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New Media Theory

Reading 2-1

Principles of Mediamorphosis

Roger Fidler

EDITOR'S NOTE

The emergence of new media rarely precipitates the death of old media; instead, existing media forms evolve and adapt to the changing communication environment in a gradual process that is comparable in some ways to the evolution of species. In this reading, Roger Fidler introduces a unified way of thinking about media transformation and adaptation, a process he calls mediamorphosis. *Instead of studying each new media form separately, mediamorphosis regards all media as constituent elements of an interdependent system. By studying the communication system as a whole, Fidler asserts, it becomes clear that new media do not arise spontaneously and independently—they emerge gradually from the metamorphosis of old media.*

CONSIDER

1. To better understand technological change, why must we first discard most of our commonly held assumptions, particularly about the pace of change?
2. What are the dangers of *technomyopia*? How do inflated short-term hopes distort initial expectations for new media and cause us to treat future growth phases with skepticism?

3. How can the six principles of mediamorphosis be used to predict what will happen in the next stage of media evolution?

Change is not something most people look forward to or are particularly good at predicting. Even for the inventors and innovators who stimulate technological and social changes, visualizing the future presents an enigmatic problem. Yet, despite the anxieties often caused by change, humans seem to have a remarkable propensity for rapidly assimilating new ideas, products, and services once they are perceived to fit into their personal and cultural definitions of reality. While no one, it seems, is ever completely prepared for change or able to accurately predict outcomes, we can all begin to discern probable shapes of the future by learning to recognize the historic patterns and mechanisms of change. This chapter introduces several frameworks for assessing change and evaluating new media technologies.

YESTERDAY'S FUTURE, TODAY'S PAST

Much of what is now taken for granted has, in fact, only recently emerged. Just one human generation ago, at the beginning of the 1970s, electronic pocket calculators were just starting to compete with slide rules and mechanical adding machines; computers were big and impersonal; and AT&T was still a monopoly that leased nearly all private telephones in the United States. Portable communicators and voice interaction with computers only existed in the imaginary twenty-third-century universe of the original Star Trek television series.

Twenty-five years ago, electronic media were confined to broadcast radio and television. Lasers and fiber-optic networks, miniature video cameras and handheld television sets, compact disc players and music CDs, digital fax machines, cellular phones, and laptop computers were all unknown outside of a few research and development laboratories.

Information retrieval was something one only did in libraries with printed books and periodicals, or microfilm, using pencils and paper. The Internet and electronic mail (e-mail) were still confined to the rarefied and generally secret world of defense-related research.

Newspapers and magazines had just begun converting their newsrooms from mechanical typewriters to electronic text-editing systems and their composing rooms from hot-type to cold-type technologies. Few journalists then could have imagined the electronic news gathering and production technologies that are common today or foreseen desktop publishing and the explosion of news graphics made possible by personal computers.

A mere decade ago, few people could have imagined that by the mid-1990s digital fax machines, electronic mail services, and miniature cell phones would be routinely used to communicate just as easily and inexpensively with individuals in distant countries and rural communities as within large cities and office buildings. In the mid-1980s, most publishers abandoned consumer online services (then called videotex) after collectively losing several hundred million dollars and promptly declared that electronic publishing would not emerge as a viable business until well into the next century. Who then would have envisioned the frenzy of activity that now surrounds consumer online services and the World Wide Web?

THE 30-YEAR RULE

While we may never be able to foretell the outcomes of technological change with a high degree of precision, we can sharpen our focus. To do so, we must first enlarge our perspective and discard most of our commonly held assumptions, particularly about the speed of change.

Changes may seem to be occurring more rapidly in the world today, but studies of historical records have shown that this is a common misconception. Paul Saffo, a director at the Institute for the Future in Menlo Park, California, posits that the amount of time re-

From *Mediamorphosis: Understanding New Media* by Roger Fidler (Thousand Oaks, CA: Pine Forge Press, 1997), pp. 1–29.

quired for new ideas to fully seep into a culture has consistently averaged about three decades for at least the past five centuries. He calls this the 30-year rule.

As a new media forecaster, Saffo has learned from experience that our short human memories all too often confuse surprise with speed. When it comes to emerging technologies, he finds that the slowness of change is the rule rather than the exception. Most ideas take much longer to become "overnight successes" than anyone is ever prepared to admit.

The reason life feels so much more rapid today, Saffo contends, is not that individual technologies are accelerating at a faster rate or that things are happening more quickly than they have in the past. What's actually occurring is that "more technologies are coming up at the same time. It is the unexpected cross-impact of maturing technologies that creates this powerful acceleration that we all feel."[1] Cross-impacts are also the variables, he says, that make new media forecasting so difficult.

STAGES OF DEVELOPMENT

There is, however, a relatively consistent pattern of accelerated development that takes place as each new technology moves from laboratory to marketplace. Saffo has identified three typical stages within the 30-year rule. "First decade: lots of excitement, lots of puzzlement, not a lot of penetration. Second decade: lots of flux, penetration of the product into society is beginning. Third decade: 'Oh, so what?' Just a standard technology and everybody has it."[2]

Which Development Stage Are We In?

As we attempt to peer into the future of communications, it would seem, therefore, that the critical question to be asked with regard to emerging media technologies is, Which development stage are they in? But, as we will discover, the answer to such an apparently simple question is not always obvious. To know the stage, we must also have some idea of when the clock started, and how innovations are likely to be affected by other technological and social developments, which are not easily determined in the midst of change.

Example: Xerox's Alto

When the first personal computer designed specifically for nontechnical users was switched on at the Xerox Palo Alto Research Center (PARC) in the early 1970s, most of the underlying ideas and technologies had been under development for one to three decades. The scientists who created the Alto, as this early computer was called, believed they were already in the second stage and that their invention could quickly penetrate the office market, but the company's senior executives and market researchers were unconvinced.[3]

While Xerox's decision not to immediately begin marketing Alto systems is often held up as an example of corporate incompetence, it may have been based on a more accurate assessment than the pundits have acknowledged. With the benefits of hindsight, we can now see that personal computing in the 1970s was still in its first stage. Beyond a small cadre of scientists and amateur enthusiasts, few people then were ready to believe they might soon have a practical use for their own desktop computer. Additionally, many of the component and manufacturing technologies needed to make personal computers affordable to general consumers were not yet available.

Another decade would pass before a personal computer system comparable to the Alto would enter the consumer marketplace. And even in the 1980s there was uncertainty as to which stage personal computers were in. Many financial bets were made on the assumption that they were then in the third stage, only to be lost when the market for home computers faltered toward the middle of the decade. What we can see only now is that the cross-impacts of video game, electronic mail, online information, and Internet technologies coupled with faster and cheaper telecommunications and a growing home office market in the 1990s finally thrust personal computers into the third stage.

RESTATING THE RULE

The 30-year rule may not be foolproof, but it does put the development of new technologies into a more realistic perspective. We need to remember, however, that this rule is not intended to fix a precise time frame for the widespread adoption of new technologies. Saffo's essential point is that impressions of spontaneous technological advancements are generally wrong. This rule can be restated in two different ways: (1) Laboratory breakthroughs and discoveries nearly always take longer than anyone expects to become successful commercial products or services. (2) Technologies that appear to have suddenly emerged as successful new

products and services have been under development for much longer than anyone admits.

THE DANGERS OF TECHNOMYOPIA

While the time required for new technologies to migrate from laboratories to store shelves may span several decades, Saffo also cautions industry leaders against complacency. History, he says, shows that once consumers perceive a new technology to be useful and affordable, widespread adoption can take place rather quickly. Yet, despite the frequent repetition of this pattern, he has found that people are still nearly always caught by surprise.

The relatively flat, slow ramp followed by a steep, rapid climb is the growth model upon which most start-up companies build their business plans. But that model can be misleading. The actual pattern for enterprises attempting to exploit new technologies rarely conforms to a smooth ascending curve. More often than not, the typical, real-life trend line resembles a roller coaster. Several moderate ups and downs generally precede the final grand ascent to market success, although there are never any assurances that there will, in the end, be a final grand ascent. This tendency to undergo several initial ups and downs may contribute to the surprise factor when a new technology finally does take off. Typically, a great deal of publicity will follow the announcement of a discovery or new invention. But when the first rush of excitement is dampened by disappointments and setbacks, we usually treat future growth phases with skepticism. Saffo calls this affliction technomyopia:

> [Technomyopia] is a strange phenomenon that causes us to overestimate the potential short-term impacts of a new technology. And when the world fails to conform to our inflated expectations, we turn around and we underestimate the long-term implications. First we over-shoot and then we under-shoot.[4]

Example: The Video Game Roller Coaster

The development of video game technology illustrates this phenomenon. Beginning in 1972 with two simple ball-and-paddle games called Odyssey and Pong, video games quickly captivated the minds, and wallets, of teenagers and young adults. A steady stream of popular video arcade games, such as Pac Man and Space Invaders, followed in the late 1970s. Within 10 years, Americans were spending more money on home video game systems and at video arcades than they spent on movies and music—a total of more than $11 billion. Then, even more suddenly, the market collapsed. By 1985 total sales of home video game systems had dropped from more than $3 billion at its peak to only $100 million.[5]

The crash forced nearly all U.S. video game companies into other computer businesses or bankruptcy. Most industry executives and analysts saw this as a sign that video games were merely a fad. But just as the U.S. market was collapsing, Nintendo, a Japanese toy company, introduced a new game system in Japan called Famicon. And two years later, Nintendo swept across the Pacific with the speed and power of a tsunami. Armed with a wider selection of fast-action games that incorporated sophisticated graphics, Nintendo quickly revived interest among those who had become bored with earlier systems and attracted a new generation of players as well. By 1989 Nintendo controlled 80 percent of the U.S. video game market, which had recovered to its $3 billion pre-crash level. By the beginning of the 1990s, one out of every five U.S. households owned a Nintendo set.

TECHNOLOGICAL ACCELERATORS AND BRAKES

Rogers's diffusion theory is perhaps the simplest model for visualizing the historic adoption patterns of established technologies, but it only partially explains why a new media technology will suddenly diffuse into the general consumer market and attain a dominant position. Early adopters may encourage others to try a new technology, but they alone have not been shown to provide the energy needed for rapid acceleration, or to have sufficient influence to significantly affect the introduction and diffusion of a technology.

Diffusion theory cannot adequately explain, for example, why FM radio (which was invented in the early 1930s and provided a far superior means of broadcasting than the original AM radio technology) floundered for three decades and then, in less than 10 years, managed to dethrone its rival all across North America. What was the accelerator? And what had applied the brakes for so long? These are the questions that Brian Winston, a journalism professor at the University of Wales, has attempted to answer.[6]

Winston blends a strong cultural perspective with the history of media technologies to arrive at a comprehensive explanation of how new media are born and developed. His ideas are based on the following convictions:

- Social, political, and economic forces play powerful roles in the development of new technologies.
- Inventions and innovations are not widely adopted on the merits of a technology alone.
- There must always be an opportunity as well as a motivating social, political, or economic reason for a new technology to be developed.

SUPERVENING SOCIAL NECESSITIES

In Winston's view, the accelerators that push the development of new media technologies are what he calls *supervening social necessities*. He defines these as "the interfaces between society and technology." They derive from the needs of companies, requirements of other technologies, regulatory or legal actions, and general social forces. In the case of FM radio, the supervening social necessities that emerged in the 1960s fit into all four categories.

Needs of Companies

Competition with television was cutting deeply into the profits of large established AM stations, and their future seemed in doubt. By contrast, the dramatically lower costs associated with FM broadcasting made the operation of smaller stations that targeted niche audiences quite profitable and appealing to media companies, entrepreneurs, and investors. Manufacturers were also attracted to FM because it created a new and potentially even larger market for radios.

Requirements of Other Technologies

Advances in recording and playback technologies, significant improvements in home equipment, and the growing popularity of hi-fi and stereo recordings created the need and demand for high-quality broadcasting technology, which FM readily provided. Stereo, introduced on FM in 1961, offered radio audiences yet another incentive to switch. The miniaturization of electronic components also made it possible for radio manufacturers to combine AM and FM technologies in more compact receivers, which, in turn, increased the demand for FM stations and new equipment.

Regulatory and Legal Actions

The resolution in the mid-1960s of patent infringement suits finally removed a serious legal impediment to FM's development. But even more important was the 1967 Public Broadcasting Act. This regulatory action established National Public Radio (NPR) as a production center for educational and public affairs broadcasting and reserved space on the FM dial for new public radio stations.

General Social Forces

However, FM owes a great deal of its ultimate success to rock 'n roll music and to teenagers in the late 1950s and 1960s. Because of AM's broad reach and large undifferentiated audiences, stations tended to broadcast only Top 40 popular music and avoid so-called underground recordings, such as rock, jazz, and blues. The smaller FM stations could afford to target niche audiences, which allowed them to satisfy the musical tastes of teenagers and to provide an outlet for small, independent recording studios.

The increasing popularity of FM music stations among teenagers helped drive demand for new portable and car radios with FM receiver technology. It also attracted advertisers who were trying to reach the affluent young audience, which was rapidly becoming a social and economic force to be reckoned with. By 1969, the average FM listener was about 10 years younger than the average AM listener, and more than half of all Americans listening to radio were tuned to FM stations.

THE LAW OF SUPPRESSION OF RADICAL POTENTIAL

The law of suppression of radical potential, in Winston's view, applies the brakes that slow the disruptive impact of a new technology upon the social or corporate status quo. Brakes arise from the same four broad categories identified with supervening social necessities. The [suppression] law helps us understand why FM radio took so long to succeed in the general consumer market despite its obvious technical and economic superiority over AM broadcasting.

Needs of Companies

In 1933, when Howard Armstrong demonstrated his FM prototype to David Sarnoff, president of the powerful Radio Corporation of America (RCA), AM radio was already well established and generating high profits

for manufacturers and broadcasters. Sarnoff recognized that FM represented a revolutionary new radio technology that was far better than AM, but he was not eager to disrupt RCA's substantial profits from AM radio, especially in the midst of the Great Depression.

Requirements of Other Technologies

In the 1930s RCA was also investing heavily in the development of television, and many of the company's patents involved using the same portion of the radio spectrum that Armstrong was proposing for FM radio. Sarnoff saw television as RCA's next great opportunity and marshaled the company's resources to protect its position.

Regulatory and Legal Actions

When Armstrong realized that RCA would not back his invention, he decided to push its development on his own. After the Federal Communications Commission (FCC) allocated a small range of the radio spectrum for FM broadcasting, he secured licenses to build several stations and begin manufacturing FM radios. Buoyed by his early success, he confidently predicted in 1940 that the existing AM broadcast system would be largely superseded by FM within five years.

But, however farsighted he was about technology, Armstrong underestimated the interest Sarnoff and other broadcasters had in maintaining the status quo, as well as their political clout, particularly with the FCC.[7] At the insistence of RCA and the network broadcasters, the FCC began hearings in 1944 into the appropriate spectrum allocations for television and other broadcast technologies that were poised to take off as soon as the war ended. Using dubious evidence to justify its decision, the FCC in 1945 approved the recommendations of the broadcasters to move FM to a different location in the radio spectrum and give TV broadcasters the portion previously allocated to FM.

With this one ruling, the FCC rendered all of Armstrong's installed FM broadcast equipment and radios obsolete and useless. At the time, there were more than 50 FM broadcast stations and half a million FM radios in operation in the United States.

General Social Forces

The 1929 stock market crash and subsequent global depression significantly reduced consumer demand for new radio sets and caused a shakeout in the radio manufacturing business. Enthusiasm for a new radio technology that would require replacement of existing sets and broadcast equipment was understandably low.

However, even with the financial constraints posed by the Depression, Armstrong managed to attract a credible number of early adopters and investors. Unfortunately, just as FM broadcasting was poised to take off, its commercial development and expansion were abruptly halted by the United States' entry into World War II. After the war, FM technology still had a strong following, but the obsolescence caused by the FCC's change of radio spectrum allocations seriously inhibited continuing support. Moreover, by the end of the 1940s, TV was already rapidly drawing consumer and investor attention away from both AM and FM radio.

THE MEDIAMORPHIC PROCESS

While the preceding hypotheses are integral to the process I call mediamorphosis, they only provide general insights into the pacing and timing of technological developments. Before we can even begin to make reasonable judgments about emerging technologies and the future of mainstream media, we need to acquire a broad, integrated knowledge of human communications and the historic patterns of change within the overall system. This knowledge is central to our understanding of the mediamorphic process, which I have defined as: *The transformation of communication media, usually brought about by the complex interplay of perceived needs, competitive and political pressures, and social and technological innovations.*

Mediamorphosis is not so much a theory as it is a unified way of thinking about the technological evolution of communication media. Instead of studying each form separately, it encourages us to examine all forms as members of an interdependent system, and to note the similarities and relationships that exist among past, present, and emerging forms. By studying the communication system as a whole, we will see that new media do not arise spontaneously and independently—they emerge gradually from the metamorphosis of old media. And that when newer forms of communication media emerge, the older forms usually do not die—they continue to evolve and adapt.

The example of FM's delayed success and radio's transformation from a mass-audience medium to a niche-audience medium can also be used to illustrate this key principle of mediamorphosis. As TV began its

grand ascent, general-audience radio went into a steep decline that led some analysts to predict the eminent death of the medium. But radio didn't die. Nor was AM entirely subsumed by FM. Instead, AM adapted and through the adoption of new technologies and marketing strategies has steadily become more competitive with FM. Since the beginning of the 1990s, AM radio has been showing strong signs of revival in the United States and elsewhere.

The rapid diffusion of TV also brought about significant transformations within the newspaper, magazine, and film industries. Each was declared a dying medium without the capacity to compete with TV's immediacy and compelling images, yet each proved to be more resilient and adaptable than expected. This also illustrates an important corollary to the metamorphosis principle: Established forms of communication media *must* change in response to the emergence of a new medium—their only other option is to die. The metamorphosis principle, as well as several other key principles of mediamorphosis, derive from three concepts—coevolution, convergence, and complexity.

COEVOLUTION

All forms of communication are, as we shall see, tightly woven into the fabric of the human communication system and cannot exist independently from one another in our culture. As each new form emerges and develops, it influences, over time and to varying degrees, the development of every other existing form. Coevolution and coexistence, rather than sequential evolution and replacement, have been the norm since the first organisms made their debut on the planet. The wealth of communication technologies we now take for granted would not have been possible if the birth of each new medium had resulted in the simultaneous death of an older medium.

Communicatory Codes

Specific forms of media, as with species, have life cycles and eventually do die out, but most of their defining traits will always remain part of the system. Just as biological characteristics are propagated from one generation to another through genetic codes, media traits are embodied and carried forward through communicatory codes that we call languages. Languages have been, without compare, the most powerful agents of change in the course of human evolution.

The development of spoken language and written language brought about two great transformations, or mediamorphoses, within the human communication system. Each of these two classes of language has been responsible for reordering and greatly expanding the human mind in ways that made modern civilization and culture possible. Countless transforming technologies affecting all aspects of human life and communication have been inspired and energized by these two agents of change.

Now a third great mediamorphosis resulting from the recent development of a new class of language is poised to once again radically influence the evolution of communication and civilization. For the past two centuries, industrial age and information age technologies have been conjointly contributing to the rapid development and spread of this language, which has only become known to most people in the past two decades. This new class of language is called digital language. It is the *lingua franca* of computers and global telecommunication networks.

CONVERGENCE

Nearly every personal computer sold today offers users the ability to play CD-ROMs that blend text and still images with audio and video clips, as well as the opportunity to conveniently dial into global networks and access vast stores of textual and audio/visual information. This is just one of the more obvious examples of the concept known as media convergence. The idea that diverse technologies and forms of media are coming together now seems almost commonplace, but not so long ago it was considered quite visionary.

In 1979, when Nicholas Negroponte began popularizing the concept in his lecture tours to raise funds for a building to house the Media Lab at the Massachusetts Institute of Technology, few people had any comprehension of convergence. Audiences were often astonished by Negroponte's revelation that "all communication technologies are suffering a joint metamorphosis, which can only be understood properly if treated as a single subject."[8] To illustrate this concept, Negroponte drew three overlapping circles labeled "broadcast and motion picture industry," "computer industry," and "print and publishing industry" (see Figure 2-1). Since then, the notion that these industries are coming together to create new forms of com-

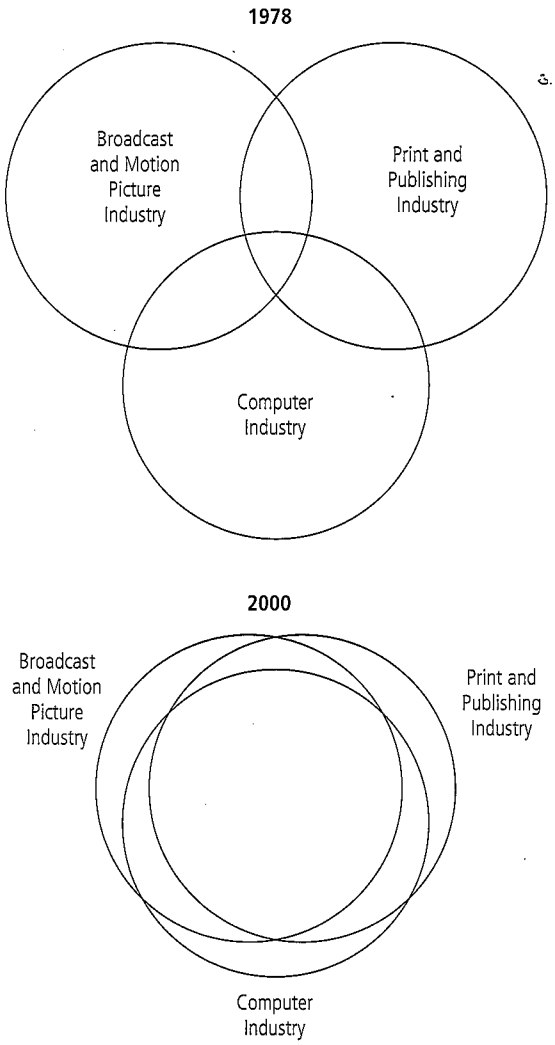

FIGURE 2-1. The MIT Media Lab's construct of convergence.

munication has shaped much of the thinking about the future of mass media and human communications.

Multimedia Forms of Communication

Negroponte and others at MIT are credited with being among the first to recognize that this convergence of media industries and digital technologies would ultimately lead to new forms of so-called multimedia communication. Multimedia, or mixed media as it is also known, is generally defined as any medium in which two or more forms of communication are integrated.

Within the broadest definition of the term, most printed newspapers and magazines qualify as forms of multimedia because they convey information through a blend of written words, photography, and graphics displayed on a paper medium. However, the visions of multimedia popularized in the past two decades have tended to dismiss paper as an "old" medium. The preferred "new" medium for displaying blended content is the electronic screen. With an electronic display medium, such as a computer monitor or television screen, new multimedia systems are capable of conveying information through various blends of full-motion video, animation and sounds, as well as still images and written words.

COMPLEXITY

During periods of great change, such as we are now experiencing, everything around us may appear to be in a state of chaos and, to a large extent, it is. Chaos is an essential component of change. Without it, the universe would be a dead place and life would be impossible. Out of chaos comes the new ideas that transform and vitalize systems.

Chaos Theory

A central tenet of contemporary chaos theory is the notion that seemingly insignificant events or slight initial variations within chaotic systems, such as the weather and the economy, can trigger cascades of escalating, unpredictable occurrences that ultimately lead to consequential or catastrophic events. This aspect of the theory is often illustrated by the example of a butterfly flapping its wings in China and causing a hurricane to develop off the coast of Florida.

Chaotic systems are essentially anarchistic. That is, they exhibit nearly infinite variability with no predictable long-term patterns, which explains why precise long-range weather and national economic forecasts are all but impossible. It also explains why no one will ever be able to accurately predict which specific new media technologies and forms of communication will ultimately succeed and which will fail.

The importance of chaos to our understanding of mediamorphosis and the development of new media is actually less in the theory than in its connection to

another related concept—complexity. In this context, *complexity* refers to the events that take place within certain apparently chaotic systems.

Chaos and order, like birth and death, are opposite extremes of all complex, or so-called *living systems*. According to physicist Mitchell Waldrop, the edge of chaos is "where new ideas and innovative genotypes are forever nibbling away at the edges of the status quo."[9]

Complex, Adaptive Systems

As scientists studied the behavior of complex systems, they discovered that the richness of the interactions that occur within living systems allows them to undergo *spontaneous self-organization* in response to changing conditions. In other words, Waldrop observes, complex systems are *adaptive,* in that "they don't just passively respond to events the way a rock might roll around in an earthquake. They actively try to turn whatever happens to their advantage."

By recognizing that the human communication system is, in fact, a complex, adaptive system, we can see that all forms of media live in a dynamic, interdependent universe. When external pressures are applied and new innovations are introduced, each form of communication is affected by an intrinsic self-organizing process that spontaneously occurs within the system. Just as species evolve for better survival in a changing environment, so do forms of communication and established media enterprises. This process is the essence of mediamorphosis.

PRINCIPLES OF MEDIAMORPHOSIS IN PERSPECTIVE

This discussion furnishes a number of general insights into the adoption and implementation of new media technologies that can guide our thinking about the next stage in the transformation of mainstream media and emerging computer-mediated communications. The following *six fundamental principles of mediamorphosis* flow from the preceding discussion:

1. *Coevolution and coexistence:* All forms of communication media coexist and coevolve within an expanding, complex adaptive system. As each new form emerges and develops, it influences, over time and to varying degrees, the development of every other existing form.
2. *Metamorphosis:* New media do not arise spontaneously and independently—they emerge gradually from the metamorphosis of older media. When newer forms emerge, the older forms tend to adapt and continue to evolve rather than die.
3. *Propagation:* Emerging forms of communication media propagate dominant traits from earlier forms. These traits are passed on and spread through communicatory codes called languages.
4. *Survival:* All forms of communication media, as well as media enterprises, are compelled to adapt and evolve for survival in a changing environment. Their only other option is to die.
5. *Opportunity and need:* New media are not widely adopted on the merits of a technology alone. There must always be an opportunity, as well as a motivating social, political, and/or economic reason for a new media technology to be developed.
6. *Delayed adoption:* New media technologies always take longer than expected to become commercial successes. They tend to require *at least* one human generation (20–30 years) to progress from proof of concept to widespread adoption.

By combining the principles of mediamorphosis with an understanding of the attributes that have shaped the development of communication media in the past, we can gain valuable insights into the new forms that may emerge as well as the ways in which existing forms may adapt and continue to evolve.

NOTES

1. "Paul Saffo and the 30-Year Rule," *Design World, 24* (1992): 18.
2. Ibid.
3. The story of Xerox's development of the first personal computer system is told by Douglas K. Smith and Robert C. Alexander in *Fumbling the Future: How Xerox Invented then Ignored the First Personal Computer.* New York: Morrow, 1988.
4. "Paul Saffo and the 30-Year Rule," p. 18.
5. Steven Lubar, *InfoCulture: The Smithsonian Book of Information Age Inventions*. Boston: Houghton Mifflin, 1993, p. 274.
6. Brian Winston, "How Are Media Born and Developed?" In John Downing, Ali Mohammadi, and Annabelle Sreberny-Mohammadi (Eds.), *Questioning the Media: A Critical Intro-*

duction. Thousand Oaks, CA: Sage Publications, 1995, pp. 54–74.

7. Tom Lewis, *Empire of the Air: The Men Who Made Radio.* New York: HarperCollins, 1991, pp. 300–301.
8. Quoted in Stewart Brand, *The Media Lab: Inventing the Future at MIT.* New York: Viking Penguin, 1987, p. 11.
9. M. Mitchell Waldrop, *Complexity: The Emerging Science at the Edge of Order and Chaos.* New York: Touchstone, 1992, p. 12.

RELATED LINKS

- The Poynter Institute's New Media Timeline (http://www.poynterextra.org/extra/Timeline/index.htm)
- Xerox Palo Alto Research Center (http://www.parc.com)
- The Pulse of Tablet Technology (http://www.ojr.org/ojr/technology/1017968908.php)
- Roger Fidler (http://www.ici.kent.edu/fidler.htm)

FOR FURTHER RESEARCH

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Reading 2-2

A New World (Small Pieces Loosely Joined)

David Weinberger

EDITOR'S NOTE

To author David Weinberger, the Internet represents a new world that we are just beginning to inhabit. However, unlike the real world, cyberspace has few rules of behavior and fewer lines of authority. Although the effects of online communication are only now coming into vague relief, the new environment is allowing users to explore and seek out new aspects of themselves. In cyberspace, the very notion of self is becoming more fluid and flexible. As Netizens negotiate the social and psychological terrain of this new world, the Web is redrawing the rules of social interaction in ways that still do not make complete sense. Whatever the outcome of these negotiations, social and cultural life may never be the same. "It is a measure of the importance of the Web," Weinberger observes, "that to understand it we find ourselves rethinking bedrock notions of our culture . . . such as space, time, perfection, social interaction, knowledge, matter, and morality." For a similar perspective, consult Reading 1-3 on media ecology and the new global narrative by Douglas Rushkoff.

CONSIDER

1. Why does Weinberger conclude that, for all the overheated, exaggerated news coverage of the World Wide Web, the Web has not yet been hyped *enough*?
2. How is the problem of drawing a clear line between what's public and what's private in cyberspace part of the more general problem of understanding how to coordinate the virtual and real worlds?