ARTICLE

The natural life cycle of new media evolution

Inter-media struggle for survival in the internet age

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Abstract

This article analyzes the evolution of the internet, with special emphasis on its impact on older media in their struggle to survive. The analysis is based on a 6–stage, natural life cycle model of new media evolution, comprising birth (technical invention), penetration, growth, maturity, self-defense, and adaptation, convergence or obsolescence. Our universal model melds several elements of previous theories and analyses from disparate fields such as media history, marketing, technological diffusion and convergence, while adding a few new aspects as well. The model's three contributions lie in expanding the scope – quantitatively and qualitatively – of new media's development stages (beyond the three or four stages noted by others); emphasizing the interaction and struggle between old and new media; and analyzing 'functional-life after appliance-death' of media transformed/co-opted into something old/new. Applying this model to the internet enables us to better understand its future evolution and the survival chances of older mass media.

Key words

convergence • diffusion of innovation • internet • media competition • media history • new media evolution

INTRODUCTION

How media evolve – and what older media can do to survive the advent of new competition – are the underlying questions of this article. We shall present a 'natural life-cycle model of new media development', applied to the internet, based on processes and elements found in previous theories, studies and models that had each emphasized discrete aspects: audience types, media leadership, historical development, convergence processes and others. Our study adds a few stages that have not been discussed previously, analyses different stage-to-stage possibilities, incorporates audience adoption rates per stage and presents a complete graphic model: birth, penetration, growth, maturation, defensive resistance, adaptation, convergence or obsolescence. Moreover, whereas other studies have focused generally on a specific medium, today's dynamic media world requires an inter-media approach as new media influence – and evolve into – older media. Finally, we use the internet as a case study to make the theoretical analysis concrete.

   We chose a biological metaphor for our model for several reasons: interaction between the individual medium and surrounding media ecology; nature's 'continued life through death' phenomenon; and non–absolute determinism of the 'iron rules of media development'. As Dimmick recently noted:

> Like the biologist, the researcher interested in the . . . media cannot appeal to universal laws like those of chemistry or classical physics . . . Like the biologist, who also studies complex living systems, the social scientist inhabits a world where prediction is difficult at best, and explanation must be won without recourse to causal laws. (Dimmick, 2003: 1)

   A final introductory point: the term 'internet' is terminologically problematic. Adams and Clark (2001: 29) conclude that the internet is both a macromedium (comprehensive in scope and global in size; also disseminating the shortest messages to the smallest audience) and a metamedium (platform for older media). We prefer to call the internet a 'multimedium', following Jankowski and Hanssen (1996) and Fidler (1997: 25), i.e. a combination of these two categories.

THEORETICAL BACKGROUND: EARLIER APPROACHES, MODELS, STAGES AND ELEMENTS

Despite cogent criticisms of Innis' (1951) and McLuhan's (1962, 1964) technological determinism being too mono-dimensional and Western culture-dependent (Mowlana and Wilson, 1990), Levinson (1999) argues that McLuhan's work is even more relevant today, given the encompassing nature and extended scope of new media in general and the internet specifically. On the other hand, social constructionism[1] emphasizes the ongoing give-and-take between social needs and technological possibilities (Edwards,

1996; Flanagin et al., 2000). Our proposed model synthesizes these two approaches, adding a new sub-theory: 'media constructionism' – constant interaction between new and older media is a key factor in the successful or unsuccessful evolution and specific direction of the new medium.

A second approach underlying our model is 'Diffusion of Innovation' (Beal and Bohlen, 1955), 'the process by which an innovation [new ideas, opinions, or products] is communicated through certain channels over time among the members of social system' (Rogers, 1983: 5; see also Burt, 1987; Coleman et al., 1966; Granovetter, 1973, 1982; Rogers, 1962; Rogers and Kincaid, 1981; Ryan and Gross, 1943; Valente, 1999). Our model relates to how much time it takes to diffuse cumulatively and adopt new media, as well as how many adopters exist at each stage. Rogers (1962) identified five types of adopters, the first two being catalytic 'Change Agents': innovators (2.5% on average), early adopters (13.5%), members of the early majority (34%), members of the late majority (34%), and laggards (16%). The mass media play a central role in innovation diffusion – especially when the technology involves a communications medium. Thus, in our model each specific medium is both the subject of study and an important part of the objective social environment influencing the new medium's development – once again, 'media constructionism'.

Merrill and Lowenstein (1971) were the first to delineate a dynamic model of media development, focusing on audience type: elite–popular–specialized. First, a social elite adopts the new medium (Shinar, 2001, adds a prior 'experimental' stage, in which a prototype is developed in the laboratory), then the general public and finally sub-audiences using the medium in a specialized fashion. Taking a different tack, Shaw's three-part model (1991) uses a human metaphor for media development: youth, maturity and senior citizenship, stressing the importance of media leaders in responding creatively to technological advances, at all three stages.

Another historical schema is Caspi's (1993) condensed,[2] four-stage media development:

(1) inauguration – where much public attention is given to the new medium;
(2) institutionalization – where there is widespread public adoption and routinization of the new medium;
(3) defensiveness – where the hegemony is threatened by a new medium; and
(4) adaptation – the *modus vivendi* between old and new medium.

His schema is itself loosely-based on models taken from the world of marketing, especially product life-cycle (Hornik, 1985; Kotler, 1986; Kotler and Hornik, 2000):

(1) presentation – the audience gets used to the product (no profits);
(2) growth – faster market dissemination (improved profits);
(3) maturity – slowing growth rate (steady or declining profits); and
(4) decline – declining sales (profit erosion).

One other relevant marketing oriented theory is Cox's life-cycle scalloped product model (1967): a series of life-cycles for an individual product which continually discovers or develops new characteristics, uses or users.

Other researchers have dealt with specific elements. Saffo (1992) addresses the question of time-span: 30 years appears to be the general rule for a new technology's complete adoption:

• decade 1 – much enthusiasm and amazement;
• decade 2 – intensive technological change and market penetration; and
• decade 3 – technological normalization through widespread use.

Perhaps the most widely discussed element, however, is 'convergence', i.e. technological merging. Baldwin et al. (1996) emphasized the technical ability of different media transferring messages between one another, then combining content (e.g. radio and newspaper text on the computer screen) and finally merging, i.e. multi-functional media machines. Of course, this is not inevitable; without political, consumer and legal or regulatory approval, convergence will not occur (Maherzi, 1997).

Adoni and Nossek (2001) place convergence within the defensive resistance stage, offering three possible interactions:

(1) functional equivalence – the older medium is supplanted by the new one;
(2) functional differentiation – the two find a way to coexist; and
(3) functional multiplicity – both media merge into one multi-functional unit.

Napoli (1998) also focuses on the defensive stage of older media, offering a four-stage process: complacency, resistance (rhetorical, legal and economic), differentiation and diversification. Finally, O'Brien (1999) offers two different possibilities awaiting older media: 'mediamorphosis', i.e. the future adaptation and change of each medium (Fidler, 1997); 'mediacide', i.e. predicting the death of traditional media (Nielsen, 1998). Dimmick (2003: 125) believes that the former is much more likely than the latter.

THE LIFE-CYCLE MODEL OF MASS MEDIA DEVELOPMENT

Before presenting our model (see Figure 1), two central comments and then four specific points are in order. First, the model is mostly relevant to the modern age: in the pre-industrial era each medium remained in place for many hundreds, if not thousands of years, without any palpable new competition. Moreover, print constituted the world's first mass medium, i.e. beyond the elite and the few that were highly-educated.
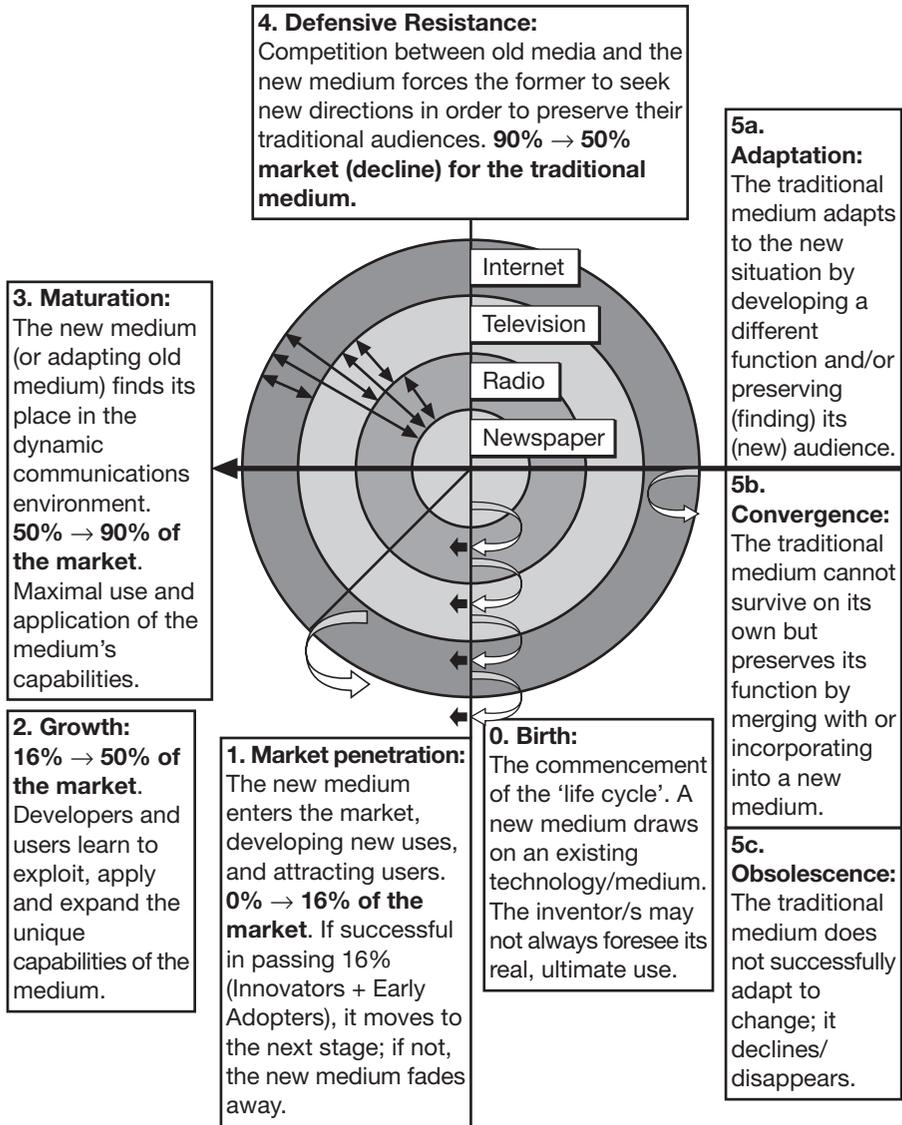
Second, the model is spatially universal. However, for various technological (infrastructure), economic, social (educational), political, cultural and other reasons, its development pace and territorial scope vary enormously from region to region – and at times, within a specific region or even country.

Four specific points relate to elements of the model itself. First, it appears in 'circular' fashion because every new medium is influenced by older media and vice-versa; moreover, every new medium incorporates elements of previous media (physical and/or functional). Second, the circles represent the chronological order in which these main media appeared (only the three media most relevant to the internet are included). Every circle represents one complete 'life-cycle' of a medium with its set parameters: functions and audience.

Third, the length of each medium's life-cycle and the time between each stage are also not uniform. Stage transitions are dependent on the appearance of new competitors; adaptation and survival is in great part a function of innate technological capabilities. Fourth, while the formal 'defensive resistance' stage is at 4 on the model, the bi-directional arrows placed between stages 3 and 4 (upper left quadrant of the circles) suggest that the 'older' medium's defensive resistance can begin at stages 1, 2 or 3 if and when a brand new medium appears, while the older one is still in that relatively early stage.

0 – birth (technological invention)

Most new media are 'continuous innovation' types (Atkin and LaRose, 1994) – direct descendants of previous media seriously lacking something. For example, Bell was hired to find a 'harmonic' way to transmit several telegraph messages simultaneously. The final result was different than expected (de Sola Pool et al., 1978, 1983; Winston, 1999). Such 'piggybacking' on the older medium foreshortens the birth and early growth stages, both technologically and in marketing. A new medium with the 'look' or 'feel' of an older one will have an advantage with the usually conservative audience (Rubin, 1993), overcoming the 'discontinuity factor' (Atkin and LaRose, 1994).

4. Defensive Resistance:
Competition between old media and the new medium forces the former to seek new directions in order to preserve their traditional audiences. **90% → 50% market (decline) for the traditional medium.**

5a. Adaptation:
The traditional medium adapts to the new situation by developing a different function and/or preserving (finding) its (new) audience.

3. Maturation:
The new medium (or adapting old medium) finds its place in the dynamic communications environment. **50% → 90% of the market.** Maximal use and application of the medium's capabilities.

Internet

Television

Radio

Newspaper

5b. Convergence:
The traditional medium cannot survive on its own but preserves its function by merging with or incorporating into a new medium.

2. Growth:
16% → 50% of the market. Developers and users learn to exploit, apply and expand the unique capabilities of the medium.

1. Market penetration:
The new medium enters the market, developing new uses, and attracting users. **0% → 16% of the market.** If successful in passing 16% (Innovators + Early Adopters), it moves to the next stage; if not, the new medium fades away.

0. Birth:
The commencement of the 'life cycle'. A new medium draws on an existing technology/medium. The inventor/s may not always foresee its real, ultimate use.

5c. Obsolescence:
The traditional medium does not successfully adapt to change; it declines/ disappears.

*The model assumes that the media environment is essentially dynamic (↔), with individual media constantly affecting others.

• Figure 1   Natural life cycle model of new media evolution*

Other cases involve new media emerging out of recently invented general technologies, e.g. the internet based on the computer (originally without communication functions), coupled with the phone system. However, the time-lag between invention and mass media application (Marvin, 1988) may be relatively long (e.g. 'wireless' took about 25 years to become 'radio'; the

internet became a mass medium after a similar period of time). For most mass media the appropriate infrastructure (e.g. telegraph, telephone) or organization (e.g. television; see Crowley and Heyer, 1991) must accompany the 'appliance' itself.

Social constructionism theory factors inhibiting the birth process are: the older media's aggressive tactics; political intervention; lack of marketability or economic unprofitability; inhospitable economic or political environment (e.g. depression, war); lack of management belief in its company's own inventions; lack of cost/benefit utility to the consumer; and legal/regulatory problems.

1–Market penetration

Eventually, the new mass medium enters the media environment, usually undergoing rapid change – physical (technical) as well as content (type of messages and style of presentation). Innovator and early adapter types buy and critique the new medium among themselves and through the traditional media. Given the public's usual technological conservatism, only if their evaluation is truly positive will the new medium have any chance of passing the 16 percent threshold (the sum of Rogers' first two categories) and move on to the next stage. However, a new medium that is 'not ready for prime time', without positive word-of-mouth reviews, could undergo significant change (cheaper, better quality, more functions, etc) and succeed in a second incarnation. A recent example: the digital versatile disc (DVD) is a later generation of laser disc technology whose prior incarnation failed.

Successful market penetration and widespread diffusion of a new medium is helped along by business acceptance (e.g. the early telephone). Corporations provide access to workers who cannot afford home purchase as yet, teach the necessary skills for using the medium and lend public legitimacy. However, this is not absolutely necessary – radio and television flourished from the beginning without business use.

A new communications technology can also begin life as a 'niche' medium. Later, after transformation to a mass medium it can move to the next stage: growth. 'Wireless radio' started off as a minor role-player, mainly for land–sea communication. Only after some 20 years did its real mass nature emerge. On the other hand, bad timing can lead to the technological equivalent of 'sudden infant death syndrome'. If an incremental innovation appears at the same time as other radical media inventions, the former will not pass the penetration stage, e.g. closed–platform videotext emerging around the time of open–platform personal computers (and accompanying modems) (Lievrouw, 2002).

In sum, the market penetration stage has several possibilities: premature demise, long-term stasis (cocooning), or immediate success, which are all

dependent on endogenous factors (the technology's capabilities) and exogenous factors (social readiness and opinion leaders' acceptance).

2–Growth

At first, a new mass medium usually has difficulty finding its 'natural voice', i.e. its unique character relative to previous media. Technical operators (and even the inventors themselves, e.g. Bell had no inkling of the ultimate real use of his telephone; Aronson, 1978) do not correctly identify the most appropriate service or function. For their part, content providers blindly reapply the previous medium's style and format (Chan-Olmstead and Park, 2000; O'Brien, 1999); for example, the Gutenberg Bible perfectly reproducing a codex manuscript or initial American television programs that were the most popular radio shows 'televised' (Stephens, 1991). Media producers have trouble freeing themselves from previous media paradigms – even if they are inventing a new technological paradigm. This is reinforced by the obvious economic benefits of reproducing 'off-the-shelf' content instead of producing new formats and material, such as early radio and broadcasting recorded music. Normally, the general public is even more incapable of seeing the new medium in a different light. However, various actors begin to 'understand' the new medium better after a while, transforming it into something more 'true to itself' (e.g. television's physical slapstick comedy, *I Love Lucy*).

At the growth stage, the inventors/originators begin to lose control over the young medium with other elements shaping its nature. True, media professionals (both technical and editorial personnel) may have been doing this already at the penetration stage, but now the public at large becomes a force in such 'medium definition': for example, the public's use of VCRs less for recording TV programs than for purchasing or renting movies, and more recently, mobile phone short message services (SMS, or 'texting'). Thus, content and presentation experimentation do not cease at this stage.

At some point the medium's growth accelerates, reaching 50 percent audience penetration within a decade or two of commercial introduction; examples of this are black and white TV in America by the mid-1950s and original programming cable TV by the mid-1980s (Rogers, 1986). We should note that '50 percent' follows from Rogers' diffusion of innovations model: the first three categories together (innovators 2.5%, early adopters 13.5%, and members of the early majority 34%) equal precisely 50 percent. Certainly, when half the public uses a medium we can safely say that it is no longer marginal. However, the proper indicator should be 50 percent of *users*, not *purchasers* (as many media can be consumed without purchase, such as radio in a public place) or *households* (dependent on the average number of persons in each home).

What are the reasons for the fast growth of a new medium? Culture (that is, openness to novelty), cost–benefit utility ('bang for the buck'), user-friendliness ('human–machine interface'), and a nation's technological infrastructure (human and physical), are all critical factors. Also, the level of inter-medium interactivity (Mahler and Rogers, 1999), for if the medium can be utilized usefully only in conjunction with someone else's appliance (say, a videophone), that will retard diffusion as each consumer waits for others to buy it first – until a critical mass is attained (Marwell and Oliver, 1993).

However, the most important factor is social need and readiness. Without the proper communications and social conditions, new media can wait for decades to realise their potential. In the 1950s, no one conceived of CATV as a medium for original programming as the three networks and local stations fulfilled that function quite nicely. However, when the 'melting pot' ethos disintegrated in the 1960s – feminism, Black Power, massive immigration, a return to ethnic roots – the need developed for discrete, audience-sector programming, and thereafter CATV skyrocketed in popularity.

The new medium need not perform a complete new service or supply a radically different function. It can offer a traditional communication function but far more efficiently, cheaply, or with much greater ease of use. However, usually incremental improvement will not be enough to entice most people to change old media habits, e.g. the very slow market penetration of the e-book in recent years.

Older media may recognize early on that the new medium presents a potential threat and respond by narrowing the 'performance gap' between their traditionally limited offering and the new medium's 'better' service. Thus, a new medium's initial large advantage may not last for long if older media respond quickly and significantly, seriously retarding the pace of growth. When internet telephony emerged in the mid-1990s it was far cheaper than long distance phoning. However, with regular long distance phone prices declining drastically, the primary advantage of internet telephony has been undercut, and its future rendered cloudy (Adams and Clark, 2001: 271). Another example is DBS limping along as a result of the cable TV's system's upgrade from analog to digital.

3–Maturation

Once past the 50 percent user mark, the not-so-new medium becomes a routine part of the media user's repertoire. Normally, the medium will pass the 90 percent mark and, in certain cases, approach universal use.

Why? First, with financial and organizational heft, the medium can spend heavily on advertising and marketing, fix outstanding technical glitches, drive incremental technological improvements at a faster pace and answer

the needs of late adopters. Second, economies of scale lower content production and appliance purchase costs – attracting consumers at the bottom of the socio-economic pyramid, including the masses in poorer regions of the world. Third, many more content providers become involved, further expanding its attractiveness for the consumer (e.g. software programmers for video games, application developers for the handheld personal digital assistant – PDA). An increasing cadre of in-house developers and content providers find added functions, further driving growth and profits despite market saturation (Stephens, 1998).

In short, this is the medium's 'Golden Age'. It dominates the media world – at least within a specific functional niche. However, middle age is but a prelude to peril.

4–Defensive resistance

Sooner or later an established medium will be threatened by other, younger media – usually new, but on occasion merely less senior. Deterioration need not be measured only in number of users but also in reduced gross income of the medium (e.g. ticket sales) or consumption time (e.g. radio listening). The declining medium may still have a large following, but with sharply-reduced user money or time outlay, it must react in order to survive.

Certainly, not every new medium immediately pushes old media into a vortex of change. First, a new medium can offer a service that did not exist heretofore (e.g. the telegraph). Second, older media may not understand the potential threat and ignore it (Western Union was offered the telephone patent for US$125,000 but declined). Third, sometimes the new medium is perceived as threatening one specific medium; only later do *other* older media comprehend that they too are threatened (e.g. by the late 1970s it was becoming clear that the computer could make the typewriter obsolete, but the post office, phone companies, music industry, radio stations or TV networks did not see any potential threat in the computer's ascendance).

Fourth, the decline of the older medium may not occur immediately; under competitive pressure the traditional medium can squeeze more out of its arsenal – even actually increasing revenues for a period of time. Landes (1969: 260) noted three basic reasons for this:

(1) creative technological response;
(2) cutting costs and prices; and
(3) widening markets and opportunities due to the increased demand brought about by the new technology's efforts.

A past example: the telegraph strengthened newspapers, enabling them to bring fresh news from afar. However, two contemporary examples show how the relationship can be a double-edged sword: music file-swapping programs undercut the economics of the music industry but, paradoxically,

increase music listening; DVDs add extra elements to the movie experience (outtakes, translations, production scenes), thus strengthening the movie industry while further eroding cinema attendance.

Speed of response is economic in character: the larger the infrastructure investment, the greater the medium's unwillingness to change or adapt – 'network lock-in' (Antonelli, 1991: 12), as in the case of Western Union's huge telegraph system blinding it to the potential of the telephone.

What are the older medium's possible reactions? First, attack – the best defence is a good offence. As a vehicle of communication, the threatened medium can propagandize against the newer competitor: the new medium's content reliability and technical dependability might be questioned (Naughton, 2000). Also, fearmongering is not an uncommon ploy, where the print and electronic media play up the internet's dark side: paedophilia, pornography, sales fraud, etc, that are actually but a very small part of the internet universe (see Rössler, 2001, for counter-evidence).

Second, the older medium can try to cut off the new medium's content sources. In the 1930s the newspaper industry tried to block news agencies from feeding news to the young radio medium (Emery and Emery, 1988). More recently, the US cable industry lobbied the FCC to overturn rules requiring cable programmers to make their programming available to DBS providers. Third, with its institutional and political clout the older medium can attempt legal resistance (de Sola Pool, 1983: 50), e.g. the American TV broadcast industry's temporarily successful influence on regulatory and court action against nascent cable TV in the 1960s (Le Duc, 1973), and the newspapers' similar campaign against radio (Jackaway, 1995).

However, if the new medium has some real added value to offer, these will be merely holding actions against the inevitable tide. Thus, the older medium will devote great effort to finding ways of keeping its traditional audience and/or attracting new ones. Weber's 15 competitive 'gap analysis' parameters are relevant to our media-defence analysis: audience differentiation, new product uses, stimuli for non-users, applications enlargement, etc. (Weber and Utpal, 1998).

Mature media will respond differently, depending on their technological capabilities and the degree of perceived or actual threat. Radio and the cinema defended themselves from television, but in diverse ways: radio changed its functional use with narrower, targeted audiences and more audience participation; cinema took the technological route of special effects, with large screens and strong sound (Rogers, 1986), and expanded distribution channels through videotape rentals and DVD as well as overseas.

For some media, defensive resistance can be an ongoing affair: on occasion the move from stage 4 to stage 5 (adaptation) will be followed immediately by a return to stage 4 without much time to enjoy growth and maturation (stages 2 and 3) once again in the medium's new guise. Cinema

today again finds itself threatened by newer technologies, e.g. large screen/ surround sound/DVD home cinema. Its present attempted adaptation is digital cinema, enabling interactive audience participation in determining the outcome of the movie, winning prizes during the screening of movie promos, and so forth (Sigan, 2002).

5–Adaptation, convergence or obsolescence

This stage constitutes the outcome of the previous stage. There are three broad possibilities.

Adaptation: the first and perhaps foremost tactic is to find a new audience niche, or to focus more sharply on the sub-audiences within the medium's traditional audience. This is preferred because the older medium has the advantage of knowing what its audience wants. For example, the immediacy of radio engendered a reconsideration of what timeframe constituted 'news': newspaper deadlines were foreshortened and, occasionally, later editions were published. Network television news, grabbing an almost universal audience, moved the papers to add much more colour and visuals to the printed page (i.e. functional equivalence or mimicry) as well as offering much more news commentary and background that television news could not, or would not, offer (i.e. functional differentiation or complementarity). Finally, in a third adaptation – to cable television's fragmentation of the news market – newspapers offered audience-segmented supplements, apportioned by geographic region and/or subject (science, health, etc). Presently, newspapers are groping through a fourth round of adaptation as web news offers personalization, animation, video, audio, interactivity and such like (Chan-Olmstead and Park, 2000; Naughton, 2000; Nielsen, 1995).

A second tactic involves technical upgrade and multi-functionality. Many traditional media have the technological potential to do more, but without a serious competitive threat, and especially if they have monopoly power (Lessig, 2002: 33), they do not. The telephone hardly changed for a century, but after deregulation and particularly during these last two decades it has undergone a wholesale makeover – first, becoming mobile-wireless, then adding text and now video. Indeed, US phone companies had Digital Subscriber Line (DSL) technology for years but only launched such a service after the cable industry inaugurated high-speed cable modem services.

A third tactic is economic: older media, especially if financially sound, have the luxury of purchasing or jumping on the new medium's bandwagon, and placing a few eggs in the new basket; for example, NBC added television to its radio holdings in the 1930s and 1940s, and more recently it invested in TiVo. Of course, this does not guarantee older medium survival, but it does enable the use of new media revenues to

'subsidize' the adaptation changes of the older medium, enabling the original media organization's survival after its founding medium disappears.

Convergence: when little else seems to work, 'if you can't beat 'em, join 'em'. For example, by the late 1990s, it was thought that telephony would be gobbled up by the internet (or more precisely, by computers), but today, internet surfing is migrating onto the mobile phone. Again, in offering to its traditional audience a parallel medium (e.g. e-newspaper, internet surfing), the transformed medium can quickly reach the stage of maturation (stage 3) without too many birth or growing pains.

In extremis, convergence can also mean self-effacing absorption (media 'sublimation'): an over-the-hill medium loses its identity but maintains its basic function within the new, replacement medium (functional multiplicity). In a sense, this is partial obsolescence: the technology disappears while the communication service survives. Examples: the typewriter's function existing on the computer keyboard; tomorrow, the printing press's print function will survive in digital guise, on e-books with PDA-sized screens, or plastic page, tablet-sized, downloadable/reusable, digital ink 'magazines'.

Obsolescence: many successful media have disappeared over time – in modern times: telegraph, typewriter, hi–fi phonograph, videotext; earlier in history: papyrus, drums, torches, scroll, parchment manuscript (codex), semaphore. Their common denominator? They were all limited technologically and narrow functionally; their analogue nature did not enable 'communication' with other media.

However, modern media are almost all electronic and particularly, digital – possessing a technological reservoir for technically upgrading themselves and expanding functionally. Their digital language also affords a commonality with other media, thus opening convergence possibilities that were not feasible in the analogue age. Whether this can guarantee the survival of contemporary digital media is a question to be addressed in the next section.

THE INTERNET AS CASE STUDY: APPLICATION AND PROBLEMS

As is well known, the internet's gestation period took a few years during the 1960s when the Pentagon sought to ensure nuclear attack survivability for its military communications network. This gave birth to a new 'medium' (ARPAnet), 'piggybacking' on the traditional telephone infrastructure along with stand-alone computers, with some new routing and software technologies added (Krol and Klopfenstein, 1996; Naughton, 2000; Winston, 1999).

However, once the academic community (as users) became involved, functions other than data transfer slowly evolved – email (the early 1970s)

and Usenet (early 1980s). While their growth increased dramatically during the first two decades, the internet only became a mass medium with the world wide web following the introduction of hypertext (HTML) in 1989, web browsers in 1992–4, and search engines soon thereafter (Leiner et al., 2000). The growth rate of the internet from the mid-1990s onwards increased exponentially after the web's invention (e.g. 20 e-newspapers in 1994 and 3622 in 1997; Meyer, 2001), but this occurred after more than two decades of relatively incremental growth, due to economic inertia (non-profit from the start) and technological complexity (a very user-unfriendly experience back then) – and not because of any action or reaction of older media which hardly registered it on their radar screen.

This history points towards a terminological problem for the concept of media development in general, and our natural life-cycle model specifically. Regarding stage 5a (adaptation), one can ask: when a medium undergoes metamorphosis, does it thereby become a 'new' medium? Is the modern, multi-functional 3G mobile phone the same medium as Bell's telephone, or a new medium altogether? Is an interactive, multimedia, e-book version of the Old Testament the same medium as Gutenberg's Bible? Is internet TV the same medium or different from regular television, given its increased functional possibilities? Previous theories and models did not ask such questions due to their highly-focused analyses. Our model provides an answer: these are 'adapted/converged' media, commencing a new (albeit foreshortened) life-cycle.

The history of the internet suggests another, perhaps more complex, question: what happens when a *new* medium, in its early market penetration stage (stage 1), spawns several significant 'sub-media'? Are we to view the world wide web, Usenet, email, etc, as distinct new media or as part of one *multimedium*? We have chosen the latter course, in part because of the common infrastructure (internet 'backbone'), the common appliance (computer, although this may soon change), and the seamless employment by the user of these sundry 'media' ('convergence').

Nevertheless, one could make a reasonable counter-argument for developing a life-cycle model separately for each. First, the major uses of the internet have changed dramatically: from academic information and data transfer in the early years to email communication (84% of all American users in 2001), commercial/product information collection (67%), and news/weather/sports (62%) (US Commerce Department, 2001).

Second, the level of new medium/old media competition has intensified: from virtually nil to major upheaval today. A good example is to be seen from Dimmick and McDonald's research (2000): '[B]oth the diffusion of the computer and the Internet have contributed to a displacement of time spent viewing television' (Dimmick and McDonald, 2000: 94). Email threatens postal mail, fax and perhaps telephone conversations (Ries and Ries, 2000;

Taub, 2003) for reasons of convenience and perhaps economics (only regarding 'low involvement' communications: Dimmick, 2003: 99). The world wide web threatens newspapers (Nielsen, 1998) as well as bricks-and-mortar libraries. File-swapping programs threaten radio specifically and the recorded music industry as a whole (Adams and Clark, 2001).

The terminological problem, of course, has theoretical implications. For example, by early 2002 the internet had arrived at 50 percent US household penetration, placing it within the fourth stage (no. 3) of 'maturation'. This might seem to support Saffo's 30-year rule – but only if we look at the internet as a metamedium. However, the real mass success of the internet occurred only after the world wide web's advent; as an individual medium, Saffo's rule is way off the mark.

What were the factors behind the Web's spectacular early growth – stages 0, 1 and 2 (birth, penetration and growth)? First, the underlying technologies, infrastructure and appliances already were to be found widely among the general population, especially the telephone system and home computers. The added costs to the economy of laying the foundation, and to the consumer of becoming connected, were relatively minimal given the internet's 'piggybacking'. This also bypassed the 'critical mass' problem. Had the world wide web arrived before the telephone or at the beginning of the personal computer age (1980), it would not have exhibited geometric rates of growth, as most potential customers would have waited for others to purchase the terminal. This is strong justification for adding a stage heretofore missing from other models – 'birth' – the basis of any medium's early development pattern, from slow to spectacularly fast.

Second, another reason for immediate success, the multi-functionality[3] of the web and wider internet, in effect offers several new functions for the price of one: interpersonal communication, information retrieval, group conversation, shopping, etc, from different sub-media and media technologies such as email, ICQ ('I-seek-you'), web, Usenet, streaming audio/video and so forth. This sheds new light on 'convergence', normally referred to at the stage of adaptation (5b) – convergence between older, threatened media, and the newer medium. However, internet convergence appeared already at the growth stage (2) and is certainly continuing apace at the maturation stage (3), involving novel media developed in tandem within the new multimedium, e.g. internet video gaming.

Third, unlike most other electronic media (especially radio and TV), the web and the internet are profoundly interactive (Chan-Olmsted and Park, 2000; Kiousis, 2002; Ries and Ries, 2000), placing the user in the driver's seat. For example, online journalism thrives on the producer–end-user partnership (Pryor, 2002). Also the web in particular was relatively user-friendly from the start, with no heavy programs to learn.

Finally, for various historical reasons almost all the content on the web was free, and most remains so. This suggests an important 'law' of new media development: media without significant, ongoing, per-use costs will grow at a much faster rate. Compare the slower growth rates of the telegraph, telephone and cinema with the far faster expansion of radio, over-the-air television and the web.

Unsurprisingly, even before the internet and web approached maturation, the older media took a defensive resistance posture. Newspapers were the first to respond in several ways. First, by 'reproduction' or 'mirroring' (O'Brien, 1999), i.e. offering their own product through the internet but with the same 'look', such as e-newspapers copied directly onto the screen. Second, by mildly changing the traditional product online – adding some new elements to fit the new medium, while keeping the original format basically intact. This is where most e-newspapers are today – not only (or necessarily) because of a lack of organizational 'vision', but also because the audience is not always willing to move to a strange medium that lacks elements of the familiar. Third, by creating an entirely new way to present content, e.g. the portal with its myriad links to other pages and other sites (Chan-Olmsted and Park, 2000). However, presenting material in a different format entails changing the content as well, that is, the internet's unique, dynamic characteristics influence the very substance of what is being displayed and perceived (graphically, user involvement and storage capabilities).

To some extent, the threat to older media is a cultural–generational one. As McLuhan noted, new media can change profoundly the way in which content is consumed and perceived. The printed book changed our culture from oral to textual literacy (and a more linear, logical frame of mind); the internet promises or threatens to move us from linearity back to associativity (Stephens, 1998), through hypertext and soundbite communication: links, ICQ messaging, advertisement bursts, streamlined text with short audio and video clips – all leading to 'scanning' (Nielsen, 1997a, 1997b), a new form of media consumption. Moreover, the sheer number of media available can also change consumption patterns – today's youngsters listen to music, watch TV, read magazines and play video games simultaneously, thereby altering the media experience of each. Such 'parallel consumption' (or multi-tasking) is a problem for each older medium but also an opportunity for synergistic inter-media cooperation, for example, CD music which is produced specially as streaming background to popular internet video games.

Such new modes of consumption are incompatible with the way in which older, traditional, media have normally worked, and certainly threaten their economic *raison d'être*, i.e. advertising, dependent on a closer 'reading' of the commercial or advertisement copy. As the internet grows, attracting a wider youthful audience, it threatens the future existence of

older media because its audience will not be open (or even able) to 'consume' in the traditional fashion. What attraction will static print newspapers hold in 2024 for adults who were brought up in a 2004 soundbite/MTV/hypertext environment where ten seconds of concentration is their maximum? In short, the real technological threat of the new medium is cognitive. Transforming deep-rooted patterns of thought and consumption undercut the very foundations of the older media (Nielsen, 1998).

Thus, while our model relates mainly to changes in the media themselves, it is also relevant to what happens in the long-term to audience usage of new, as well as 'transformed' or 'reinvented', media. Moreover, although it is not designed to discuss the social influences of new media, we should note that especially during the initial stages of a new medium's development, scholars do not always perceive its eventual societal impact. For example, Winston (1999: 335–6) suggests that the virtual world will not replace important aspects of the 'real' world (e-conferences will not replace business meetings, nor will e-commerce halt mall shopping). However, such assessments fail to take into account both the important future technological advances of that evolving medium (in our case, the possibility of transmitting virtual reality through the internet), and the next generation's comfort level with 'virtual' socializing.

With the internet at the transition point between growth (2) and maturation (3), what lies ahead? The first thing that needs to be noted is that 'maturation' does not necessarily entail 'routinization', or what Caspi (1993) called 'institutionalization', as is clear from the present ferment of the entire internet enterprise. This has happened in the past. For example, after almost universal market penetration in the 1970s, television began to undergo upheaval – not because of the reaction of other media but due to internal technological, content and regulatory factors that changed the face of it: CATV, satellite TV, digital TV, etc. Thus, one cannot look only at factors or media outside a specific medium as fomenting turmoil (or forcing adaptation); internal factors are at least as important, at almost any stage of a medium's evolution.

Much of the internet's ferment is endogenous and not exogenous, although the reaction and adaptation of other media have had some impact. The endogenous factors are: technological (XML superceding HTML software, file-swapping programs, broadband); economic (the beginning of the end of free content); and increasingly significant, political and regulatory factors (taxation legislation, variation among national laws, copyright law expansion; Lessig, 2002). However, the turmoil need not prevent the continued expansion of the internet. Indeed, it could actually give it a further push – for example, by strengthening the financial base of surviving e-companies.

How will older media adapt to the maturing internet? Most of the older media will survive in somewhat changed form in the internet age – with a few caveats. First, it is not contradictory to predict that most of the older media will continue to exist, albeit within the internet's underlying metamedium infrastructure. While content and functions will remain recognizable, their modes of transmission/distribution will change drastically. Ultimately, newspapers will become exclusively electronic (Ries and Ries, 2000), delivered through the internet to new media appliances (PDA, e-book, tablet computers). Radio will continue to gravitate towards the internet, because that is where people will be spending more of their work and leisure time.

Television is a different matter, as a titanic struggle is taking place between WebTV (internet on the TV screen) and 'InterneTV' (television programming which is video-streamed to the computer screen). Of course, both could lose out ultimately to transparent screen goggles, wirelessly receiving and displaying visual content half an inch from the viewer's eyeball – or to 3G 'cellphoNET'. But these are the means of presentation; most probably the electronic conduit for them all will be the internet. Indeed, it is not far-fetched to predict that the internet will ultimately form the overall framework of the natural life-cycle model, i.e. older and new media will be going through their life-cycle stages within the totality of the internet metamedium and as part of the multimedium.

Second, as mentioned, the older media's content will remain 'recognizable' but will not stay the same. The present serious attempts to push audience-participation in interactive TV, 'select-your-own-content' digital radio, jumbo-screen and multi-sensory cinema, etc., are all attempts by the older media to adapt to the web's attraction by upgrading the mode, quantity and quality of their contents – to better serve traditional audiences while finding and creating new audience niches. Altogether, as the CD music business today is beginning to understand under the immense pressure of internet file-swapping, significant adaptation demands new modes of thinking (copy protection), packaging (listeners' song selection, e.g. Apple's iPod), and at times, pricing (rental, time-based).

Finally, older media adaptation might also take the form of uniting together ('convergence'), in order to provide a multimedia, multi-functional, super-medium that can compete on equal terms with the newer medium. In reaction to the 'threat' of do-it-yourself web newspapers, traditional media could offer an electronic, pre-packaged newspaper, combining regular text with radio/audio and TV/video clips on an advanced 'e-paper' medium, transmitted wirelessly from editorial office to reader. This is a likely possibility given the media world's increasing number of conglomerates owning radio and TV stations as well as print newspapers/ magazines. In short, older media do not have to adapt individually. They can

do so symbiotically, with strength in numbers. Old enemies can fruitfully 'converge' and create a 'hybrid' medium for all to stay alive, e.g. telephone, camera, teletext (SMS), music – the multi-purpose mobile phone; or Sony's PDA 'Clie', combining MP3 music player, photo album, as well as diary, etc.

Will any of the older media disappear completely (stage 5c)? To use a digital metaphor: yes, but mainly through morphing into something else. We have hinted already that the 'newspaper' will not exist in a few decades – in its present format. However, if it gravitates onto the web and does not disintegrate under the centrifugal force of do-it-yourself news and text/ photo weblogging, it might well survive but in quite a different form. Just as the typewriter became the computer keyboard, so too might older media 'appliances' become obsolete but continue to live through their functions.

CONCLUSION

Our six–stage model is called 'life–cycle' to indicate the transformational possibilities open to the media which are not merely linear and finite (unlike those of a human being). True, a few media such as the telegraph have lived a 'linear' life (Shaw's (1991) 'youth, maturity, senior citizenship'), but many others, such as magazines and cinema, have successfully reincarnated themselves in spite of – or perhaps because of – the natural and increasingly competitive Darwinian struggle to survive. Indeed, one of our central points is that it is not so much the fickleness of the audience or even surrounding social change that constitute the prime factor in an older medium's (un)successful adaptation, but rather its response to newer media – what we call 'media constructionism'.

The biological analogy is intentional. On the surface, death seems to be an inevitable part of any living system, and communications media are no exception. However, evolutionary biology talks of the 'life–cycle' not only on the micro–level of the individual organism, but also of the 'circle of life' on the macro–species level. Older life forms eventually disappear after having spawned their successors. A large part of the older species' 'genome' continues to exist, even though the phenotype (external appearance) has evolved into something quite different.

Mass media are not too much different in this respect, as they also form their own 'circle of life' in totality. Therefore, the model we offer here is circular from the perspective of the lifespan of any particular medium and multi–cyclical regarding the entire media corpus taken together over the generations. This is a central element that distinguishes the present model from all the others (except for Cox, 1967) that end with the demise of the medium under consideration. We suggest broadening the perspective to generations of media within a wider macro–media context of survival of the fittest.

These two elements are particularly prominent in the case of the internet, albeit with some surprises. From the model's perspective, the 'natural history' of the internet is paradoxical. While following the same pattern of stages found among its predecessors (Winston, 1999) – if at a somewhat accelerated pace – in its threat to older media we find a reversal of the historical pattern. Life on Earth began with a single-cell organism, differentiating ever since into more and more varied species. Media also started out simply (speech, drawing) and have been multiplying since the dawn of the human race – that is, until the internet. While this multimedium is a new species too, it also 'threatens' to swallow up most, if not all, of the other media in an orgy of digital convergence – a super-species rendering most (or even all) others extinct as separate communications organisms.

This does not mean that the internet marks the end of the line. One can think of future developments to threaten its growing hegemony, e.g. ubiquitous, personal device-driven, ultra-wideband, 'open spectrum' communication (Werbach, 2003: 82), or even unmediated 'brain-to-brain' communication.[4] It does suggest, however, that while our life-cycle model is useful in analysing the historical past, present and immediate future, it might require revision after the internet completes its maturation stage. In the longer-term future, new media may seek to be incorporated within this established multimedium from the start, rather than fighting it in the vain hope of emerging as the new dominant force. This would change significantly our model's 'defensive resistance' stage – indeed, it would be relevant no longer then. However, in the meantime that stage, along with the whole model, is all too relevant for almost all of the older media that are attempting to find ways of surviving the internet juggernaut.

Notes

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1 Also known as social constructivism, depending on the theoretician.
2 Caspi's model takes up but two pages of explanation in a Hebrew textbook. Unfortunately, he never developed the model analytically any further. The textbook did devote several ensuing chapters using past media as illustrative case studies of his model. Given its 1993 publication date, his treatment also could not have taken the web into account.
3 Also known as 'mixed media' (Fidler, 1997: 25).
4 Serious research has already begun, with some success, regarding virtual telekinesis (Williams, 2000).

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