for less than a dollar apiece, and they are perfect copies of the master, and are therefore perfect substitutes for the original. If a perfect copy is available at bargain basement price, who would buy the original?

In many parts of Asia, Africa and South America, bootlegged movies are sold for about one dollar, compared to tens of dollars for the original. Worse, the latest movies are secretly recorded onto handheld video cameras in theaters, and then converted to Video-CDs for mass selling at a really low cost. Hong Kong's movie industry saw a drop of 60% of its revenue in 1999 because the public was buying illicit Video-CDs to watch at home rather than going to the cinemas.[27]

The problem of perfect digital copies also affects software publishers in the IT industry. Although between 1999 and 2001, software piracy worldwide has decreased due to stricter regulations and actions by the Business Software Alliance (BSA), we are still seeing about US$11 billion revenue lost to piracy in 2001 alone.

[27] "Asia Pacific Hong Kong Cinema Shutdown", BBC Report, March 17, 1999

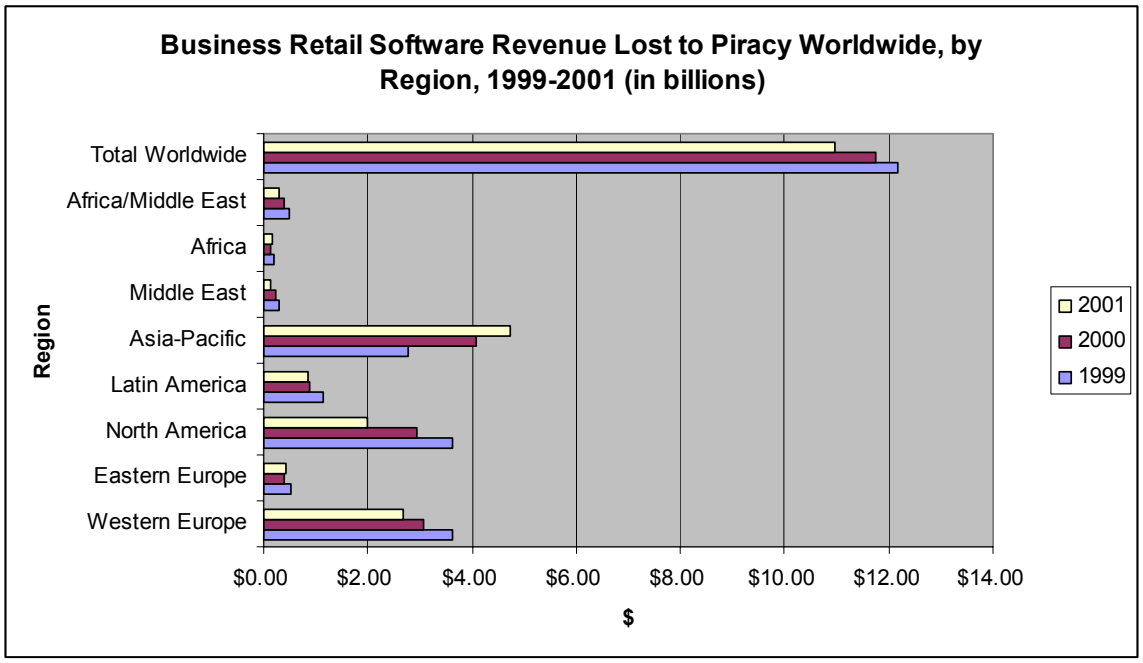


Figure 4-1: Business Retail Software Revenue Lost to Piracy Worldwide, by Region, 1999-2001. Source: International Planning and Research Corporation (IPR), June 2002

On the publishing side, printing presses, xerography, and the Internet have made text reproduction progressively cheaper. However, technology does not just lead to a reduction in cost, but also a dramatic increase in the amount of information distributed.

4.1.1.3 Friction-Free Distribution

In the last few decades, express mail and fax machines have reduced the costs of text distribution immensely. But none had the impact of the Internet in terms of enabling information distribution. Digital information can now be 'served' through large storage and fat channels to the individual. Email zips through international borders within seconds. In essence, the main differences between digital distribution through the Internet and traditional distribution methods like broadcasting are that:

1. Digital content is interactive (which is a pull model while broadcasting is a push model).
2. Digital content can be re-distributed by the consumer through the same channel the information was received (peer-to-peer).

3. Digital information can be easily searched, reducing search costs.
4. Speed of information flow has dramatically increased through digitization.

4.1.1.3.1 Interactivity

Interactivity is probably one of the most disruptive characteristics of digital content for traditional content providers. Traditional media like video, music, images and text have been passively consumed for decades through television, radio and newspapers. The rise of digital technologies like World Wide Web and Interactive TV created a new dimension to content – interactivity, which eludes the core competencies of most traditional content providers. The ability for consumers to interact with content do not just change the consumer's experience in consuming content, but also changes the way content need to be produced. The consumption model has changed from a push-based, to a pull-push model. Consumers' choices reflected in the functions of interactivity become part of the content itself, opening up infinite ways in which the same content can be consumed.

The difficulty for content providers to embrace interactive content is revealed during an interview with Reuters.[28] Artists at the media producers find producing interactive content like Flash animations five times more time consuming than regular graphics. Further, the management views interactive graphics similar in value to regular graphics and the prices of both regular graphics and interactive graphics reflect that. As such, the management at Reuters will not place anymore strategic emphasis than it currently does on interactive graphics, even though the content may be richer in user experience.

Another result that interactivity brings is the creation of virtual communities. Chat rooms and forums pepper the World Wide Web in vast numbers, allowing the shift from the one-to-many paradigm in traditional media towards a many-to-many paradigm. The transformation of the digital media value chain changes the way users collaborate and interact with each other. Since it is so easy to setup a bulletin board on the web, we see an explosion of channels and communities one can participate in. *About.com*,

[28] Interview with Reuters' Global Online Editor Robert Basler, in Washington DC. March 25, 2003

delphiforums.com and *Yahoo* are proponents of the large array of virtual communities that exists today. For example, *delphiforums.com* boasts 100,000 active forums with 4.5 million registered users posting more than 50,000 messages a day.

4.1.1.3.2 Peer-to-Peer

Peer-to-Peer, or P2P, in some sense is decentralization – moving away from monolithic central hub-spoke model to the decentralized device to device or service to service model. The devices can be edge devices or they could be servers talking to each other to make a server/network overlay. The power of peer-to-peer networking is based on sharing. Napster is an example of peer-to-peer file sharing, while SETI@HOME is a movement of peer-to-peer computing time sharing, which is also called Grid Computing. There are two models of peer-to-peer architectures today. The first, popularized by Napster, has a "Assisted Peer-to-peer" model, where there exists a centralized index server to facilitate the finding of matching nodes. Its operation is illustrated in Figure 4-2.

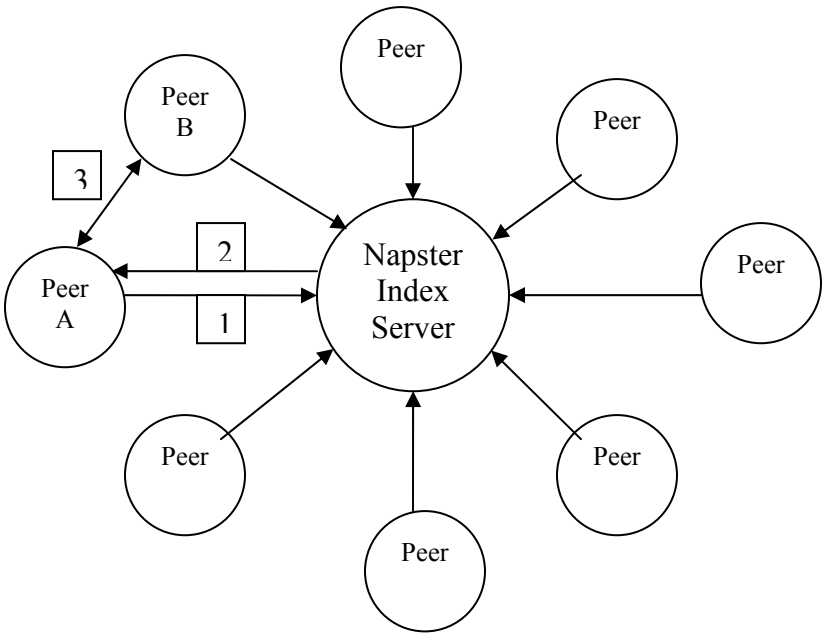


Figure 4-2: Architecture of Napster. "Assisted Peer-to-Peer"

(1) Peers publish files available on their hard drive.

(2) Peer A requests for files. Index Server returns IP address of Peer B who stores the file.

(3) Peer A connects to Peer B for file transfer.

Currently, the most popular system for sharing files is a second model of the peer-to-peer network called Gnutella, or the Gnutella network. This "Decentralized Peer-to-Peer" model is based on network nodes, rather than on a central server.

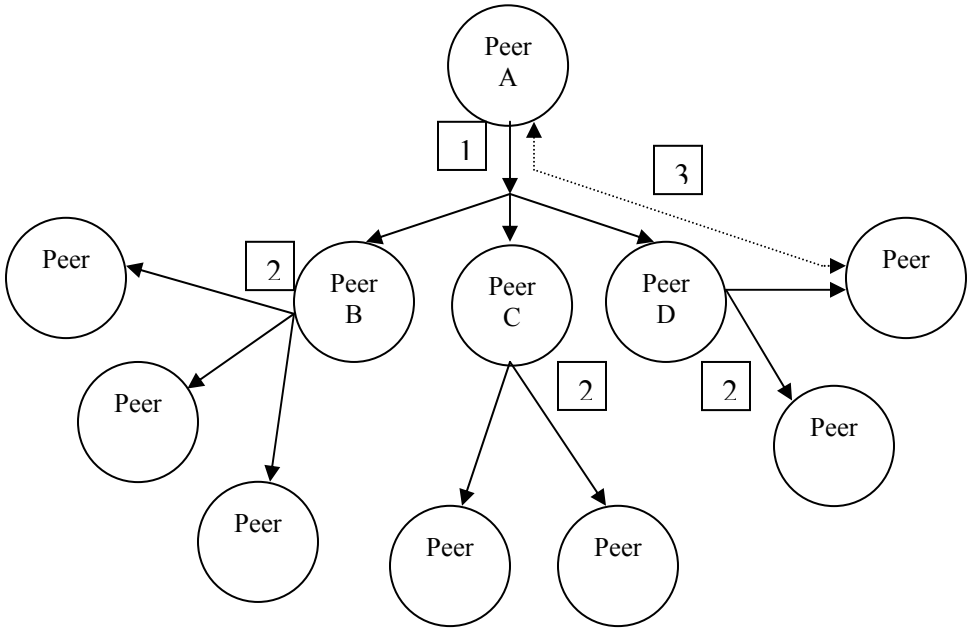


Figure 4-3: Architecture of Gnutella. "Decentralized Peer-to-Peer"

(1) Peer-A broadcasts request for file to nearby peers.

(2) Leaf peers receive request and query other nodes attached.

(3) Once file is found, the IP is returned to Peer A, so it can establish independent connection with destination peer.

There are two main similarities between Gnutella and Napster:

- Users place the files they want to share on their hard disks and make them available to everyone else for downloading in peer-to-peer fashion.
- Users run a piece of Gnutella software to connect to the Gnutella network.

There are also two big differences between Gnutella and Napster:

- There is no central database that knows all of the files available on the Gnutella network. Instead, all of the machines on the network tell each other about available files using a distributed query approach.

- There are many different client applications available to access the Gnutella network.

Because of both of these features, peer-to-peer networks are difficult to regulate, and it would be difficult for a simple court order to shut Gnutella down. The court would have to find a way to block all Gnutella network traffic at the ISP and the backbone levels of the Internet to stop people from sharing.

Due to this lack of centralized control and the difficulty in regulating digital file sharing, content providers are fearful of digitalizing their most precious assets if there is no sure way of protecting copyright digitally.

4.1.1.4 Commoditization of Digital Information

The story of Encyclopedia Britannica illustrates the power of commoditization of information. Being a classic reference work, the hardback set of 32 volumes of the Britannica sold for about $1,600 in the early 1990s. However, Microsoft's Encarta entered with market with a multimedia CD-ROM selling for just $49.95, with a slightly reduced set of information, but included bells and whistles of multimedia. This eroded the market share and profitability of Britannica. Today, the complete Britannica reference can be purchased for $49.95 on a CD-ROM that has the same content as the 32 volume print version, enhanced with multimedia.

News producers are another group that is facing commoditization of their information. The Internet has created a platform for easy distribution of news information, not just locally, but globally. Suddenly, people from all over the world could read the news of a small town in the middle of Turkey via the Internet, and at the same time, the small news producer in Turkey had to compete with all other online news providers around the world. Due to the ease of manipulation and distribution of information, there is now more than 4,500 news website today on the internet and most of these sites offer free news, hoping to attract viewers to their site to capture banner advertisement clicks. In this fragmented and competitive environment, news producers try to differentiate themselves on two

factors: the quality of editorial and the localization of news content. However, the appearance of Google News (news.google.com) in 2002 added a new dimension to this fragmentation.

Google News utilizes a web crawler engine to aggregate news pages from over 4,500 news website at regular intervals of 10 minutes, and uses real-time ranking algorithms to determine which stories are the most important at the moment -- in theory highlighting the sources with the "best" coverage of news events.[29] The resulting page isn't assembled by human editors who select and format the news, but a fully automated grouping of similarly news into related collection of stories from all online news published. Google News also allows the user to do a specific search on a certain topic, creating a powerful tool for news research. The implication of Google News is that this news gateway sets all the online news on the same level and makes them searchable. Therefore, for an online news consumer, instead of going regularly to a specific site for specific news, and find a single editorial view of the topic, the consumer could go to Google News to do a search resulting in a list of all online news sites reporting on that topic. Although Google News still relies on human editorial input in those 4,500 websites, this automated new tool has made online news more useful by allowing consumers to manage information overload. The flip side of this is that it also increases the commoditization of news, making online news sites harder to create differentiation in the crowded online news market.

Britannica and Google News are just two of the many examples of the increasing pressure of commoditization of information for media producers. One of the ways of combating the force of commoditization is to personalize or contextualize information. But there are many issues that hinder effectiveness implementation of such methods, including privacy issues and the perpetual changing interests of readers. Commoditization invariably leads to fragmentation as content producers would try all means to create niche experiences amidst new forces enabled by technology.

[29] Interview with Google.com's Technical Director. January 2003.

4.1.2 The Explosion of Channels to the User

Digital convergence has enabled a substantial increase in the number of channels of information flow to user who wishes to receive digital information. From the value chain perspective, the stages of "Distribution" and "Consumption" are affected on three levels:

- The changing communication networks infrastructure
- The increasing number of 'last-mile' user access channels
- The fragmentation of interfacing devices

4.1.2.1 Changes in Communication Network Infrastructure

With digital convergence, there is the breakdown in specialization among communications networks. Traditionally, each particular type of information was transmitted using a dedicated communications pipe. For example, telephone calls and faxes were carried by dial-up analog lines, data were sent over IP networks like the Internet, television was delivered by cable, broadcast or satellite, videoconferencing was transmitted by dial-up digital lines like ISDN, cellular communications used wireless delivery within a frequency range. However, the radical convergence of communications networks is allowing information to be sent across multiple pipes. The same content can be received using cable, wireless cellular and satellites, packet-switched IP networks, or circuit-switched networks.

As a result of the breakdown of the distribution bottleneck (3.2.1) and deregulation, the communications market has become very fragmented. One of the benefits of this fragmentation is that communications providers are offering more services and are consolidating them into packaged services. Therefore, consumers can receive local dial tone, long distance, Internet, satellite, cable, and cellular access from the same source. Further, consumers are able use mobile services to access e-mail accounts and the Internet when away from a cable-connected computer.

From this greater consolidation, both communication and content providers become aware of the changes in the value chain. Where each industry was comfortable in being disparate and vertically integrated in the past will now have to realize the importance of

each others role. Communication providers who have not considered providing content in the past will have to look upstream for producers of content for their end users. At the same time, content providers now require communication providers to distribute their content will have to look downstream for assistance or partnership. Therefore, a competitive communications market will help the entertainment community. Content companies will be able to acquire financing from the communications companies that are seeking content to be distributed through their infrastructure. Communications providers, in turn, will need to find people who understand the production, licensing, and distribution of content through their infrastructure.

A fragmented communications market poses a potential lack of integration and cooperation among providers. Since communications providers might not yet offer all services or all markets, consumers must use multiple companies to handle their needs. For example, AOL's 35 million subscribers have to rely on other service providers for broadband access, since the company at this time could only provide dial-up services. The company's new "Bring Your Own Access" plan lets consumers who get broadband access from other cable or telephone companies add a high-speed version of AOL for an additional monthly fee.[30] The ability of communications and content providers to cooperate and integrate their services will be a driving force of digital delivery of content. In AOL's case, its future success will depend greatly on how much synergy it can leverage from its merger with Time Warner. AOL hopes to create new revenue by selling new premium services to its dial-up and high-speed subscribers. But so far few specifics have been revealed, despite the company's access to a gigantic library of print, music and video content owned by the AOL-Time Warner media empire. In the meantime, the fragmentation of the market and the resulting objective of offering more markets and services continue to necessitate great infrastructure investments. So far, the rate of such investments has failed to meet expectations due to its tremendous costs.

[30] "Can AOL Bridge Its Broadband Gap?", Strategy Analytics Report Feb 2003.

4.1.2.2 Increased User Access Channels

The link in the communications chain for supplying digital media directly to consumers is often referred to as the "last mile" because it connects homes and offices to local communications networks. Currently, there exists a variety of access types, including cable, telephony, utilities (power grid), wireless and satellite; all spreading across a wide range of access speeds and costs. Each medium's functionality depends largely on the type of usage expected. For example, digital media applications, such as movies, will require substantial amount of inbound bandwidth and some degree of interactivity. With the increase need for interactivity, applications will require greater two-way high-speed transmission of data, voice, and video. However, it is foreseeable that most home consumers of entertainment and information will require a larger amount of bandwidth of inbound files and considerably less outbound bandwidth because a typical home user will receive content such as digital movies, but is not likely to send that content back out of their house. Outbound files will likely to be data for interactive use and be a small file, such as an e-mail, or an instant message. This type of bandwidth requirement is frequently referred to a "wide in, narrow out." Some applications will require more outbound bandwidth, such as those functionalities that need to send large data files, for example, graphics rich online gaming and video conferencing.

There is intensifying competition for communications providers to connect directly with consumers and to deliver digital content. However, having too many physical connections to the user is cumbersome and dealing with multiple companies for service is confusing and time consuming. Therefore, it is likely that the type of last-mile access that offers the best combination of bandwidth, low-cost, transparent delivery, user-friendliness, flexibility, and service will emerge as the medium of choice for digital access. The common digital access methods available today are telephony, cable, utilities, wireless and physical media. We shall analyze the impact of each access method on convergence and divergence in digital media in greater detail.

4.1.2.2.1 Telephony

In 2002, 88% of a total of 65.7 million US households were using dial-up or DSL to connect to the Internet,[31] making the twisted-pair copper telephone wire the most commonly used last-mile medium. Generally, the copper wires are connected to the local loop, with the local loops being attached to high-speed optical fibers capable of sending up to 10 terabits per second at longer distances. Cost is the main reason that deters direct fiber-optic connections to the consumer, but some local providers are upgrading their connections to a hybrid fiber-coaxial cable to offer greater availability of broadband connections to the home. However, progress is slow in this development because it is also costly.

According to PricewaterhouseCoopers, switched fixed-wire services over phone networks use five types of technologies over analog lines: modems, Integrated Services Digital Network (ISDN), High-speed Digital Subscriber Line (HDSL), Asymmetrical Digital Subscriber Line (ADSL), or Asynchronous Transfer Mode (ATM) technologies.[32]

Modems (*Mo*dulators/*Dem*odulators) have been used since the 1970s to convert digital data into analog signals in the form of audio frequencies by the transmitting modem. The sound waves are transmitted over telephone networks and then converted back to digital data via the receiving modem. Although modem speed has grown tremendously, it still lacks the high bandwidth needed for digital media and the rate of speed growth has slowed in recent generations. The high-end modems today theoretically transmit at 56kb per second, but this speed is not often reached due to modem compatibility problems, as well as the quality of the line between the two ends.

ISDN offers a greater transmission speed by using the existing copper phone networks with slight infrastructure upgrades. ISDN offers circuit-switched digital channels from end-to-end at up to 128kb per second. Users can also utilize one 64kb per second channel for data while using the remaining channel for voice. ISDN also offer even higher than

[31] Whitepaper, Strategy Analytics, Feb 2003.
[32] Entertainment Media and Communications Technology Forecast: 1998, PricewaterhouseCoopers.

128kb per second access by combining multiple channels to achieve 256kb or 512kb bandwidths, albeit at much higher costs. Also, ISDN offers faster connection times than analog dial-up modems, about one to two seconds compared to 20 seconds. ISDN requires a digital connection to the telephone network and an ISDN adapter, and provides full two-way transmission. Though ISDN is sufficient to provide low to medium-level digital media and interactive applications, it still lacks the speed for higher-end entertainment applications.

ADSL and HDSL dramatically increase bandwidth using existing copper pairs. HDSL is a two-way technology and ADSL provides wide in, narrow out access, where inbound transmissions are ten times faster than outbound. Because their implementation costs are reasonable, this technology enables telecommunications companies to leverage their installed base of twisted-pair copper telephone lines. The bandwidth is capable to provide the downstream channel to deliver high-end digital media content like television and video-on-demand.

ATM is another technology that will bring broadband communication for interactive and high-end, digital-media transmission. The superiority of the ATM technology is that it enables the multiple data types of data, voice, and video to share the same communications medium, and consumes only the bandwidth that is needed by an application. This means that ATM provides the ability to share bandwidth by packet-switching technology in which data is separated into smaller pieces for transmission and reassembled on the other end. Since ATM packets are small and a fixed length of 53 bytes each, they can easily be switched, and thus their transmission produces minimal delays. These characteristics offer near-seamless real-time video and audio transmission, perfect for two-way high bandwidth communications. Because of its higher cost of implementation, ATM is usually deployed as the network backbone for LAN or WAN infrastructures for offices. The high cost will impede foreseeable direct-to-consumer connections to the home where the high quality of network service has not yet faced a substantial demand.

The telephone fixed-line network will continue to be the most common last-mile medium for the next few years because of its two-way transmission capability and extensive installed infrastructure. Telecommunications companies are now faced with a dilemma. Although voice traffic has traditionally filled telephone lines, data traffic has grown at 30% per year compared to 3% for voice. In 2002, the top 20 telecommunication providers report that up to 15% of their revenue originates from data traffic.[33] Since data calls are less expensive, the profitability of long-distance providers is in danger of shrinking. Telephone infrastructure providers are therefore faced with the paradox of needing to offer more capacity for voice traffic, yet capacity increases will increase demand for data transmissions and increase the traffic problems and contention for voice. In addition to other communication types, telecommunications companies face competition from other telecommunications companies as firms seek to expand their services and territories and long-distance and local companies move into each other's areas. Other technologies like cable modems, wireless cellular phone capable of transmitting data and satellite broadband are already creating intensified competition in the data access space.

4.1.2.2.2 Cable

Cable providers are trying to take advantage of their existing consumer access to cable television services already connected to millions of homes. Using cable modems, consumers are able to access the Internet through the same physical coaxial-cable lines that carry television content into the home. Since there is up to 27mb per second bandwidth available using cable modems, consumers have greater high-speed access and ability to download large content files compared with other phone technologies like ISDN, or ASDL. Also, one can send data back to the system at a lower speed, but respectable 10mb per second, enabling content interactivity. However, the caveat is that cable bandwidth must be shared among users in the local cable infrastructure. Unlike xDSL technologies which offer dedicated bandwidth per connection, cable modem lacks the quality of service needed to provide reliable and consistent bandwidth for each connection.

[33] Nokia Whitepaper. Data consumption report 2003.

In addition, many cable infrastructures are not two-way, forcing cable providers to rely on telecommunications companies to provide the upstream service. In order to provide content interactivity, especially with the deployment of digital television, two-way transmissions have to be offered. This means existing cable infrastructure has to be upgraded and cable companies must provide greater reliability through higher quality of service through a non-distilled transmission path, enabling full bandwidth access per user.

Besides Internet access, cable companies are seeking to expand the traditional cable service by providing overlaying menus to create enhanced content for normal television programming. In doing so, they will likely seek to buy or partner with content producers in order to have entertainment and information that will attract and retain customers. They will need content-oriented personnel with insights into production and management personnel with insights into how to integrate the entertainment business model with their more bureaucratic, static, subscriber model.

4.1.2.2.3 Utilities

While sending information over the power grid has long been theorized, it was not until recently that engineer Paul Brown invented a method of sending phone and data services over electricity lines.[34] Similarly to wireless technologies, this technology uses multiple frequencies for different packets with a signaling system to manage the traffic of all packets. Not only does using electricity offer an existing installed base, especially to homes, but it also offer speeds of network access up to 1 Mb per second, making it faster than phone modems and ISDN, albeit slower than cable modems. Another advantage of connecting through the power grid is that no dial-up is needed to connect.

Although utilities industries are deregulating and growing at a rapid pace, it will still taken substantial investments to setup such an infrastructure. To create a system with the type of scale needed for the mass market would require technologies to operate data switching at the systems substation and a high-speed fiber network between the substation and the Internet. Since utility companies are required to build the necessary

[34] "Ringing Innovation," Guatam Naik, Wall Street Journal, June 29, 1998.

infrastructure with such a high initial investment, the largest threat in entering the information delivery industry is that they will be quickly rendered redundant by other forms of transmission technologies, especially wireless.

4.1.2.2.4 Wireless

While high-speed, physical connections are costly and create concerns of bulkiness and complexity of managing physical lines entering homes, wireless technologies offer the freedom to access information without any entanglements. The key technologies that enable wireless communication include cellular, satellite and radio frequency technologies. In addition to being able to use in any space within and outside their home and office, consumers can leap across physical geographical boundaries to connect to voice, video, and data networks in regions and places to which most services previously did not extend. The biggest advantage of deploying wireless networks is that it enables rapid growth, especially in new markets where it is more easily entered using wireless technologies than by building more costly physical infrastructures. There are an increasing number of potential markets for wireless technologies: people without access, current customers who require wider coverage and wire-free connectivity with more consolidate services, and service providers who are expanding into new markets, especially into locations where there are few installed physical telecommunication infrastructures.

4.1.2.2.4.1 Cellular Technologies

Despite the well publicized problems of the cellular phone industry, substantial investment is continuing in wireless technologies, and we have seen much expansion and development in this space the last decade. It's now around 20 years since the first cellular networks brought mobile voice services to the business market. Although cellular services still lags terrestrial networks in capacity, data-transmission quality, and cost per call, the continual drop of connection costs and the convenience of mobility are spurring the adoption of cellular phones as the preferred choice for voice and soon, data communication. Cellular phone market penetration in the UK, for example, has exceeded 70%. On the technology front, we have seen second generation digital technology (2G) replaced the original analogue cellular technology from 1990. Text messaging has

become commonplace and the mobile phone is an essential fashion accessory. Most operators have upgraded or in the midst of upgrading to 2.5G, the next phase of technology. New data services are now becoming available that operate more than six times faster than 2G equivalents, enabling new services such as multimedia messaging and 'always on' access to corporate e-mail accounts.

In the US, 'always on' e-mail access has proved to be one of the most popular mobile data applications. For example, Research In Motion's (RIM) Blackberry system is used by more than 500,000 individuals and 20,000 companies today. RIM sells the complete solution, including the server for the corporate LAN and the handheld Blackberry device. One of the main factors behind Blackberry's success device itself — it has been specifically designed for e-mail and is generally regarded as very easy to use.

Cellular will continue to be the dominant mobile technology in the next few years. The original first generation cellular networks, introduced from 1979 onwards, were based on analogue technology. In most parts of the world these services have been superceded by 2G technology. There are currently five incompatible 2G standards in use in different parts of the world — but only the GSM standard is supported in all major countries. While 2G generally offers good quality voice services, data support is limited to short messages (SMS) and conventional data transfer at 9.6kb per second, which is slow, cumbersome to set up and prone to failure. Wireless applications protocol (WAP), which was based on this slow speed, was designed to access reduced versions of internet services. It is generally regarded as time-consuming and difficult to use and has failed to meet expectations. Many service providers have already ceased support for WAP.

2.5G services were recently introduced in 2002, and they provide upgraded data services capable of operating at up to 64kbps. The data service uses general packet radio service (GPRS) protocol, which supports 'always on' style connections to corporate networks and the internet. Few existing 2G phones support GPRS and therefore, consumers will have to purchase a new device to access 2.5G services. Alternatively some users choose to use a Smartphone or PDA-like device that incorporates the functions of an organizer,

phone and PDA. Multi-media messaging (MMS) is a new class of service enabled by 2.5G. MMS enables composite messages including text, pictures, graphics, video and audio clips to be accessed on multi-media enabled handsets.

The first 3G services are expected to offer limited coverage in metropolitan areas within the next year. However, availability nationwide for the US is expected from 2004 onwards, although it's possible that this will be delayed as some commentators are expressing doubts about whether 3G can justify its deployment costs. In an attempt to mitigate the costs some of the major network operators are believed to be in discussion on possible sharing of 3G network infrastructure. However the real benefits of 3G are in doubt. While it will increase network call capacity by around 75%, its main distinctive feature is higher data transfer speeds. The theoretical maximum data rate is 2 Mbps. However this speed has a short range and will possibly be available only inside a building. When roaming, the data transfer rate will reduce to 384kbps (low mobility), or to 144kbps (high mobility). Comparatively, this is only a little faster than the rates potentially achievable from a combination of WiFi and 2.5G GPRS.

The data rates that are possible with 3G will enable distribution of video clips and even mobile video conferencing. However market research[35] suggests that demand for video-based services is insufficient to drive 3G take up in its own right. 3G faces some other challenges too, when it first becomes available its geographic coverage will be fairly limited. To maintain full roaming service 3G users will also need to access 2.5G services. Current 3G handsets are comparatively large, they will need to become smaller and probably offer dual band 2.5G/3G operation before they achieve mass penetration.

As a result some analysts are now questioning short term widespread investment in 3G deployment, especially as no compelling application has been identified that might persuade users to upgrade handsets. From the network operators' perspective the slowing growth in cellular penetration means that there may not be an imperative to upgrade. There are some technology developments in the pipeline beyond 3G. 4G systems are at

[35] "The New Mobile Technologies" – KPMG Whitepaper, June 2002

concept stage and may emerge in the next decade. They will enable software-based signal decoding and device configuration, providing more flexibility as users move between different activities and geographies. For example, a PDA could be reconfigured into an online betting terminal for someone attending a sports game.

4.1.2.2.4.2 Radio Frequency Technologies

While mobile communications are dominated by cellular services, Bluetooth and WiFi are two emerging potential complementors, or even as competitors in the near future.

Bluetooth is a specification for wireless connections between electronic devices within a range of up to 10 meters. For example, it can be used to connect computers to printers, mobile phones to PDAs and headsets, or perhaps a mobile phone to a retail terminal. Many of the new wireless and computing devices now being sold are equipped with Bluetooth, including some of those made by IBM, Microsoft, Intel, Nokia and Ericsson. In Finland Bluetooth has been used to demonstrate purchases from a vending machine, with the payment being processed using Bluetooth through a mobile phone

WiFi (802.11x) is a wireless network standard that operates up to speeds of 22 Mb per second. Because of its higher speed and range, WiFi is better suited than Bluetooth to providing wireless access to corporate LANs. In the US, some network operators have begun establishing public WiFi access points, which can provide coverage within a radius of five to six city blocks. A leading analyst is predicting that there could be over 20,000 public WiFi access points within five years. It is possible that with the imminent upgrading of standard cellular data speeds to 64kb per second, a combination of 2.5G cellular (when roaming) and WiFi access (within airports, cities etc), could make the additional benefits of 3G obsolete. However, this could mean users will have to juggle between different standards depending on the available of signals at his location. WiFi is an evolving standard and gradually, its bandwidth will continue to improve. The Voice-over-IP technology combined with WiFi could provide extremely low-cost wireless voice communication and become a potential disruptive technology that will upset the cellular market.

The current fragmentation and lack of coherent solutions in the wireless industry is possibly a key factor in the divergence of the digital industry. In order to move forward and entice content providers to embrace wireless broadband, integrated capabilities and common standards are essential prerequisites. There are several outstanding technological issues to be resolved besides providing voice, data and multimedia communication capabilities. Wireless operators need to offer a range of additional value-added network services to underpin commercial content-based applications. For example:

- Payment services: for example, the phone authenticates the user and can then communicate to a point-of-sale device (perhaps using Bluetooth) that funds are available either from a local e-wallet, or by reference to a credit card authorization system. It's possible that transactions may be charged directly to the mobile network operators billing system.
- Directory services: provided by network operators to help users locate their desired information service. This potentially means that network operators will be able to direct their customers to preferred service partners, as is already the case in Japan with iMode.
- Location information: will be used by operators to direct generic requests (e.g. "get me a Taxi") to the nearest, available preferred operator, and potentially also to select location-specific advertising for display on specific users' devices.
- Digital rights services: content that is flowed into devices are protected, such that unauthorized transfers or storage is impossible.

4.1.2.2.4.3 Satellite Technologies

Due to high equipment, maintenance, and control costs, commercial demand for satellite technology has been limited in the past. However, recently there has been enormous growth in the use of low-cost, global-satellite distribution systems, which provided instant infrastructure and connectivity. These new systems provide portable access to consumers who are accustomed to limited range, as well as global access for service providers to new markets, further breaking down geographic and cultural barriers. Through satellite, consumers can receive voice, video, data, and access the Internet using

a variety of receivers, including television, PDAs, phones, fax machines, and computers. Satellite communications can establish connection with wired technologies, such as phone networks, to provide integrated services.

A case in point is DirecTV. DirecTV is the nation's first high-power direct broadcast satellite (DBS) service. It began in 1994, and in 2003, this digital satellite media service has 11.2 million subscribers. The DirecTV System is the fastest selling consumer electronics product ever. The equipment consists of an 18-inch dish, an integrated receiver decoder and a remote control. It is manufactured by Hughes, RCA and Sony. In addition to the 225 channels of TV and music programming, DirecTV offers occasional interactive and pay-per-view content, and partners with TiVo to cater digital video recording. The programming is up-linked to a satellite then sent directly to the dish at the subscriber's home. The picture and sound are much better than cable. DirecTV's main competitor is DISH Network, one of three interrelated business units of EchoStar Communications Corporation, along with EchoStar Technologies and EchoStar Satellite Services. EchoStar's state-of-the-art direct broadcast satellite system has the capacity to offer customers over 500 channels of digital video and CD-quality audio programming using a single small satellite DISH. Such explosion of channels could only be made possible through digital technologies.

The demand for satellite communications and media demonstrates that a strong market exists and that those that can build cost-effective systems will be at a competitive advantage. Initial setup costs and connection charges per minute must be reduced to encourage demand and wider use. The production of equipment and the launch of satellites are very costly and uncertain investments. Building and launching a satellite costs tens of millions of dollars and one-in-ten launches fail due to launch-vehicle malfunctions. One way to accomplish cost efficiencies is to produce receivers on a larger scale.

From a content provider perspective, wireless communication offers a more direct connection to consumers by eliminating the need for intermediaries that formerly

provided the connection. After an initial high-investment cost, wireless services are the cheapest and easiest way of sending digital information. By combining the broadband coverage of high-altitude satellites with the minimal transmission delays of low-altitude satellites, providers can offer access to more choice of entertainment and information. Like telecommunications, cable, and utility companies, wireless service companies are likely to seek content providers as partners or buy-out candidates.

This brings us to conclude that that the wireless industry continues to face considerable challenges and uncertainty ahead. As discussed, WAP has failed to take-off as predicted and growth in cellular sales has slowed as many markets approach saturation. In 2002, Europe mobile operators paid approximately $100 billion for 3G licenses; although it was unclear how and when would there be an adequate return. Today it is far from clear there will be sufficient compelling content-based applications to inspire demand and a business model that makes sense. It will be hard to justify the massive investment in network infrastructure needed for Europe-wide 3G deployment or Satellite broadband services. Industry players will have to bear with the divergence and fragmentation in the wireless industry until a standard emerges and dominates. Unless a clear path is made for content providers, it will difficult for digital media to flourish in the wireless space.

4.1.2.2.5 Physical Distribution: DVD and CD-ROM

An alternative to accessing digital content through a physical or wireless transmission medium is distribution on a physical device such as DVD or CD-ROM. These media substitute for dealing with bandwidth problems in transmission of data. However, each medium requires an installed base of equipment at the consumer's end. Also, the cost, speed, and wide availability of Internet access cannot be met through any physically distributed medium.

CD-ROM's offer a storage capacity of 650mb, allowing rich video, audio and data applications, and is still an extremely viable and proven form for delivering content, communications, business information, education, and entertainment. Mass distribution of detailed information content through CD-ROM reduces the need for printing and

sending documents. However, distribution is limited by the need for PCs and CD-ROM drives among all recipients. Since the availability capacity on a double-sided DVD is 8.5gb, greatly exceeding CD-ROM, DVD allows producers to deliver high-quality digital content. DVD applications include home-theatre video, DVD-ROM for computer applications, such as educational, business, and entertainment software.

However, like many digital technologies, DVD suffers from a standard overload. There are 4 physical formats of DVD disks: DVD-5, DVD-9, DVD-10 and DVD-18. DVD-5 is single-sided/single-layer DVD with 4.7 GB storage capability. DVD-9 is also single-sided but dual-layer disk with 8.5 GB storage capability. DVD-10 and DVD-18 are double-sided/single-layer 9.4 GB and double-sided/dual-layer DVD 17 GB disks correspondingly. New DVD formats were also developed recently: DVD-RAM, DVD-RW and DVD+RW. Only DVD+RW disks are compatible with current DVD players.

4.1.2.3 Fragmentation of Interfacing Devices

Digital technologies have greatly affected end-user devices and their interfaces. As technologies cross the boundaries of convergent industries, devices begin to take on new functionalities, thereby transforming their user interfaces and specifications. Digital convergence increases device complexity and fragmentation in three ways:

1. The "cross fertilization" of technologies enable devices to take on auxiliary capabilities in addition to their primary functions.
2. The increased functions of new digital devices require different and more complex user interfaces.
3. The need to preserve legacy.
4. The lack of device standards allows a proliferation of physical and technical specifications of new platforms.

4.1.2.3.1 Auxiliary Capabilities

A cellular phone with digital camera built-in, or a game console with the ability to play DVD movies are examples of devices with auxiliary capabilities. 'Cross fertilization' of

technologies caused by the clashing of industries are adding more functions to devices which traditionally have dedicated functions. They are getting more complex as the number of functions it can provide increases. Examples of this are:

Device	Primary Function	Auxiliary Functions
Cellular Phones	Voice Communication	Play Games Messaging Data Modem Addresses Calendaring Digital Camera
Game Consoles	Play Games	Watch Movies Online Shopping Web Surfing Messaging
Personal Computer	Computing Web Surfing Email	Watch TV/Movies Video/Teleconferencing Play Games

Table 4-1: Primary vs. Auxiliary Functions

4.1.2.3.2 Increased Complexity of Functions

Digital devices that marry technologies from other industries have more functional complexity. One example is TiVo, a digital recording service which is a consumer electronic device powered by computing and media technologies. Consists of a hard drive and video digitization and playback capabilities, the TiVo set-top box replaces Video Cassette Recorders using a technology called Time Shifting – the ability to schedule and save up to 80 hours of TV programs on its hard drive and allow consumers to play them back at a later time. Users are able to have great control over how the recorded program is viewed, like scanning, skipping advertisement, pause, forward and rewind, like a regular VCR. The complexity of the new digital increased as new functions are introduced. In April 2003, TiVo announced the availability of enhanced functions. Subscribers could distribute personal pictures, recorded music and other video besides TV programs. The system also let some subscribers when away from their homes to use a Web page to instruct their recorders to save a desired program.

Another example of a new convergent device is the Smartphone, which is a marriage of Computing, Media and Telecoms technologies. Newer generations of Smartphones, like those introduced by Nokia or Ericsson, are mobile computers that allow downloading of software and playback and recording of photos, video and audio. The advanced technologies that are packed into such a device invariably increase the complexity of functions.

4.1.2.3.3 The Need to Preserve Legacy

As technology advances, firms would face the increasing pressure to support existing technology as well as create innovations that utilize new technologies. The need to preserve legacy and compatibility of older technologies often put a damper on new capabilities and increases the number of offerings available to the consumer. For example, Sony has a version of flash memory hardware called the Memory Stick which was introduced several years ago. As technology progresses, Sony was able to squeeze more transistors into a smaller package, and subsequently released the Memory Stick Pro with higher memory capacity, as well as the Memory Stick Duo, which offers same memory scale but in half the size of the original package. Newer devices that are designed to use Memory Stick Pro and Memory Stick Duo are also compatible with the older Memory Stick. However, older devices will not be able to use the newer flash memories without adapters or modifications to the hardware. As such, new innovations have created limited compatibilities across generations of technologies, and this hinder convergence.

An interview with a senior executive at Sony reveals that the company sees the market as fragmented due to the accelerating pace of innovations especially in the last decade. Sometimes new technologies supplant the old, other times, complete new technologies are invented. In essence, consumer choices keep increasing, and the marketplace gets more and more diverse in time. Figure 4-4 illustrates this point.

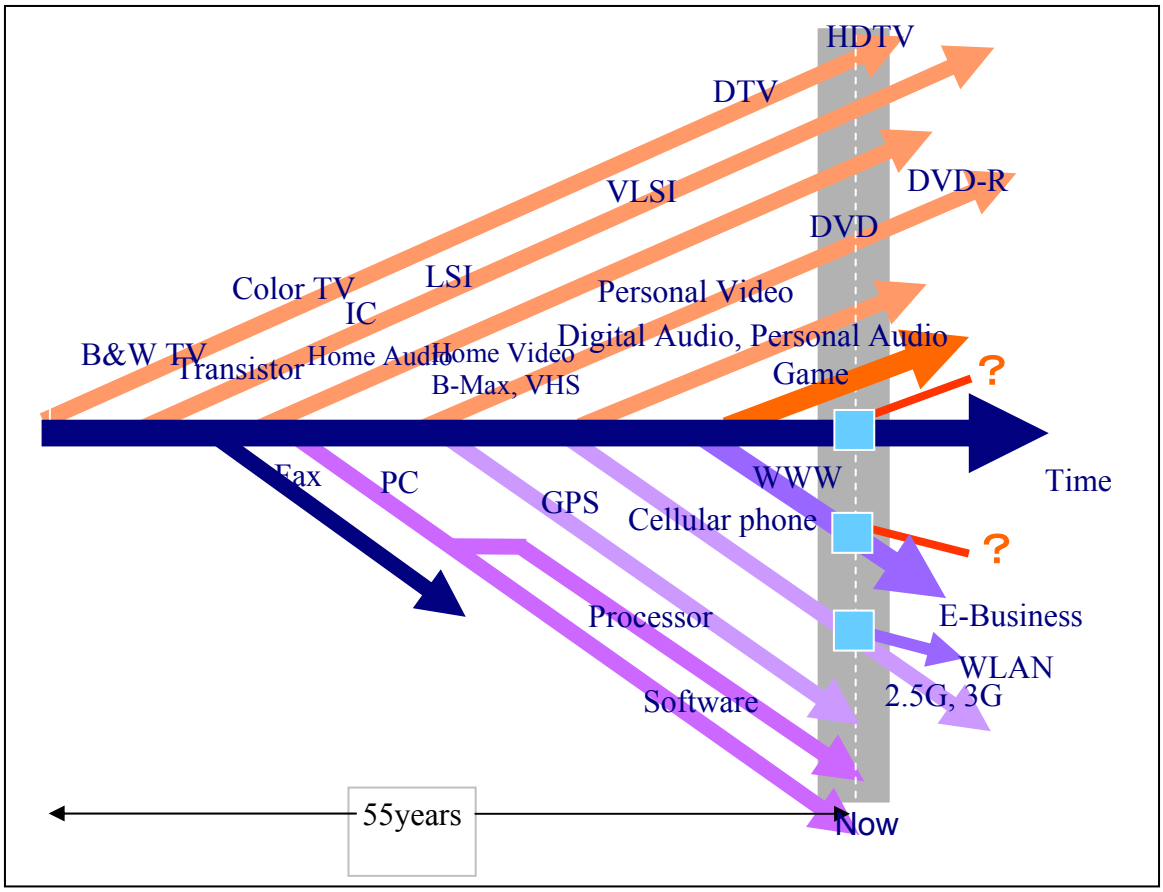


Figure 4-4: Divergence of Legacy Systems. Source: Sony Ventures.

4.1.2.3.4 Lack of Device Standards

The lack of standards contributes greatly to the fragmentation of new media devices, especially in terms of their physical interface and technical specifications. The disparate platforms among converging technologies provided inconsistent access to digital-media technologies. Unlike the era of radio or television where the reception technologies were cast in stone policy making bodies like the FCC, technical standards for devices are few and far between.

While technological innovation drives efficiency and growth, a sufficient platform installed base is needed to take of advantage of new technology or entertainment content. Many media providers are waiting for the convergence of the technology and the installed base for products to be widely successful. Often, this limitation mandates that suppliers restrict their product offering to aim it at more mainstream, low-end platforms.

Many are caught in between because if they create products for insufficient platforms or reduce the functionality of the digital content, the experience will not be engaging enough and their brand and the content will be devalued.

A fairly successful digital standard is the MPEG. The MPEG standards for digital video compression allow multiple digital channels to be sent over the same spectrum as a single channel. While MPEG2 is a powerful standard, it is not widely used because of the processing power required to decode MPEG2, the bandwidth needed for large files, and local storage limitations.

Most digital markets today are severely fragmented. For example, the market of flash memory storage cards has seen fragmentation with multiple independent and incompatible interfaces. There are at least 7 different incompatible flash memory interfaces in the market in 2002 from Sony's Memory Stick, Panasonic's Secure Digital, Toshiba's xD, USB and Compact Flash. This wide availability of flash memory interfaces and standards stems from the difficulty of the converging industries to set standards.

4.1.3 The Challenge of Setting Standards

The clashing of the four industries sets a stage for difficult battle in setting standards. In order to have any progress in standard setting for this emerging market, especially with such heavyweight industries, the incumbents in their respective industries will need to cooperate with one another to create a single network of compatible users. However, even if they do come to an agreement on standards, these same companies might shift gears and compete head to head for their share of that network. *Coopetition* captures this tension.

There are three key barriers to setting standards in a market of digital convergence:
1) Establishing a standard might not be everyone's interest
2) Agreeing on a standard may involve long negotiations over details

3) Standards will alter the nature of competition

4.1.3.1 Interest Barriers

Product standards for new technologies can pose grave threats to established incumbents. Their main concern is that as soon as the agreed standard initiates a network effect and fuel a positive feedback loop, it can easily cannibalize sales from an older technology. Historical examples are numerous. RCA, the leading maker of black-and-white television sets during the 1940s was not eager to see a color television standard established that would challenge its leadership.[36] When Nintendo managed to leverage on network effects to become the dominant game console standard in the mid-1980s, Atari was not pleased.[37] More recently, Microsoft would not be keen in seeing a unified Unix standard, or a unified Java standard, since these technologies pose a greater threat to Microsoft than an opportunity.[38]

In digital convergence, it must be recognized that standard setting might be hard to achieve as incumbents in each of the four industries might be reluctant to do so. To protect their interests in their respective traditional industries and to keep a foothold in the new emerging industry, they could try to deny backward by creating new proprietary technologies creating greater barriers to entry. Another strategy they could also use is the first-mover advantage to introduce its own new technologies, perhaps with the unique advantage of backward compatibility to a dominant standard in the old industry, to win a standard's war. Or, incumbents can ally themselves with the new dominant technologies that might emerge, hoping to leverage on established brand name or an expanded market.

An incumbent in any of the four industries that has little to offer to the new generation of technology, offensively or defensively, will have a greater interest in sabotaging new standards than in promoting them. Sun has learned this lesson the hard way in its battle with Microsoft over Java.

[36] "The Forces at work behind the NTSC Standard", Donald G. Fink, SMPTE Historical note 1981
[37] "Power Play: Nintendo in 8-bit Video Games", HBS Case Study 1995
[38] "Sun Microsystems Inc.: Solaris Strategy", HBS Case Study 2001

4.1.3.2 Negotiation Barriers

With the varied players in the digital convergence market, negotiation barriers could be major hindrance to the setting of standards. Players may disagree over how extensive or detailed that standard should be. The uncertainty that surrounds the industry during the long delays of standard setting would create confusion in the market. With long negotiations and delays in decisions, consumers may take the easy way out and continue to sit on the sidelines, especially if the older technologies continue to be available and standardized. The danger is that when the new standards are finally decided, there might be a lack the support of sufficient market participants as the incentive to move to the new standard might be low and the excitement of the migration stifled. The slow migration to the HDTV standard from traditional broadcast standard is a case in point.

The HDTV standards process was a long-drawn and tiring one. After 9 years, 3 months and 22 days of study, debate, design, construction, testing, and rulemaking, the ATSC digital TV and HDTV system was finally set in stone in 1995. However, even after the battles over whether the standard would include specifications regarding scanning forwards and line resolutions, the resulting agreement was that not 1, but 18 different Digital TV formats!

Common Name	Horizontal & Vertical	Frame Rate	Scanning Technique	Aspect Ratio
1080-I	1920x1080	60	Interlaced	16:9
	1920x1080	30	Progressive	16:9
24-P	1920x1080	24	Progressive	16:9
720-P	1280x720	60	Progressive	16:9
	1280x720	30	Progressive	16:9
	1280x720	24	Progressive	16:9
480-P	704x480	60	Progressive	16:9
480-I	704x480	60	Interlaced	16:9
	704x480	30	Progressive	16:9
	704x480	24	Progressive	16:9
	704x480	60	Progressive	4:3
	704x480	60	Interlaced	4:3
	704x480	30	Progressive	4:3
	704x480	24	Progressive	4:3
480-P (4:3)	640x480	60	Progressive	4:3
480-I (4:3)	640x480	60	Interlaced	4:3
	640x480	30	Progressive	4:3

Table 4-2: HDTV Standards

The formation of the DVD standard was also plagued with delays and multiple formats, especially regarding the "write" part of the standard. The major players in the DVD industry have agreed to a "read" standard under the pressure of the content providers, who naturally prefer to provide content in a standardized format. But since content providers are indifferent to the write standard, they left that to the equipment manufacturers. In fact, incompatible write standards would likely to make piracy more difficult.

4.1.3.3 Competition Barriers

Setting standards will alter the nature of competition in the new convergent industry and this could be detrimental to some players in the traditional industry. Standards could change the competition of the industry by shifting competition away from features toward price. For the convergent industry where the market is huge, it would lead to faster commodization of products or services. The more detailed the standard, the harder it is for each producer to differentiate its product and still comply with the standard.

Therefore, it follows that players in the digital convergence industry may all be better off living some incompatibilities and de-emphasizes pricing competition and focus competition on product features. However, over time, there will be strong incentives for the players to differentiate themselves by developing proprietary technologies and extensions to traditional standards. This will in turn cause even more fragmentation in the new digital industry.

This fragmentation can work both ways for the consumer. It could provide consumers with new features in products that are designed in a highly competitive race to offer improvements and innovations, but flip side would be that incompatibilities can be major source of frustration. Worse, the owner of the proprietary rights could use these rights to control the evolution of technology and the distribution of content under that technology. Of course, the sponsor will seek to capture profits for itself. Historical examples are Sony and Philips, who charged royalties to manufacturers of CD players and disks and by limiting the manufacture of certain enhanced CD players.

4.1.4 Incompatible Industry Structures and Technology Values

The incompatibility of Industry Structures and Technology Values is a major cause of fragmentation and divergence in converging industries. Each of the four industries we identified that takes part in digital convergence has different industrial structures and technological values. This means that:

1. The dynamics of how the stages of the value chain interact in each industry is different and how the industry defines its buyers, suppliers, competitors, new entrants and substitutes, is also different.
2. Each industry has traditionally designed its products and service to cater for specific requirements and values in their respective markets. When industries converge, there will be conflicts in the design of these foundational technologies.

As the markets collide, there will be alignment, adaptations or elimination of values in each industry. It is the disruptive nature of value adaptation and elimination that will create innovations and cause uncertainties in the new digital market. The challenge for the converging industries is therefore to resolve seemingly irreconcilable differences between old industry structures and embrace new values created from this titanic clash of industries.

The problem that immediately arises with the blurring and disappearance of industry boundaries is that the forces that affect each industry begin to interact. Since some industries move and mature faster than others, the "clock speed", as MIT's Professor Charles Fine defines it, of each industry is different.[39] The technologies and infrastructures begin to affect each other like a system of many gears, each gear with its own speed and 'torque'. Some may be more efficient and can be moved easily, while others may be slower and more rigid. Therefore, with each industry's value chain based on different combination of technologies and forces that work at different rates, dissonance begins to emerge.

[39] "Clockspeed", Charles Fine, Harvard Business Press 1999

As an example, let us look at the PC, which is the heart of the IT industry. The industry structure of IT is horizontally aligned. The PC was designed for flexibility in its applications, via software, and that is what makes the PC powerful: it is upgradeable and customizable by the user. However, in recent years, the PC is gradually entering into the media and consumer electronics space. In 2003, Microsoft introduced the Windows XP Media Center Edition, which transformed the PC into a Personal Video Recorder, DVD player, cable TV set-top box, stereo system as well as game console, in addition to being a fully fledged PC. This multifunctional device is threatening to replace every other entertainment devices in your living room. Will it succeed? The Consumer Electronics industry structure and technology design is very different and Microsoft and its partners will have several hurdles to cross. The CE industry is vertically integrated with dominant players, and the commodization forces are strong. Devices in the CE tend to be uni-function, and stress on ease of use, rather than flexibility. Upgradeability and customizability are usually not found in CE devices like television or stereo systems. And the biggest feature for CE devices is that it is designed to function immediately once the power is turned on, a big design conflict against the PC's need to boot and load its software upon startup.

Following, I will explore the major incompatibilities among the four converging industries.

Information Technology	• Horizontally aligned; highly fragmented with Processor and Operating System dominated by two players. • Main buyers' needs are Computing/networking power and access to Internet. Most common applications are word processing and email. • Suppliers are chips and subsystem manufacturers. • Competition fierce among system and component suppliers, lock-in effect is moderate to strong. • Design characteristics: Upgradeability through software and peripherals • Distribution strength: Information and data • Industry clock speed: Very Fast
Consumer Electronics	• Highly vertically integrated; dominated by few players, especially from Japan. Industry with a few standards that are hard to change like TV

	technology. • Main buyer's needs are based on utility. • Competition fierce among manufacturers, lock-in effect is weak to moderate. • Design characteristics: Uni-functional, power-on use, easy user interface • Distribution strength: physical • Industry clock speed: Moderate to Fast
Telecommunications	• Vertically integrated on two camps: handset/system manufacturers; and service providers. Fragmented industry with several incompatible standards. • Main buyer's needs are communication. • Competition fierce among service providers, lock-in effects is moderate to strong. • Design characteristics: quality of service utmost important • Distribution strength: wireless and voice • Industry clock speed: Moderate to Fast
Media	• Vertically integrated. Few dominant players for music, tv and movies who control channels. Publishers are fragmented based on locations, with a few international or national players. • Main buyer's needs are entertainment and information. • Competition fierce among dominant players; lock-in effect is weak to moderate. • Distribution strength: content, cable, satellite • Industry clock speed: Slow

Table 4-3: Incompatibilities of Converging Industries

4.1.4.1 Between Information Technology and Consumer Electronics

Consumer electronics devices are traditionally classified as appliances. Most appliances have certain pre-define characteristics that serve a specific function which they are designed for. For example, a refrigerator or a television has a certain place in the home, and they are usually not multifunctional. Computers were large data processing machines like IBM mainframes, and they have little to do with appliances. Digital technology has brought many changes. Mainframes have been replaced with PCs, and as the era of networking has arrived, PCs have come to serve as terminals for network communications as well. And because PCs now handle not only text data but also graphics and sound, they have come to be regarded as entertainment electronics, similar

to traditional appliances like stereo systems and television. With the invasion of IT into the consumer electronic space, we see characteristics of traditional appliances changing, either enhancing them with more functionalities or substituting them completely. A microprocessor-controlled microwave oven is an example of the former, and a digital camera is an example of the latter, where digital technologies have displaced the old.

The boundaries between the IT and CE industries have blurred, and although there are many successful stories of IT and CE convergence, there remain many dichotomies between the two industries. We shall examine these briefly.

4.1.4.1.1 Fixed Function vs. Upgradeability

In their examination of Internet Appliances, Gillett et al (2001) categorized three categories of devices. Class 1 devices are those that have their functions fixed by the manufacturers. Traditional consumer electronics devices like toasters and refrigerators are examples. Once they are built, they have no capacity to change their functions. Class 2 devices are those which can have their functions changed by software download, but these changes are controlled by the service provider. The service provider offers a subscription service, and in turn determines the functionality of the box, by controlling which software runs on it and when, if ever, the software is updated. Examples are TiVo and Smartphones. The final category, Class 3 devices, are those like Class 2, but the users would control the software updates and ultimately, its functions. Obvious examples are PCs and PDAs.

From this categorization, the conflict in design values between IT and CE industries is clear. The basic design goals for consumer electronic appliances are that they serve the function they are built for and little else. They are not upgradeable. The PC enhances itself through installation software, and therefore allows the user to tailor the hardware to use the application he or she chooses.

4.1.4.1.2 Power On vs. Boot Up

CE devices are built to focus on its utility, and therefore, they are designed to be used upon power up. Computers, at its current incarnation, still requires about a minute to

'boot', where it takes time for its operating system to load. This time delay is usually not acceptable in the CE industry.

4.1.4.1.3 Hardware Centric vs. OS Centric

CE devices are hardware centric. The software is pre-defined and resides on the firmware chip, and built as part of the circuitry. Computer, on the other hand, relies on the operating system software to run all its other applications. The firmware on a computer (the BIOS) is a bootstrap that is only responsible for setting the state of the computer and doing minor diagnostic on the hardware. Its significance is minimal.

4.1.4.1.4 Stand Alone vs. Peripheral

CE devices are usually stand alone devices; they are complete in themselves. There are very few CE devices that need additional hardware. Computers, in contrast require a host of peripherals to extend its functionalities.

4.1.4.2 Between Information Technology and Telecoms

For decades, the worlds of telecommunication and of computing have coexisted in relative peace, each one less or more confined to a separate customer base in the conduct of its core business. The telecommunication industry saw itself centered on the business of carrying life-line quality voice telephony, while the computer industry centered its effort on data processing. Of course, there were encounters and crossovers between the two industries. Computer users relied on telephone lines, and the telecommunication industry employed powerful computers in the delivery of its services. However, these limited crossovers were not seen as threats. On the contrary, both industries saw them as a "desirable cross fertilization." The use of computers in telecommunication provided new revenues for computer manufacturers, and the embedding of specialized computers in telecommunication equipment did not matter because it did not cater to the mass market. On the other hand, increased telephone demand and the desire to feed the "digital frenzy" generated an incentive for new equipment, particularly digital telecommunication equipment.

On the computer side, the continuing increase of the performance/cost ratio has displaced the social focus of computing away from the main frame and to the desktop. This trend has in turn generated the need for computer communication. The local area network (LAN) and the development of network file sharing systems have provided a cost effective compromise between centralization and distribution, while offering economic incentives for alternate communication equipment (routers, edge switches,...). Over time, hardware and software innovations enabled computers to take over the functions of some telecommunication systems, like dialing the phone, picking it up, establishing a conference, recognizing a caller, and much more. This increasingly presents a significant threat to the telephone industry. In recent years, computer telephony has improved to a point where Voice-over-IP is a viable substitute to a circuit switched system. The Computer industry is about to clash into the Telecommunications industry.

What are the incompatibilities between the two behemoths? The author of a recent article, "Bellheads vs. Netheads"[40], observed the differences between the world of telephone service ("Bellheads") and that of computer networks ("Netheads"). The first one is dominated by the tradition of delivering high quality lifeline telephone service under monopolistic conditions. The second one is the home of diversity and free enterprise. Telephony is the prime example of the first, while Internet is a vivid representative of the second. Bellheads and Netheads differ in many dimensions.

4.1.4.2.1 Order vs. Disorder

The tradition of order is almost a century old in the telephone industry. Quality of service was of utmost importance and was implemented by guaranteeing a connection between two communicating people for the duration of the conversation. Circuit switching was a simple extension of the wire connection between two points. In order to operate a network along this principle, the telephone service provider needed order and standardization. This led to large standard bodies both in Europe and in the North American continent. If any competition is possible in the Bellheads' world, it is after standards have been established. ISDN is an outstanding example. Its deployment was

[40] Steinberg, Steve G., "Netheads vs Bellheads," Wired, pp. 203-213, October, 1996.

held for many years because of the slow adoption process of the telephone service companies.

In contrast, the computer industry produces diverse interface protocols, and standards emerge as the result of competition. Netheads' world is hardly a world of order, and changes are frequent. Netheads do not particularly like quality of service, because they do not see themselves as supporting services. They are more interested on quality of output because their main customers are using their products to process data.

4.1.4.2.2 Centralized solutions vs. distributed solutions

In the telephone industry, processors are embedded in the network and the approach to dependable communication is based on a control of the entire path between two communicating parties. The need to control the entire path originates from the telephone service provider's responsibility for providing an end to end service.

The computer networks are based on a decentralized approach to service, and the virtue of such a network lay in the distribution of clients and servers. In this environment, communication is the result of continuous negotiation, and the end points are largely responsible for their welfare.

4.1.4.2.3 Circuit switching vs. TCP/IP

The telephone network requires the establishment of a complete path before the communication can start, and failure to secure a path will abort the communication attempt. Once established, the path remains fixed for the duration of the communication. This is the result of a commitment to service quality during a call. The call will not start if quality cannot be assured.

In the computer network, Internet for instance, the communication protocol TCP/IP will link two communicating points through a path which is variable both in geometry and in capacity. Communication will start with the attempt to establish a link, and communication quality and speed will be determined as a result of free contention.

Quality of service is largely determined by the correctness of the data transferred rather than its timeliness.

4.1.4.2.4 Traffic control vs. adaptive routing

In order to provide enough capacity for peak traffic, the telephone system designers rely heavily on traffic predictions based on a statistical characterization of the expected loads. Indeed, it has been shown that the incoming rate of demand for communication obeys Poisson distributions which are easy to manipulate and support predictions well. This prediction modeling has enabled the industry to provide the necessary communication paths within the context of global traffic management, which allows the network operators to direct traffic away from congestion points.

On the other hand, computer network is bursty and unpredictable at any level of granularity. As a result, data is transferred by using adaptive routing during communication. The Internet packets are not bound by real time guarantees.

4.1.4.2.5 Connection Billing vs. Subscription Billing vs. Content Billing

In the telephone network, billing is a major activity which secures the revenue for the continuous operation of the telephone system. The economic paradigm is simple: the value added is the connection (hosting) and the contents have no commercial value for the service provider. Therefore the connection is the central commodity.

The advent of computer networks, and more particularly of Internet, is posing unprecedented and significant billing and revenue challenges. First, the economic value has moved away from the connection toward subscription based and content based billing. In addition, the computer network connection utilization pattern is different from that of the voice. As a result, the connection pricing which assumed a short average line holding time for telephony becomes inadequate in the world of computers, which remain connected to the network for much larger amounts of time.

Many Internet broadband providers are providing services through subscription billing and content billing. In subscription billing, users have unlimited connection time and are

billed for a fixed monthly fee, and in content billing, users are charged for the amount of data transferred. This trend is set to continue and increase as broadband adoption rise. As more media providers offer their content on broadband Internet, content billing will likely be the dominant way of capturing value in the converged industry.

4.1.4.2.6 Mostly Hardware vs. Mostly Software

The establishment and the maintenance of a telephone communication path is largely the result of a hardware solution built into specialized and expensive equipment. In addition, the dependable execution of services is determined by an array of software techniques embedded in the central office switches. This approach to dependability is the cornerstone of the guaranteed delivery of service quality.

On the other hand, computer networks are constructed largely in software and hinge on the strength of the operating systems. The dependability of the services relies on the increasing robustness of modern computers and the relative ability to isolate individual computing nodes. Since most of the communication has no significant real time requirements, the dominant requirement is that of correctness, rather than strict timeliness, of the information being transferred.

4.1.4.3 Among Media, Information Technology and Telecoms

The fundamental technologies that traditional media like print and broadcast are based on analog standards in the frequency domain. In recent years, more and more media re transported over digital data lines. Digital standards like MPEG have enabled dramatic strides in the number of channels available through digital cable and satellite, and have improved the quality of media through DVDs. Digital technology advances in the wireless telecoms arena are beginning to transport digital media. What are the conflicts in values among these three fundamentally very different industries?

4.1.4.3.1 Passive Consumption vs. Interactive

The user experience of consuming traditional media like print, television and radio is, in essence, a passive experience. Information is pre-packaged or edited, and then

broadcasted and distributed to the user who would receive it by flipping the channel or the page. Communication in traditional media is a one-to-many push model. In contrast, the natural mode of consuming information in IT and telecoms is interactive. Information consumption in these industries is based on communication, whether it is through data like browsing web pages or through voice as in talking to a friend on a phone.

4.1.4.3.2 Content Centric vs. Data Centric vs. Connection Centric

Content producers are sensitive about how their content is presented and consumed, as they see their productions as personal expressions of art. The correctness demanded by the content producers is not just about getting the information across, but also getting the presentation of the content to be delivered as designed. In contrast, the IT industry's focus is on purely the correctness of data, and the Telecoms industry is on the quality of the connection.

4.1.4.3.3 Protection of Content – Who's Responsibility?

The conflict among content providers and technology companies on who should encrypt digital television transmission is a case in point on the tension between the IT and Media industries. In December 2002, an IT Coalition told the FCC that device makers should not bear the main burden of protecting TV content as the industry switches from analog to digital broadcasts. Rather than force equipment makers to include technology for scrambling signals on the receiving end, as the FCC's plan suggests, the group argued that broadcasters should be required to scramble signals before they're sent.[41] The main fear of movie studios and broadcast networks is that their ownership of creative works will be compromised in an age where people can find virtually any song through peer-to-peer networks such as Morpheus and Kazaa. Hollywood does not want to see a repeat of the music industry's file-swapping woes on its own turf, and they've turned to lawmakers and regulators to mandate anti-piracy standards in order to avoid being "Napterized". However, that has led to a backlash from technology companies, some of which have criticized Hollywood for seeking to implement regulations that they believe will hurt

[41] Hu, Jim, *IT critical of digital TV rules*, CNET News Report, December 9, 2002

consumer adoption of digital media in the long run. The movie studios, however, argue that broadcast encryption could prevent current digital TV owners from receiving digital signals, causing a legacy problem. More significantly, encrypting from the broadcast side would hamper the release of digital broadcasting.

The conflict among the IT, Telecoms and Media industries rests basically on the differences of how each side views digital technology. The IT camp, in particular, argues that regulations should not dictate product innovation. Many executives in the IT industry believe that once a program is recorded, consumers should be able to view it anywhere in his or her domain, whether on a DVD player, a PC or any other device. On the other hand, the Media camp recognizes the lucrative possibilities of interactive programming and other enhanced video services. However, they are careful not to cut themselves out of any new business resulting from the next generation of TV set-top boxes, high-definition programming, digital cable systems and wireless networking systems being developed as television, computing and entertainment increasingly converge in the home. Yet, they are dismayed by the non-collaborative stance of the IT industry to help protect their content from digital violations. "At least one high-tech executive has described illegal pirate content as a 'killer application' that will drive consumer demand for broadband," Eisner, chief executive of Walt Disney, said in testimony before a Senate hearing on copyright violations. "Unfortunately, other high-tech companies have simply lectured us that they have no obligation to help solve what they describe as 'our problem.'"[42]

4.2 Disruptions in Digital Convergence

In order for the visions of digital convergence can be realized, both content and channel infrastructures for creating and delivering value need to be in place. With the three industries clashing into each other in digital space, the immediate effect of this interaction is that it creates a disjointed value chain, which causes great instability and uncertainty in all three industries. Just as the IT and Telecoms industries progressed by leaps and bounds with fairly high clock speeds through rapid innovation and technological

[42] Hollywood sets stage for piracy battle with PC industry, CNET News Report, August 7, 2002.

disruptions, the media industry becomes the laggard as an economic behemoth with a far slower clock speed.

Traditional media players like publishing and broadcast have the value chain locked down for years. They are mostly vertically integrated industries, where specifications for technologies like newsprint, radio and television have reached their dominant design and so fundamentally, they do not change. This technological consistency has provided the stability necessary to facilitate process innovation and improvement. Over the decades, traditional media firms have progressively improved their production and distribution processes. Even though broadcast technologies shift from terrestrial to cable, and even to digital cable, and publishing technologies migrate from hot-plate to computers for typesetting, the basic processes of producing, packaging and distributing content remain constant. Further, in the 1980s and 1990s, digital technology was used to improve and enhance production by creating richer content through technologies like digital storage, computer networks and computer graphics.

Sadly, as mature industries, traditional media firms' ability to innovate both product and processes are ironically limited by their successes. By sticking to the 'formula' that makes the most economic sense, they are slow to respond to any radical technological change that might occur. MIT's Jim Utterback states this well in his book "Mastering the Dynamics for Innovation". Based on historical studies of innovation in their organizational, technical, and economic settings, he examined the lighting, typewriting, ice, plate glass and imaging industries, and drew a conclusion that "established firms were slow to adopt radical technologies as they appeared." The main reason, he argued, is that as an industry's scope of business becomes more specific, greater reliance is placed on the use of specialized and expensive equipment, as well as competences that the firms possess. Innovations that require alteration of the production system and processes become very expensive.[43]

[43] Utterback, Jim. "Mastering the Dynamics of Innovation". HBS Press 1994.

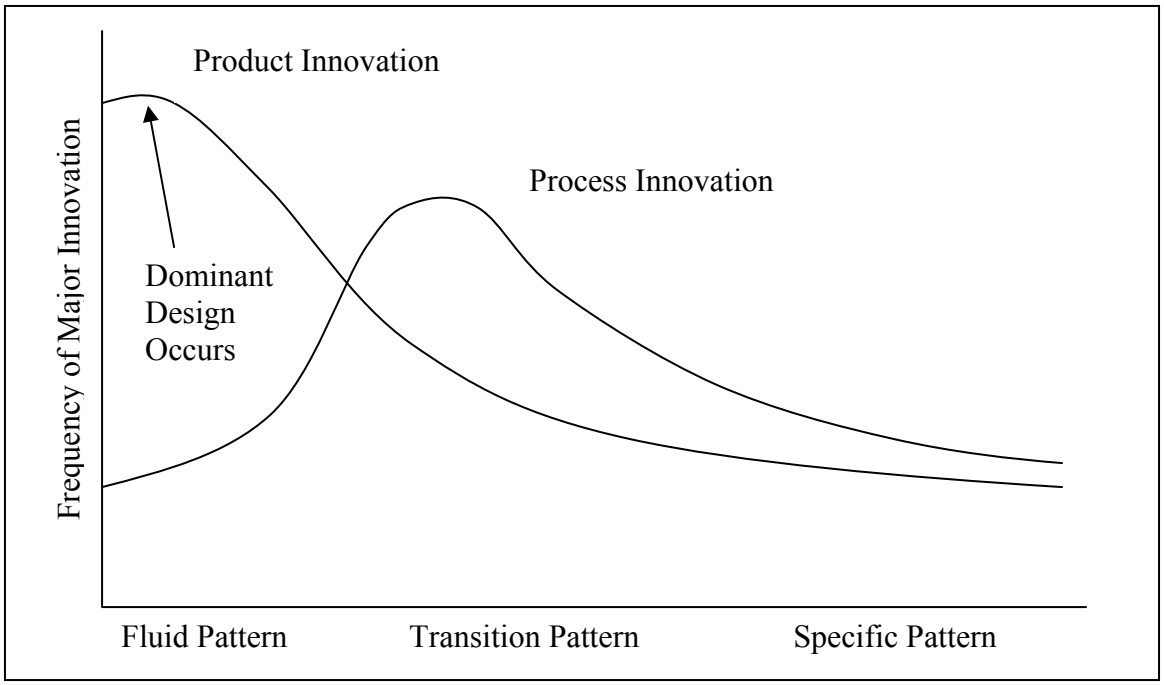


Figure 4-5: Patterns of Innovation. Source: Utterback's Mastering the Dynamics of Innovation.

Donald Sull from the London Business School calls this change paralysis of firms as an "Active Inertia", which suggests that firms are caught in the tendency to follow established patterns of behavior – even in response to dramatic environmental shifts.[44] Sull identified four hallmarks of 'Active Inertia': Strategic Frames turned into Blinders, Processes become Routines, Relationships with suppliers, employees and shareholders become Shackles and Values that define shared belief and determine corporate culture are hardened into Dogmas.

With digital convergence, it is easy for traditional media companies to fall into 'Active Inertia'. In fact, this is the story of Napster. Faced with a radical distribution system for music, RIAA and other music juggernauts ignored the rigidity of their old but highly profitable value chain, and decided to pursue arbitration to stop the technological innovation. Does the rest of the media industry face similar rigidities in embracing digital technologies? Although it is understandable that content providers would only pursue digital technologies as a valid means of content distribution if and only if their

[44] Sull, Donald N. "Why Good Companies go Bad", Harvard Business Review Reprint 99410

rights can be protected, the facts highlighted in this chapter seem to indicate that they are also bounded by their organizational rigidity of Blinders, Shackles and Dogmas.

4.3 Convergence in Digital Divergence

As the world sees the rapid expansion on the number of households owning a digital television, a mobile phone and an Internet-connected PC, content producers will be hard-pressed as they balance their time and money between the profitable old world and the emerging new world. With the divergence of digital convergence, perhaps the true economic advantage is not derived from meeting the needs of this diversity of digital channels, but to facilitate cross-platform management of customer relationships – regardless of the type of networks those customers inhabit or the kind of content they consume.

The significance of "consumer convergence" will likely be the key to competitive advantage in the digital age. True digital convergence is likely to be many years away as it faces considerable cultural and technological hurdles. For the time being, content producers have to accept that fact that it is impossible to have "write once, run anywhere" content that runs across the Internet, interactive television and your mobile phone. For example, there are currently 27 different interactive middleware standards in Europe alone. Until we see a standard becomes dominant, content producers will have to continue to cater to this fragmentation.

The conclusion to bear here is that many of the perceived values of convergence are actually years away. If anything, digital convergence has brought greater fragmentation of service and divergence of channels in the industries.

5 Causal Loop Modeling and Scenarios for the Convergent Media Industry

This chapter describes a framework that models the dynamics of media producers and the emergence of new devices and new forms of media consumption. The questions it tries to answer are: What are the dynamics of the converging industries? How would its drivers interact? And what kinds of scenarios will play out in the future that might affect media producers?

A system dynamics[45] model is used to simulate the new digital media industry, describing the interactions of participants in the phenomenon of digital convergence. This model is then used to generate a number of scenarios that describe possible paths of evolution that could bring about the restructuring of the industries. Although this model might not capture the complete complexity of the dynamics in as much details as it should, I will attempt to highlight key variables that might be sensitive, in particular to the media industry.

5.1 The Causal Loop Model

The complete system dynamics model is displayed in Annex A. In this section, I will break the model down into segments, each corresponding to a feedback loop, in order to analyze the interactions of the key variables. The five segments are:

- Creating Value with New Media Content
- Switching Costs
- Stickiness of Old Media
- Protecting Copyright
- R&D of New Content

[45]Sterman, John D. *Business Dynamics*. 2000

5.1.1 Creating Value with New Media Content

Figure 5-1 shows the causal loop diagram representing the consumer demand for new media content. The driving force of this reinforcing loop is the value of the content to the consumer (as discussed in chapter 2). This factor determines the overall demand for new content, which in turns, determines the ability of media producers to monetize their products and services. The ability to equitably share profits among participants of the value chain would depend upon the emergence of new business models and the dominant environment for the new media industry. With the increase in profitability, the environment would create the incentive for innovation and will spur parties involved to invest in the production of new media content. More development of new media content materials will improve its quality and quantity, which in turn, will increase its attractiveness. This will loop back affect the value of the content to the consumer.

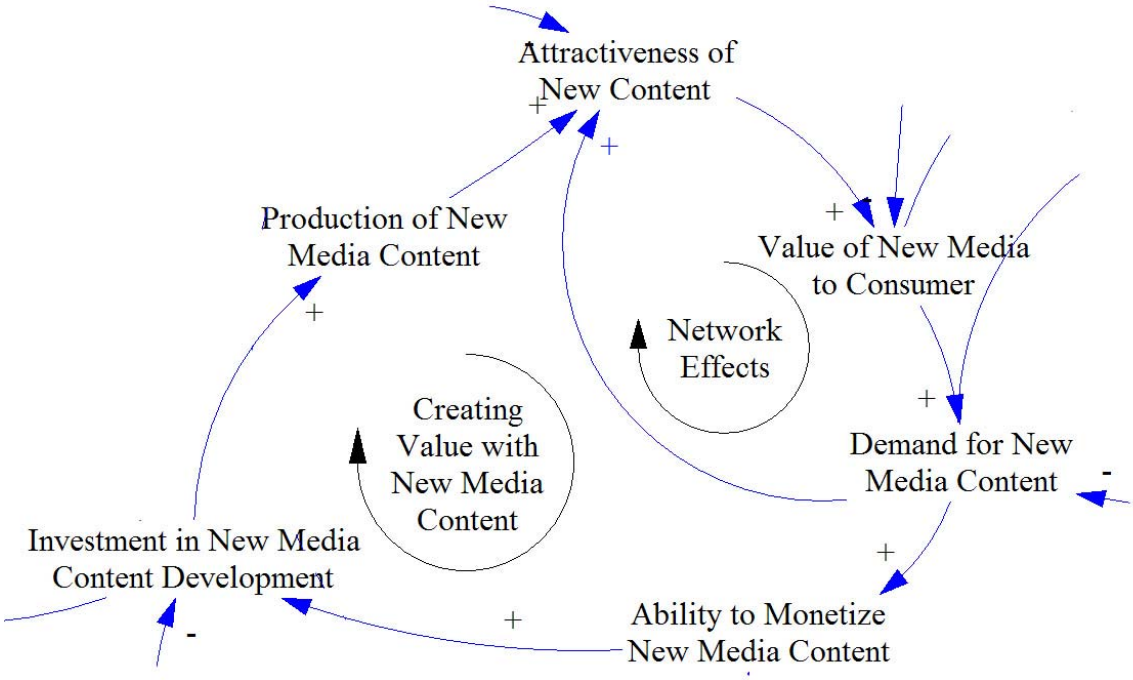


Figure 5-1: Consumer Demand for New Media Content

Within the Value Creation loop, there is a Network Effects sub-loop that serves to reinforce the primary loop. Network Effects or Network Externalities, based on

Metcalf's Law as explained in section 2.2.2., creates a multiplier effect to the Value Creation loop.

5.1.2 Switching Costs

The willingness for consumers to change consumption habits is a major factor in determining the demand for digital media content. When the demand of old media content is reduced due to a willingness of habit change, it creates a substitution effect, thereby increasing the consumption of new media. The other driver for new media demand, the value of new media, creates an increase in the total media consumption from the consumer.

Another factor that drives habit change is a social one. Word-of-mouth also creates a 'network effect', which helps users to want to consume the new media because others are doing so, or that adopters are helping new comers to learn and appreciate the new media content. This invisible but power effect can create greater awareness of the digital media, and at the same time, shifts consumer's attention away from old media. Of course, the value of the digital media itself, if substantial, could also induce a habit change. The total price of consumption, which consists of costs associated with buying the new content, the price of the new channel, and the price of new devices in order to consume the content, adds to how consumers perceive value. This dynamics would capture the 'switching costs' required for consumers to adopt new digital content that results from digital convergence. Figure 5-2 illustrates these dynamics.

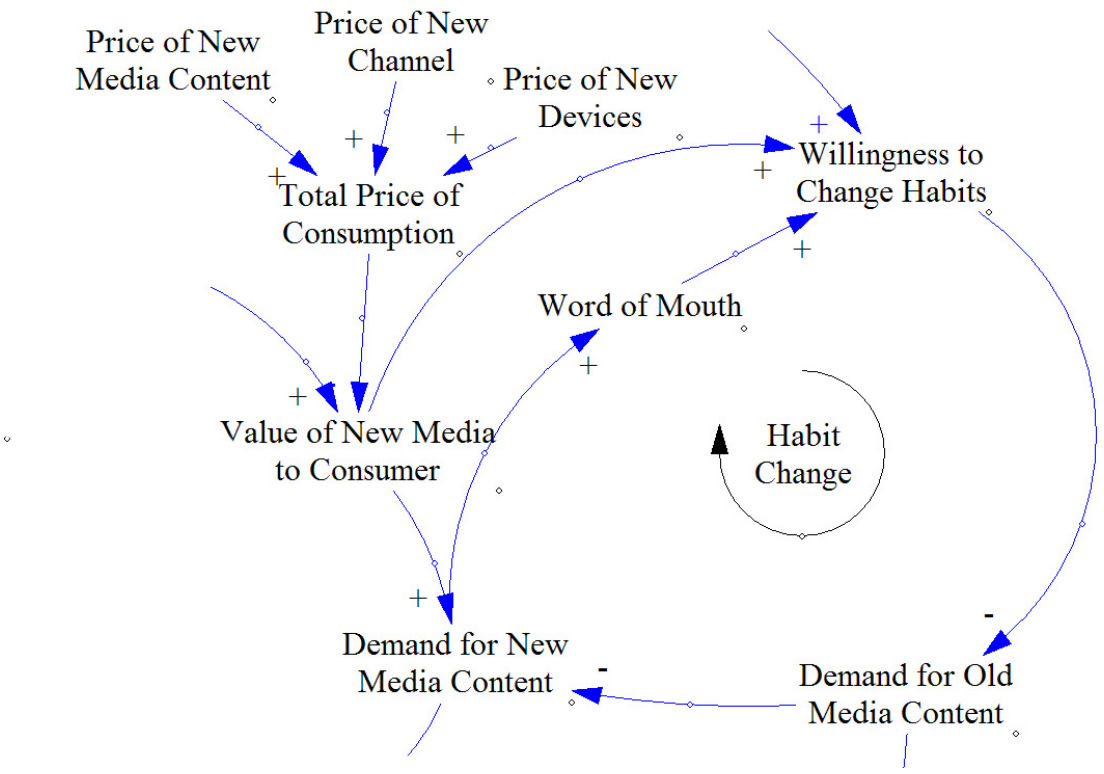


Figure 5-2: Dynamics of Switching Costs

5.1.3 Stickiness of Old Media

How sticky old media becomes when digital media arrives depend on the demand for it, as well as the profitability in the old media space. If media provider's main revenue source is to originate from producing old media, their incentive to invest in development in new media content will likely to be diluted. Media organizations that rely on media production processes will need greater incentive to change if the new media do not show as much profitability as the old media. As such, the continued success of old media and organizational rigidity could inhibit investments in developing new media content.

Inversely, if the take up of New Media is successful, the consumption of old media is likely to be affected. For example, as illustrated in chapter 1, the cannibalization of time spent in traditional media like television is reduced due to the substitution effect of new media like the Internet. (See Figure 1-2).

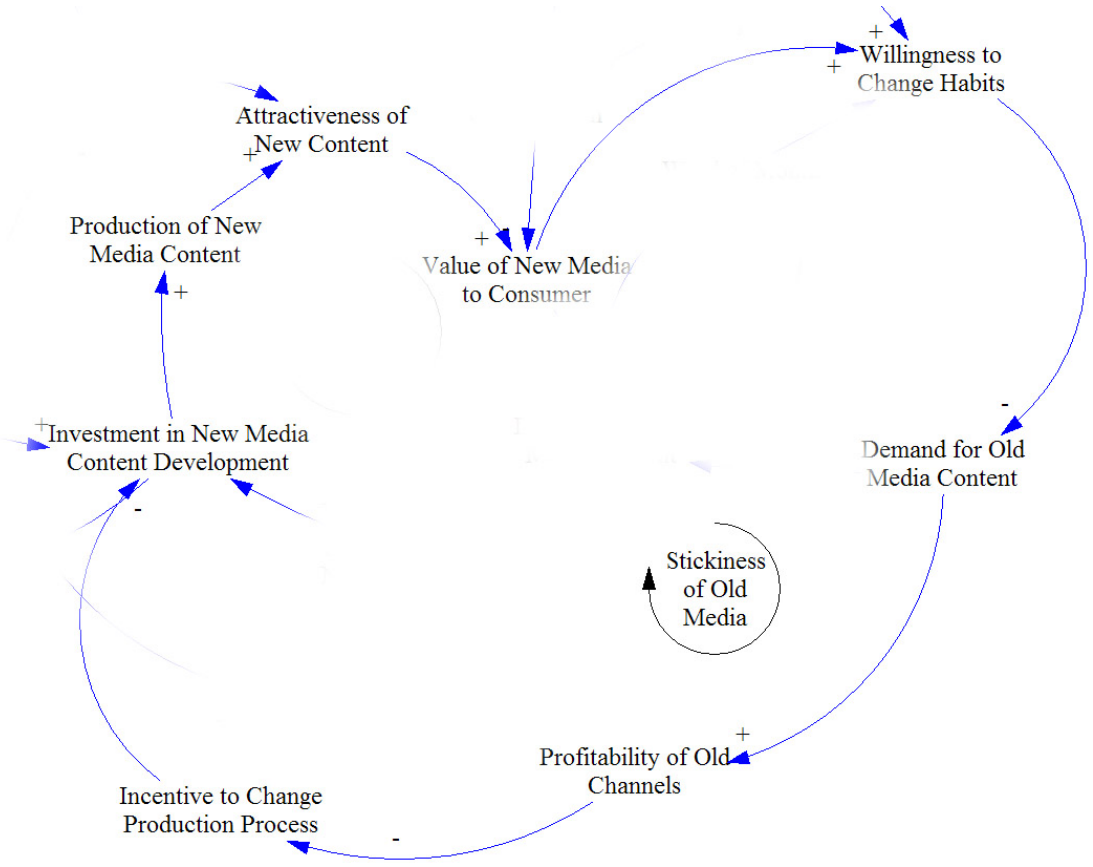


Figure 5-3: Stickiness of Old Media (Organizational Rigidity)

5.1.4 Protecting Copyright

The ability to protect the authorized use of digital content is one of the utmost concerns of media producers. And strong copy protection lies on a key factor: the ability for industries to collaborate. Converging industries need to overcome its discordant industry structures and technological values and work together to form standards that create seamless protection of content throughout the value chain. Once piracy is reduced, value can be capture and profitability can increase. These profits will lead to greater investment in developing content for digital media. If, however, the collaboration falls through, not only would they lose profitability, but also fragmentation of standards will result. Although regulator facilitation will help to reduce the chances of fragmentation, competition and the absence of dominant standards may also result in a highly

fragmented industry. In which case, the multiple incompatible standards may confuse the market and will make new media content less attractive.

One other possible side effect of a lack of strong copy protection is the increase in demand of new media content. Since new digital content are traded at a low cost, their market demand could dramatically increase. Though cost of media is low, the degree of surge will depend the other factors of consumption cost, like the price of the new channel and the new device that are required to consume the media. The set back in this demand boost is that it will not increase the investments on developing digital content due to the inability for media producers to capture value. Figure 5-4 captures this dynamics.

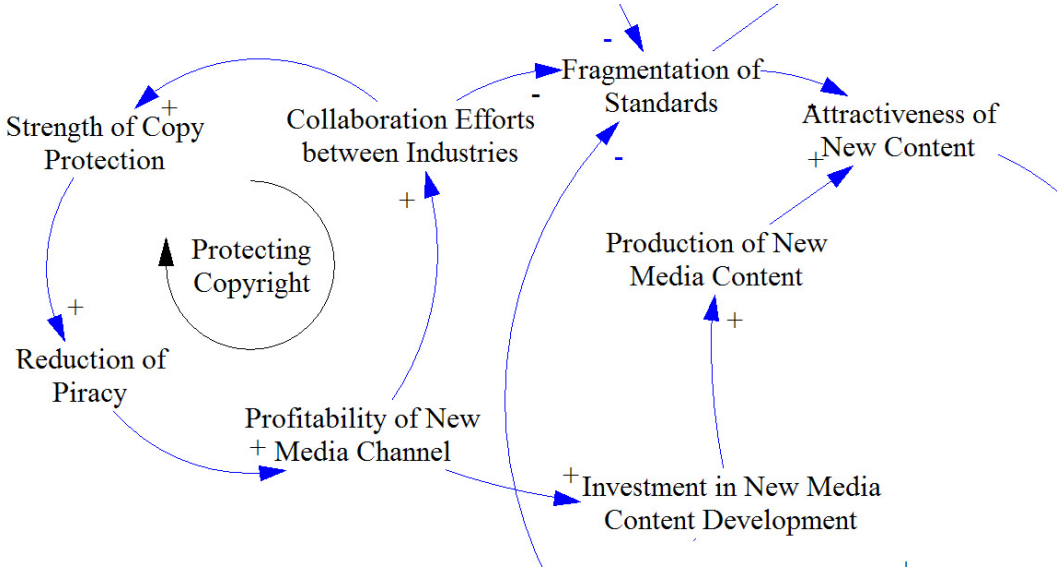


Figure 5-4: Protecting Copyright

5.1.5 R&D of New Content and Devices

Investment in New Media Content Development is not just about production of new media content, but also the R&D needed to develop ways of making new media content and devices more acceptable and palatable for consumption. The ease of use factor in digital content consumption is of key importance to the attractiveness of consumption method. Consumer's willingness to change from old media to new media will hinge on the total switching cost. Since the digitally converged industries do not solely depend on

content providers or the devices, but also on highly on other industry players, the attractiveness of the quality of service by data infrastructure providers will be paramount.

Converging industries must therefore collaborate ensure that the content, context and style of the digital media are effectively presented. The key success factor lies in the ability to use the new innovations in the technology to tell the story better and present it in a more powerful way than ever before.

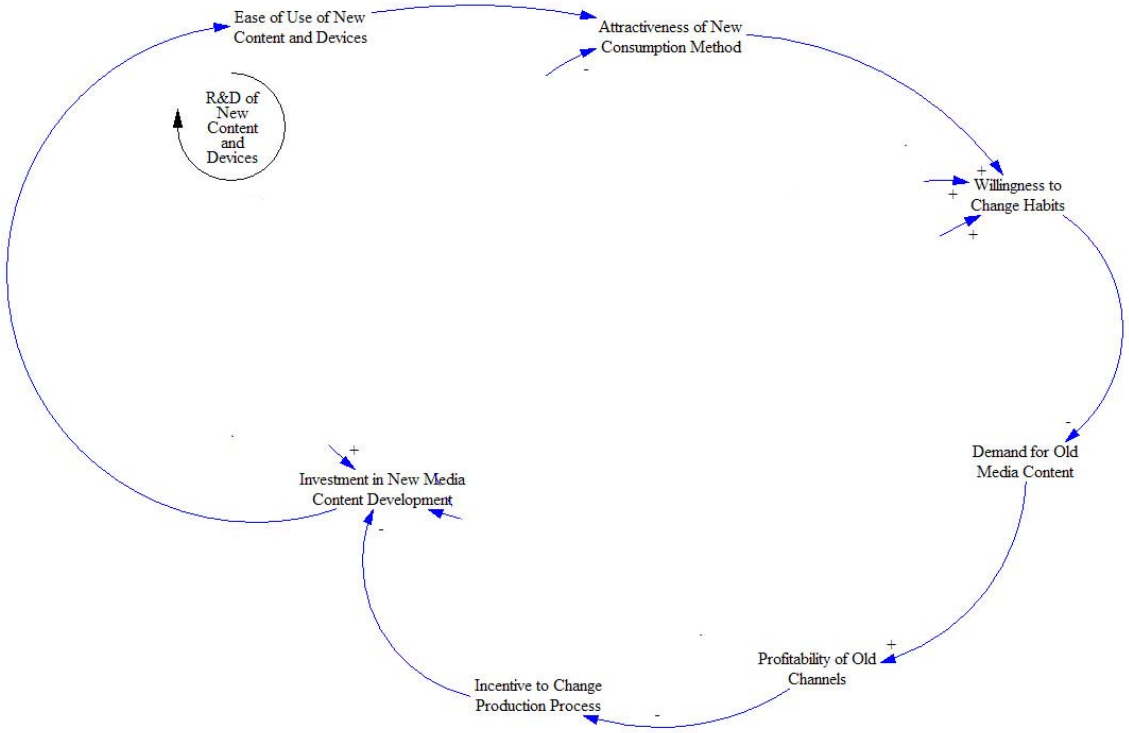


Figure 5-5: R&D in New Content and Device Development

5.2 Scenarios

This section outlines four different scenarios regarding possible future directions of the converging industries and digital media value chain. In each scenario, a different driving force begins a chain of events, which impacts the structure of the industry.

5.2.1 Scenario #1: Low Take-Up of Digital Media

This scenario projects a situation where a low broadband take-up could mitigate digital convergence. In such a case, channel access prices to digital media remains high. Data pipeline to majority of users are narrow, therefore media providers are restricted to delivering content that requires low bandwidth to consume. There are relatively lower investments in technical development and marketing, and content does not develop into compelling multimedia. This leads to less attractive content delivery compared to traditional media. The slow take-up rate puts a limit on demand as consumers are not willing to substitute traditional media with new media. Eventually, the lack of margin and lack of consumer volume will hit cash flows.

On the distribution side, broadband competition will continue to be dominated by cable and DSL. There are limited investments in the extension of existing DSL/cable network, 3G, satellite. Low-cost WiFi might make good head start, but its use is limited to file sharing, web browsing and email use. Traditional media channels are still the primary way consumers receive information and entertainment. No dominant new media environment emerges, and therefore, media providers cannot find a way to capture value successfully.

5.2.2 Scenario #2: Industry Integration – Full Collaboration

There is full collaboration among content provider, service providers and device makers, such that content is protected throughout the value chain and value is captured. Digital content becomes increasingly attractive, and with low prices, consumers see high value in consuming digital content. A network effect builds with intensity as more demand begets greater attractiveness of content. Consumers begin to move steadily towards satisfying their information needs through broadband, digital media. Prices to access channels fall, and reductions in cost are passed on to the consumers. Telecommunication players, seeing high take-up of digital media and broadband, begin to invest heavily into wireless network, especially in 3G/4G and WiFi technologies. Media providers continue develop compelling multimedia content for entertainment and education on multiple platforms. Traditional media consumption begins to fall as substitution economics take over. SMEs,

in particular, begin to be attracted by low cost, industrialized standardization and the ease of use -- much like the factors that affected the adoption of Electronic Data Interchange (EDI) and e-Commerce. Once SMEs see productivity benefits from broadband and convergence, their take up rates take a boost.

Over time, the success of digital technologies and the wide availability of high quality media content influence the development of an integrated network between cellular, RF and satellite networks to increase quality of service. Investments into R&D improve any to any access devices. Critical mass of subscribers to digital content achieved. All major players throughout the value chain are profitable.

5.2.3 Scenario #3: Industry Fragmentation

In this scenario, digital convergence does not happen. Instead, fragmentation rules, as the digital industry remains fragmented both horizontally and vertically. Standards remain diffuse, and there are many variations of hybrid devices that try to merge the PC, television, game consoles and cell phones. Due to the lack of standards, media providers are reluctant to produce digital content and stick to investing more in traditional content. Due to a diversity of standards and devices that lead to consumers, media owners are split on which standards they should embrace. Major media owners are able to straddle all standards backed by the bigger players, but resources are stretched thin, and most content are repackaged. As there is little standard and collaboration between industry players, there is no foolproof copy protection to ensure digital content cannot be pirated. Media providers are reluctant to put their best works in digital.

Consumers' habits are not moved because there are no compelling content, and they are confused. The PC continues to be the interactive platform of choice, and the Radio and TV is passive. Revenues for traditional media continue to be strong. Telecommunication providers continue to rely main on voice traffic for its revenues. Data traffic continues to pick up, but is limited to text messaging and low bandwidth data transfers, as transmission costs remain high for high bandwidth content.

Companies that bet heavily on digital convergence face severe financial challenges. Failure to manage debt for these firms, who are major players in their traditional industry, would make long term strategic management of the difficult for the newly converged industry.

5.2.4 Scenario #4: Industry Integration – Few Dominant Players

There is a consolidation of infrastructure among companies in each disparate market. Economies of scale are generated, especially in marketing and service provision. There is greater alignment vertically in the digital industry as dominant companies in each traditional market builds their own individual media empire, each focused on their view of convergence. Telecommunication giants are bought over or merged with content providers. Computer manufacturers and device makers begin to consolidate. Eventually, the entire value chain from content production to distribution and device manufacturing is controlled by a few dominant cash-rich players. There are a few dominant standards and each has their own unique way of protecting copyrights. Consumers need purchase devices, channels and content from all players to consume the same kind of media. For example, a typical home could have three different set-top boxes provided roughly similar functionalities, but they are all required for the complete breath of content offerings from all three separate but vertically integrated content and service providers. Consumer demand will increase but not as much as most hoped for.

5.2.5 Implications of Scenarios

This analysis of scenarios I have described show that collaboration among the industries are crucial in forming a more well-defined digital industry to protect copyright as well as making digital content more attractive to consumers. Fragmentation of the industry or even in a case where few dominant standards reign do not deliver and capture as much value as they should have. Ultimately, technology is an enabler and a tool. It is imperative that the industries of IT, CE, Telecoms and Media to work together to create value that will be equitable to all, from producers to consumers of digital media.

6 Strategic Recommendations

> ”No one pours new wine into old wineskins. If he does, the wine will burst the skins, and both the wine and the wineskins will be ruined. No, he pours new wine into new wineskins, and both are preserved.”
>
> - Matthew 9:17, The New Testament Bible

There are two kinds of new businesses in digital convergence. Those that start from scratch that focus on creating new forms of media and new business models; and traditional firms that continue to operate and reap profits in their respective industries but have made a commitment to a new business model implemented through a new division or subsidiary. Both types of ventures face similar challenges in digital convergence, but their resources and history put them in different competitive positions.

One of the advantages of start-ups lies in the fact that investors do not seem to require an immediate profit, whereas the divisions or subsidiaries of traditional firms have higher expectation of earnings and may have less tolerance of extensive losses. Further, few traditional firms can withstand massive change in the restructuring of its processes to embrace new ways of producing or delivering content. Weak intellectual property regimes, ‘active inertia’, lack of standards and shortage of compelling value-added content or services create barriers to adopting new technologies. In turn, it becomes difficult, if not impossible, to develop new business models that can provide sustaining competitive advantages in these new intersecting technologies. Chances are, new start-ups are better poised to learn, adapt and change their products and processes rapidly in this highly dynamic and uncertain industry environment. Alfred Chandler (1997) in his examination of the computer industry in the later half of the twentieth century observed that established companies in electronics have fared less well than start-up firms, compared with other major industries like chemicals, pharmaceuticals, and aerospace.[46] Chandler further observed that after each discontinuity in technology, there were always a few large incumbents that retained significant status across technological generations. Where computer incumbents like GE, RCA and Honeywell lost to new pioneers like Sun

[46] Chandler Jr., Alfred. The Computer Industry: The First Half-Century. HBS 1997.

and Apple in the dawn of the PC industry, traditional firms like IBM, DEC and HP retained significant positions. Similar dynamics can be expected in digital convergence because the clash of industries requires firms to master a far broader array of technologies that they currently possess. Often, such demands extend beyond their sphere of competence, and therefore it is difficult for incumbent firms to significantly change their products or processes to cater for emerging markets. New innovative media products and services will therefore likely to be pioneered by start-ups. When the shakeouts begin, we can expect to see acquisitions and consolidations of businesses, both large and small, amidst a sea of red ink.

This chapter describes some potential strategic actions that could be taken by firms, both start-ups and traditional firms, within the digital media value chain in the light of digital convergence.

6.1 Digital Strategies

In his book *Competing in the Age of Digital Convergence*, Yoffie (1997) proposed a series of strategies for digital convergences with an acronym of CHESS. The CHESS strategies focused mainly on the computer industry as Yoffie assumed that computers have emerged as the dominant access and manipulation device for digital information. His CHESS strategies proposed firms to:

1) Exploit "Creative Combinations" of old and new technologies and channels of distribution.
2) Provide "Horizontal Solutions" as the industry structure of digital convergence will likely to be fragmented horizontally like the PC industry.
3) Leverage on "Network Externalities' to set global standards.
4) Reach large economies of scale within core horizontal businesses, and find ways to tap economies of scope into adjacent markets.
5) Adopt "System-Focused Processes" which allows for a broad vision and for new information to be integrated into the product design and development iteratively,

as well as to focus on tight integration of the entire project rather than its component pieces.

Timothy Todreas (1999) proposed another view of strategy for digital convergence.[47] He recognized the commoditization of the media conduit and a "Great Value Shift", where massive profits can no longer be expected in digital distribution, but in content production. Todreas denounced two popular strategies which traditional firms try to embrace in digital convergence: the attempt to create a bottleneck through domination of the set-top box, and the creation of content/conduit combines. He argued that the set-top box is another form of creating a digital portal for television, which rests on the flawed notion that value can be retained by packaging alone. As for the content/conduit combine, Todreas argued that there is no shortage of distribution in digital convergence, and that it is impossible for a distribution company (which fundamentally a technology company) to manage a content company. The reason: it does not make strategic sense for the distributor to own content and withhold it from other competitive distribution channels. Content owners would want their productions to be distributed to consumers through as many distribution channels as possible. Further, vertical integration is notoriously difficult to implement between disparate industries. For example, the merger of AOL and TimeWarner was fraught with complications and had not produced any synergies or additional value that the merger had promised. Even a speculation in 2003 of a possible merger of Apple Computers and Vivendi Universal Music was met with skepticism as investors did not see any promises of synergy between technology and media companies.[48]

With all these potential pitfalls, Todreas proposed that industry players need to look for the bottleneck -- that part of the value chain that will have the fewest players and most critical role for users. He suggested that with the expanding universe of available content, producers of quality content will become scarce, and consumers will have little time and patience to filter and integrate the massive amounts of non-relevant information.

[47] Todreas, Timothy M., Value Creation and Branding in Television's Digital Age. Quorum Books, 1999.
[48] Martell, Duncan. "Apple Share Falls over Universal Talks", Reuters News Report, April 11, 2003.

Therefore, the winner, Todreas suggested, will be the packager if it can succeed in becoming a "digital brand" which is recognized as the filter or packager of the best content for the consumer. Unlike the strategies of the set-top box or content/conduit combines, this strategy asserts that companies that succeed will be the ones that could exert outstanding editorial values in filtering content, and rapidly create the strongest brands that consumers will rely on because they trust them, understand them and like them.

Another reason why digital branding is important in digital convergence, Todreas argued, is that it is often difficult and costly to capture consumer's attention in the crowded and overwhelming informational mess. This is where traditional media firms have the advantage over start-ups. Take for example the Internet. The idea that the Internet is a truly diverse and democratic medium is somewhat of a myth. In fact, the Internet more and more resembles its traditional off-line counterparts, especially in terms of consolidation. True, anyone can "publish" or "broadcast" their voice on the Web, and the infrastructure barriers to entry are low, but to make that voice heard is another matter— a very costly matter. And not being part of a network, the shortage of substantial resource backing and the lack of traditional media cross-promotion are grave handicaps in this new market. This trend has absolutely been fueled by the shakeout of 2000—one company's loss has been another one's gain, where acquisition frenzy of wounded sites abounded. But the reality is that the Internet looks like a hodgepodge of print publishing, computer, broadcast and cable worlds. Of more than 10,000 magazines, fewer than 100 have a circulation of one million or more. Of hundreds of broadcast and cable channels, fewer than 30 can claim national notoriety with a critical mass of users. Like traditional media, the commercial Internet, and similarly in digital convergence, are seeing the same sort of consolidation—in their own diverse way.

With that, I will explore in the following sections the possible strategies for content producers, packagers, distribution network providers and advertisers to strengthen their competitive positions.

6.1.1 Content Producers

There are several strategic actions which content producers, regardless of size, can undertake to improve their position in the converging industries. First, content producers need to actively participate in developing new digital innovations and boldly experiment with capabilities of emerging technologies. They have to recognize that going digital is not an option, but a necessity for long term survival. To digitalize does not only mean leverage on digital technologies for their production processes of traditional media, but also to deliver new experiences and new content based on the possibilities that digital technologies bring to the consumer.

Many creative movie producers like Stephen Spielberg and George Lucas set new heights in film-making due to their willingness to embrace risk and try new technologies. Their pioneering efforts in filmmaking have inspired more and more Hollywood studios to attempt synergy between theatrical feature films and digital technologies. George Lucas, in particular, took bold steps in filming and presenting the Star Wars prequel trilogy entirely in digital film. Such bold attempts have potentials of revolutionizing the entire industry.

Second, it is important that content producers localize their content. The commoditization of digital information (4.1.4) will lead to faster expiry of breaking news and real-time data. As we have seen in *Google*'s new aggregation engine (4.1.1.4), the rapid improvement in computing will automate highly routine and algorithmic tasks. The way to differentiate and create real value is to focus on unique niches. Making content localized and contextual will involve human judgment. Editorial power that understands emotions, human psychology and the dynamics of society will be very difficult, if not impossible, for machines to duplicate. Outstanding editorial judgments and critical news analysis, like those of the *New York Times*, will continue to be valued and much sought after.

Third, content producers need to produce more content that fit the consumption experience, rather than rely on the repackaging old content. (4.1.1.2) Value creation is

maximized when content is produced specifically for the device that is designed to consume it. The user experience for each traditional media type is different: reading a newspaper and watching television news are wholly different experiences, yet they co-exist. Why then should media producers see new forms of emerging technologies similar with the old, or with each other? Although repackaging of content serves to maximize economic benefit from the same produced media, it under utilizes the new technology. Imagine what television news would be like if newspaper articles are merely repackaged to fit the television screen. We will just see text and photos on television, rather than the vibrant videos and animations, which require wholly different technologies to produce. Analogous to the quote at the start of this chapter, content need to be created to fit the device that delivers it. Let old content flow into old devices using old business models. New devices, on the other hand, demand new content and business models to be created in order to be successful.

6.1.2 Media and Content Companies

The music industry's reaction to Napster and content convergence provide a good lesson to other content providers in regard to digital convergence — don't underestimate it, don't assume it will be a while in coming, don't take a defensive "it'll pass" stance, but *do* react with a full speed strategy. The 'active inertia' discussed in section 4.2 can be overcome with foresight, common sense and the ability execute changes quickly.

Though media companies have the tendency to exploit economies of scale in the production of content, dissimilarities of country-by-country culture, regulation and carriage will force the media and content companies to pursue separate regional strategies. Again, I believe that localization of content becomes the key to differentiation between firms in the digital economy. Although economies of scale and scope will attain moderate successes in this highly globalized society and digital convergence will continue to blur geographical and technological boundaries, these factors will have to work against the human social forces of the need to establish unique cultural identities.

In that light, major media and content companies will need to increase their market share by developing strategies to address local content.

With digital convergence, media companies also need to exert greater collaborative efforts with other industries, especially coalitions and firms in the IT and Telecoms industries. The future of digital media is dependent on the successful manipulation, distribution and management of data across high-speed networks. The IT and Telecoms industries will play major roles in the digital market, firms in the media industry need to realize that they do not hold the entire value chain in the palm of their hand. Vertically integrated industries in digital convergence will likely to suffer from organizational rigidity when emerging technologies displace older technologies. Therefore, the media industry needs to focus on what they do best: create value through content production and packaging, and collaborate with downstream players like IT and Telecoms to establish standards by which they can deliver these content.

One warning is the tendency for companies to engage in sexy responses of mergers or acquisitions to achieve vertical integration to gain hopeful synergies. Current wisdom suggests that the winners in digital convergence will be the new breed of big multimedia conglomerates, mainly because they will be best able to handle the diversity of new demands. Time Warner, Rupert Murdoc's News Corp, and Sony and Matsushita takeovers of two major Hollywood studios are examples of level 7: intra-industry and level 8: inter-industry convergence respectively. (2.3.4)

A major motivating force is the orthodox justification for media conglomerates that news and entertainment companies must grow or die. They are industries with high fixed costs and high product risks. Examples of this are the Hollywood studios, where most of the films produced are financial failures. The high risk nature of media production is not always due to bad management or other incompetence, but because the success of production depends on the erratic tastes of the consumer. Only media giants, the argument goes, can absorb failures and wait for high returns from more successful products. Thus, the thinking that cross-subsidization of different media products can be

exploited only by gigantic vertically integrated companies becomes the primary reason behind many media mergers and acquisitions.

While this motivating force of efficiency gains or strategic benefits make some simplistic sense, it falls apart in at least one major way. The logic on the part of distributors and packagers is to secure access to programming since it would seem that it is the only way they can ensure that their product is differentiated from their competitors. Other arguments would include the use of programming to create new networks that take up valuable shelf space [49] and the creation of networks that can be used to cross-promote programming.[50] On the other hand, the logic on the part of content producers is to secure access to packagers and distribution and to distribute their content via as many channels as possible. These two divergent logics cannot be both correct, as they differ in the assumption of which, content or distribution, is the scarce resource. The dichotomy that producers seek greater availability, while distribution seeks to control availability is one of the main reasons why media synergies have had mixed results at best. History has proven that mergers like AOL TimeWarner, or Rupert Murdoch's multimedia empire have yet to see any decisive benefits through their mergers.

Therefore, my observation is that neither mergers nor acquisitions are the answers, but partnerships, joint-ventures and collaborations that could define global standards across the industries. Unlike the deadlock of mergers and acquisitions, loosely held joint endeavors give collaborating firms the flexibilities to move, innovate or even change partners if initial ideas fall through. The key here is the ability for firms to experiment and try out new business ideas or to be able to create standards and a system to assure fair play throughout the value chain. Though it might take tremendous effort and exceptional management talents to result in agreements among such diverse industries, the good news is that once standards can be solidified across the value chain, and there is an equitable way to distribute value in every stage, producers will be motivated to produce quality content, and consumers will be attracted to digital media in droves. (5.1.1)

[49] Wolzein T. and Penney J., "Vertical Integration of Media Companies Essential in the Late 1990s," report for Berstein Research, New York 1995.
[50] Koselka, "Mergermania in Medialand".

When that happens, digital convergence will create a richer and more varied format to reach consumers. Media companies will know the customer better than the competition and better than they do today. In the past, their marketing endeavors have been addressing a passive customer; in the future, the consumer will become interactive, orchestrating his or her own entertainment experience in a balanced, integrative and equitable value chain. This, if the vision succeeds, will bring about a new era of digitally empowered media.

6.1.3 Distribution Networks

Many cable operators have an equity position in the cable networks media, and a few have taken a similar position in other media, such as newspapers and magazines. The cable operator must determine what its individual role will be, especially in a market that continues to require significant capital outlays. This requirement is further complicated as cable operators try to get into the media market. The cable operator without clear focus may easily turn out to be the next one acquired.

In the telecommunications industry, few carriers have entered the content and media markets, and mostly those that have, have been through Internet portals. With digital convergence, many carriers are starting to look at delivering content over cellular or WiFi networks. The main problem I see is that content delivery and consumption are not the carrier's core competencies. I would recommend the carriers should stay with what they know, and stay away from acquisitions of media and content companies, even if they may find the media aspects of convergence an interesting opportunity to pursue. Creating a vertically integrated value chain will likely to create a clash of cultures and operation priorities that will require new management style and philosophy. In this case, integrating the old and new paradigms will demand exceptional leadership talents and management skills, and a radical change of mindset and culture. Most traditional firms, in particular carriers, are not ready for such a change.

6.1.4 Advertisers

The business model by which advertisers reach their audience will change with digital convergence. This is so for two major reasons. First, consumers with their newfound abilities to interact with the content they consume in digital convergence will be averse to direct advertisement. Banner ads on web pages, for example, recorded dismal click-through rates. Further, the effectiveness of such ads are called into question as consumers are annoyed by the presence of advertisements, especially pop ups that obstruct the content of interest. Rather than encouraging interest, such advertisements tend to create negative impressions of the company or product that uses it.

Second, the presentation of the advertisement varies among devices. Unlike newspapers or television where the presentation of the advertisement is controlled, it is hard to ascertain the way the consumer will see the ad in digital media. Because consumption experience vary in the device's screen size, computing speed or even instances of other applications that might be running on the device at the same time, it is difficult to design advertisements that are consistently effective among a myriad of possibilities.

In other to understand which kinds of advertisements appeal in new media, I will classify advertising strategies into four types: direct targeted, direct untargeted, indirect targeted and indirect untargeted. We have the following matrix:

	Targeted	Untargeted
Direct	Direct Mail Catalogs Direct Sales Telemarketing Mailing Lists Flyers/Brochures *Online Banner Ads*	Television Radio Movies Flyers/Brochures *Online Banner Ads*
Indirect	Magazines *Amazon.com* *Google.com* *Online Travel Sites* Word of Mouth	Newspapers Posters Classifieds *Online Classifieds* Billboards

Figure 6-1: Four Types of Advertising Strategies

I observe that new media advertising, in particular the Internet, works best with Indirect Targeted advertising. Examples of success advertisement models are *Amazon*, *Google*, *eBay* and online travel sites who utilize this strategy. *Amazon*'s subtle advertising works through the user initiating a search of the product of potential purchase, and through peer reviews, recommendation engines (via collaborative filtering) and a small amount of personalization works very well to encourage users to purchase the item or other related items. *Google*'s advertising model works in a similarly subtle way. When users initiate a search, sponsored advertisements will appear unobtrusively at the top or at the sides by the search results in the form of sponsored links. This business model works well enough for *Google* to be one of the more profitable dot-com companies in existence. On the other hand, direct advertising strategies tend to turn consumers off. Online banner advertisement is one of the prime examples of such ineffective strategies.

6.2 The Digital Experience

Whether it is with digital technology or not, the most important aspect of delivering information and content ultimately is the user's experience. Economists say that a good is an experience good if consumers must experience it to value it. Information, Shapiro and Varian (1999) affirm, is an experience good *every* time it's consumed. Therefore, media businesses have devised various strategies to get wary consumers to overcome their reluctance to purchase media before they know what they are getting. As information floods the world through the Internet, generic news items become commodities. I find Pine and Gilmore (1999)[51] give a particularly enlightened understanding of the 'Experience Economy'. They propose that sellers of commodities need to move into producing differentiated products, and then to create value-added services. To achieve the next economic offering, businesses will need to stage memorable experiences. And finally, a 'Personal Transformation' is the final and most coveted phase of the economic value chain.

[51] Pine, J. and Gilmore, J.H. (1999), *The Experience Economy*, HBS Press.

It is unclear how an experience such as surfing the World Wide Web can create a personal transformation, but indeed digital convergence has transformed the experience of consuming media, and will continue to do so in the future. In the digital world, mass media is no longer a one way process from a media organization that packages the media and distributes that to the public on a scheduled basis. Consumers can potentially access to information whenever they want about any topic they want in the form they want. The digital experience demands that consumers receive media at their command, customized, personalized and contextualized. Digital content should be encased in a simple, easy-to-use interface, and yet provide a rich blend of multimedia and other kinds of interactive formats that give the information a much more engaging and compelling feel, all without intruding into their privacy. Pavlik (2001)[52] claims that 'It is very difficult for traditional media to compete with that and so they will have to adapt.'

Adaptation will be the key to the success of traditional media producers in the digital convergence space. Adaptation, however, does not mean that media producers abandon traditional media completely and hop onto any new forms of media that might emerge. Adaptation also does not mean avoiding the technical possibilities that new media bring, and scramble to squeeze traditional content into new digital platforms. What adaptation does mean is that traditional media firms need to recognize their organizational rigidity, and make a concerted effort to develop strategies to create flexibility in their production process so that they can handle emerging disruptive media that might require radically new production processes.

One suggested way is to incubate isolated divisions to develop their unique culture and work processes separate from the main firm. Another is to create completely independent spin-offs to nurture the development of this new media type. Incubation and spin-offs need upper management endorsement and sponsorship, as well as the freedom to pursue alternative production processes without the encumbrances of old processes that the traditional media firm might impose. Lee McKnight explains it well in his book, *Creative Destruction*, that the destruction of traditional industry structures, regulatory

[52] Pavlik, J. (2001), *"Journalism and New Media",* Columbia University Press.

approaches, competitive positioning strategies and technological assumptions are real in a highly fluid market like digital convergence. Creative destruction – or merely destruction of the industry landscape of digital convergence will compel traditional firms to constantly deal with commoditization forces of established products and processes. Cannibalization of their profitable products through innovation may be the only way to survive.

As such, the transition to a digital media environment will not be easy for traditional media and communication industries or even for new competitors. It should not come to a surprise to traditional players that old guidelines will be blurred or even wiped out. Media managers will face difficult decisions on how quickly they need to adapt to technological changes. The temptation to stick with old products and practices will be strong, and it will be reinforced by consumer's resistance to change or their being overwhelmed by the flood of technological innovations. For example, surveys of cable TV subscribers over the years have shown that most viewers limit themselves to 5 or 6 channels. The current offerings of digital cable of 150 or more channels leave many of them nonplussed.[53] It is clear that industries affected by digital convergence should expect that mass adoption of digitally converged products and services will prove to be slower, in large part because they are more expensive for industry to design and build, and for consumers to buy and use.

Therefore, it follows that the switching costs for consumers need to be low in order for them to change their habits and embrace new technologies. Simplicity in design, seamless interfaces, reliable quality of service, and low cost are just some of the factors that will attract mainstream users. Geoffrey Moore, in his book *Crossing the Chasm*, speaks of the need for producers to overcome a gap between early adopters and the early majority. In order to do that, firms need to position their products to not just appeal to the innovators and visionaries who can adapt to changes and new technologies easily, but also to the pragmatists and conservatives who need to be shown 'the bottom line' and who may be much slower in taking up new ideas and habits. This chasm is reframed by

[53] "Quantity Time on Cable", Washington Post, February 1992.

Andy Grove, in his book *Only the Paranoid Survive*, when he talks about the Strategic Inflection Points, where there is shift that takes place in the market -- a kind of tipping point. Traditional firms not only need to strive to set dominant standards either as a strong first mover or through collaboration, they would also need to navigate through this tipping point by repositioning themselves repeatedly by sensing the changes in the market.

The kind of constant learning and iterative change is a competency that few established firms can afford. However, it is not impossible. Grove speaks of the need for a good dialectic between top-down and bottom-up actions – what it means is a balanced interaction between the middle managers, with their deep knowledge but narrow focus, and senior management, whose larger perspective could set a context. The dialectic between these two, Grove adds, would often result in searing intellectual debates. But through such debates the shape the vision would become clear earlier, making a determined march in its direction more feasible. This is what makes a powerful, adaptive organization. And I believe this is how firms can navigate through digital convergence towards success.

6.3 Final Thoughts

Digital convergence is not a fringe phenomenon, but a dominant force that is reshaping the industries concerned. This digital transformation is affecting the form and direction of society: how we see ourselves, what we think is important, and where we get the information that affects our daily decisions and activities.

Predicting the future, especially in media patterns, is a risky thing. No one twenty five years ago had the inkling of developments in satellite broadcasting networks, cable television, compact discs, videocassettes, PCs and the Internet.[54] While the introductions of traditional media technologies were more orderly, digital convergence arrives at a speed and with an urgency that allow little time to assess how they can best be fitted into an already complex media pattern.

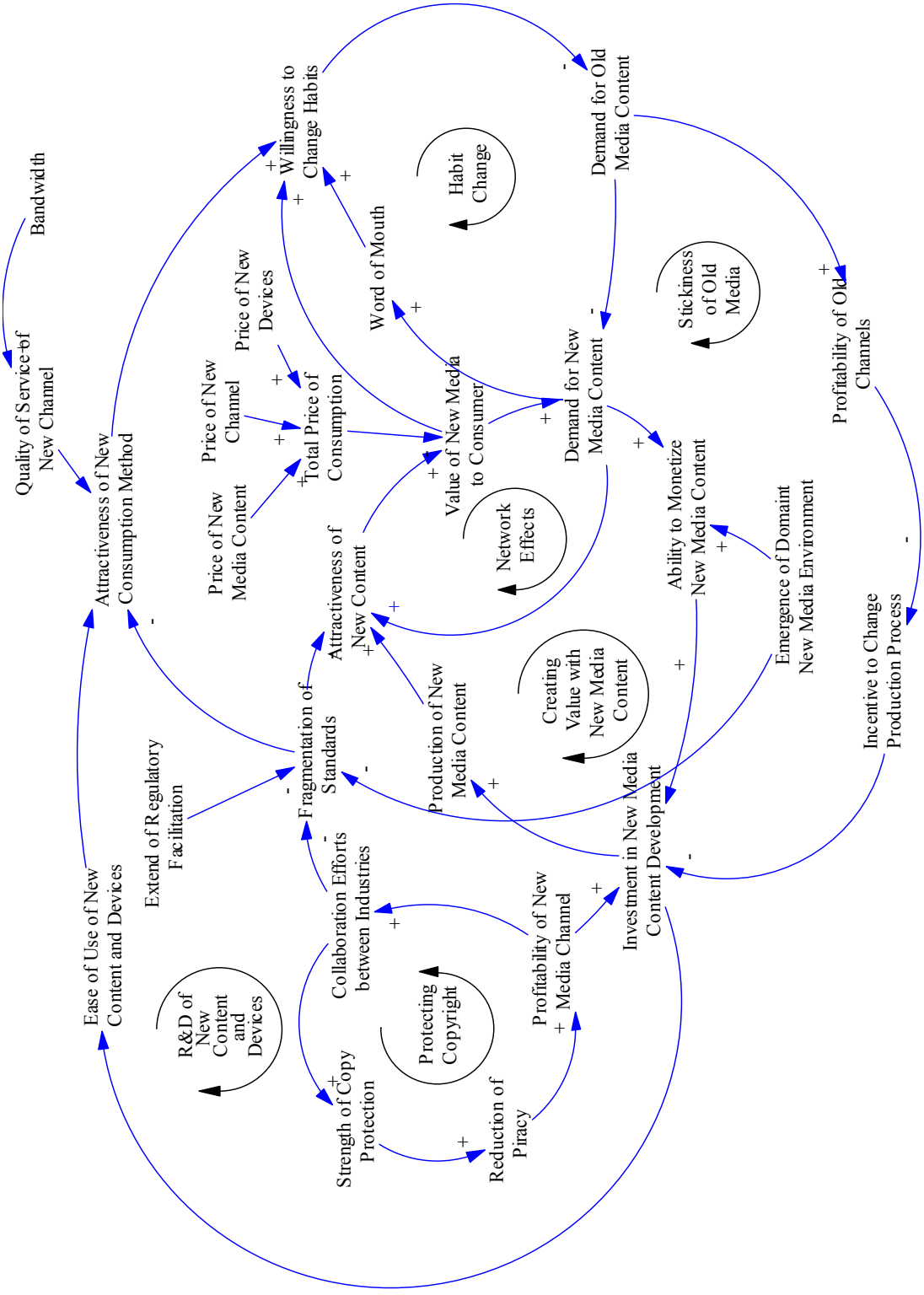
[54] Marvin, Carolyn. *When Old Technologies Were New*., Oxford University Press, 1988.

This much is clear: digital convergence is offering a wide range of options for both media producers and consumers. The options that emerge will be tried by fire as the marketplace will weed out weaker ideas. The Darwinian rule will reign: digital convergence will be a spectacle of the survival of the fittest. Therefore, we expect vastly different patterns of packaging and distributing information to be introduced, shaped by political and economic elements as well as by technological factors. In information matters, we are likely to see a flourishing of choices and variety. For societies that value diversity, this will be good news.

6.4 Further Research

This thesis should be considered as a starting point for thorough analysis of firms in the digital media value chain in the era of digital convergence. It has provided adequate data, references, analysis and background information to construct a specific investigation and analysis of any firm working through the dynamics of digital convergence, especially in the media industry. What I have explored in this paper is merely a skimming of the dynamics of convergence and divergence in digital media. The digital phenomenon is a multi-tier, multi-faceted effect that deserves detailed discussion and research into individual nuances of its impact. Further research is needed to illuminate how deregulation in traditional industries affect firms competing in digital convergence, and what goes on in the creation of original content that takes advantage of digital technologies' unique technical features – paying special attention to multimedia story telling – and more conceptually, examining the role of technology in the production of new media. Potential issues to be addressed include (1) what dimensions in new business models are more effective in capturing value, (2) how the strengths and weakness of each industry determine the success and failure in the clashing of technologies and industries, (3) what determines the differences in effectiveness between traditional content and digital content, (4) the presence or absence of tensions derived from the encounter of the different cultures of traditional and digital media, and (5) what are the factors that would make personalization of digital content more acceptable and effective.

Appendix A: A System Dynamics Model for the Digital Media Industry



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