

Convergence in the Industry

By John R. Forrest

This paper traces the evolution of the telecommunications and broadcast industries from their monopolistic positions to the rapid convergence of these sectors in a liberalized regulatory environment. The effect of the enormous changes in technology, particularly that in digital electronics, is central to the process. A future model of the industry is outlined.

The turmoil in the business environments of broadcasting, telecommunications, and information technology is evident to all. The turmoil appears all the more intense because, over many decades, long periods of stability and ordered growth have occurred in the evolution of broadcasting and telecommunications, and because of the rapidly increasing impact made on all communication media by information technology in the last five years.

When examined, the turmoil may appear to be representative of a system exhibiting what is known as chaotic behavior, reacting to an ill-defined mix of short-term pressures from the financial markets, new government legislation, dogma about business reengineering, and opportunistic moves by those involved in the market. However, it appears that what is happening in reality is the readjustment, over a relatively short timescale and enabled by technological developments, from one very contained and segmented organizational model of communications to another model that is both unified and global in nature and, because of which, operates to a very different set of principles.

The Background to the Information Society

Some moments of reflection on the origins of broadcasting and communications are appropriate since these ori-

gins have defined the starting point for convergence in the industry. The origins of telecommunications go back to the messenger who used whatever means of physical transport was at his disposal and within the financial means of his client. In return for providing such a service, private entrepreneurs were given exclusive rights and were allowed to carry other clients' correspondence for a fee. This provided a strong commercial drive to develop and extend the business, thereby putting in place the necessary infrastructure to provide a public service throughout their region of operations. This was an example, often repeated since, of a monopolistic position being important in the establishment of a universally available infrastructure that requires a large critical mass of users to be economically viable.

As the strategic importance of the messenger service grew and nationwide coverage was critical, most governments brought these services into central control, creating a state-run postal monopoly. The postal system has been one of the most stable communication systems over the years, arguably because the process of sealed, written (or now computer-printed) correspondence, associated with a very convenient, secure, nationwide collection and delivery service has so far been difficult to replace by better means. Admittedly, fax, e-mail, and courier services are taking a growing share of the urgent document delivery market, particularly for the business community, but this has not yet led to a decline in the traditional postal system.

This brings into prominence a fundamental principle that, regardless of

the attractiveness of a new technology, it will only have impact in applications where it brings a significant improvement in meeting the needs or desires of the consumer at a price that the consumer feels to be good value. The successful new technologies, however, have always had a major destabilizing effect on the organizational "status quo" and although they have been responsible for the vast expansion in communications, their effect has frequently not been in the way anticipated. When the telephone was invented by Alexander Graham Bell, however, it was seen as a device for the delivery of music and news to the home; indeed many cities in Eastern Europe and Asia adopted wired home entertainment systems in exactly the way imagined by Bell. Such systems persisted until the transistor changed the economics by making much more complex end-user equipment, in the form of a wireless receiver, a very inexpensive commodity and one that could provide much greater variety than the wired system.

This provides two further interesting observations: a new technology may have a much greater effect in a field outside that for which it was originally proposed and that a new technology may totally alter the business structure of an overall communications process by changing the balance of complexity and cost between parts of the process. Following the pioneering work of Marconi in the U.K. and Fessenden in the U.S., governments were quick to realize the potential of radio for the dissemination of information and entertainment. Although regulation would have come in due course because of the strategic importance of broadcasting, it was the havoc caused by rapidly increasing numbers of organizations and individuals using the limited amount of radio spectrum that resulted in regulation being rapidly introduced. This spectrum scarcity dictated the framework of broadcasting based on monopolistic

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positions and government regulation for the next 70 years.

Lying behind the various imperatives for regulation that have been identified has always been the influence of the Treasury in government. We must remember the words of Michael Faraday who, having completed an explanation of electromagnetic induction to his king, was faced with the question "But, Mr. Faraday, what use is it?" Realizing that further technical explanation was useless, Faraday went right to the heart of state interests and replied "You will be able to tax it, Your Majesty." The taxation legislation in broadcasting and telecommunications, whether imposed on service provision or the more recent trend of imposition on spectrum use, is important as a revenue source to government and has frequently as significant an effect on evolutionary strategy as more overt forms of regulation.

For most of the 20th century, broadcasting and telecommunications in nearly all countries have been carried out in a strongly regulated environment by separate government-owned or government-regulated monopolies. Telecommunications, being inherently a point-to-point service, became associated with nationwide wired infrastructures, whereas broadcasting as a point-to-multipoint service became associated with wireless, over-air transmission infrastructures. The technological development of cellular mobile telephony led Nicholas Negroponte to postulate that because of the superior value of the radio spectrum for mobile applications, there would be a total inversion of the current infrastructures with telecommunications being carried out over wireless infrastructures and broadcasting being carried out over wired infrastructures (as in the original concept of Bell). The postulate is too simplistic, however, and what will in fact happen in free-market economies is that applications in both broadcasting and telecommunications will use either wired or wireless infrastructures according to the needs of the business and the costs of the infrastructure. The cost of usage of spectrum will be critical in this, as will be the ability of given infrastructures to provide rapid entry to the market for new services.

The break-up of the separate

monopolistic structures in telecommunications started over a decade ago. The same is happening in broadcasting and from a situation of one or two licensed broadcasters in a country, we are now seeing increasing numbers of new entrants in competition.

The Evolutionary Process of the Communication Industries

The great similarity in the evolutionary processes of the various communication media industries indicates a common model of the following form for the evolution of these businesses (which also applies for most of the well-known public utilities):



Each stage of the evolution was influenced by the political views of the time; it had its own particular characteristics, advantages, and disadvantages.

Early Entrepreneurs

The entrepreneurs were the essential starting point of the process, being willing to invest resources to build up infrastructure and to exploit the most appropriate new technologies in the growth of the business. In almost all cases their entry was encouraged by governments, in some cases because they stimulated a market and in other cases because they provided a service needed by government, thereby putting in place an infrastructure without major Treasury expenditure being required. The success of this entrepreneurial phase of evolution led also to its demise. Apart from the inevitability that entrepreneurs would focus on the more lucrative markets at the expense of the less lucrative ones, and thereby not fully address the desires of government for universal service, the structures that developed became strategi-

cally important to government. This led to the next phase where these infrastructures were taken into government control.

Monopolies

The state monopolies were important in their own way because they caused the coordinated development of nationwide infrastructures (e.g., post, telephone, broadcast, rail, electricity) with public service goals, thereby increasing greatly the number of users and hence the added value to the nation from the service. The value of such networks and associated connected equipment has been quoted as being proportional to the square of the number of users. The problem with the monopoly phase of evolution, however, is that once a national infrastructure is complete, there is a major difficulty in stimulating the enterprise to advance in business terms. The solution usually adopted is to introduce competition.

Free-Market Enterprises

The introduction of competition is a painful process, both for the monopoly that is faced with one or more challengers, as well as for the new competitor or competitors who are faced with challenging a well-established organization with its extensive, developed infrastructure. The barriers to entry are high, but new entrants are frequently encouraged by government (as was Sky TV) and by customers who see the positive effects of competition on the lowering of prices and better customer service. It is frequently necessary for newcomers, competing with a previous state monopoly or well-established operator, to sustain a long period of loss-making operations to break into the market. Usually it is only those organizations with good cash flow from other businesses that can afford to do this. Mercury Communications, Sky TV, and Direct TV (Hughes Corp.) are examples of this. Others penetrate the market through establishing initially a strong position in a market niche and then building a position in the main market from that stronghold. NTL's preeminence in broadcast transmission, for example, enabled it to build increasingly strong business in telecommunications from its broadcast transmission base.

Privatization of the former monopolies and flotation of emerging enterprises play important roles in this phase of evolution by providing rapid access to the capital needed for the development or extension of infrastructure and the setting up of new services. The level of motivation and willingness to take business risks is high in these enterprises, and every opportunity is taken to identify opportunities in the market and ways of using new technology to achieve market advantage. Evolution is therefore very rapid.

Government intervention is also critical, particularly in the method and rate of liberalization of the market and the way in which competition is allowed to operate or not operate. A particularly interesting example is in the U.K. cable television industry, which would have languished under the challenge from satellite television if it had not been allowed to build telecommunications business on its network — a revenue stream that now exceeds that from the television service and has greater profitability, enabling the return on investment in the infrastructure to be attractive in the long term.

The difficulty of the competitive market place as it develops is that the available market is divided between a number of enterprises, and hence economies of scale start to be lost unless the market growth exceeds the capacity of all those in the market. Where market growth is insufficient, particularly in businesses such as those in communications or broadcasting that derive advantage through scale or require global operation, consolidation in the industry through mergers, acquisitions, and alliances is inevitable, with the more powerful enterprises then being able to operate on a global scale over a wide range of congruent services in the whole media sector.

The other approach adopted in an increasingly competitive environment is that of greater vertical integration. Those who have become well established in a sector of the market seek to extend their activities into other sectors of the value chain that may have higher added value or give greater control in the overall business process. The approach is one in which the sim-

plicity and logic of the concept hides the crevasses of the reality! Both Sony and Matsushita bear the scars, through their Columbia and MCA acquisitions, of a discontinuous jump up the value chain in a move to control content. The cultural adaptation proved too great, as also did the gap between Bell Atlantic and TCI in the cable television and telecommunications fields. Telecommunications operators who have tried to forge a path into the video entertainment business alone have returned bruised from Hollywood. The vertical integration failures are numerous, but the few successes give insights into the future evolution. The cultures of those involved in publishing and broadcasting are the most easily adapted since they both have an orientation toward a wide public audience. Perhaps therefore it is not surprising that the successful examples of vertical integration are to be found in examples such as News International and Time-Warner.

The traditional telecommunications operators, publishers, and broadcasters are not alone in the process of change. All major enterprises are reappraising their businesses, their strengths, and weaknesses. In regulated sectors such as the utilities (e.g., electricity, gas, water), the effect of regulation is leading to declining or static profit margins in businesses with relatively low growth prospects in their traditional areas. We can therefore expect to see wider consolidation, with the utilities developing business value through acquisitions not only in their own industry but also in other industries, such as communications, which are consistent with their present assets of network infrastructure and access to a domestic customer base. Other companies, such as Virgin, which already operate over a wide range of businesses from travel to entertainment and financial services, are concentrating on building business through brand image, an increasingly important factor in an environment of much competition where a customer can easily become confused by the range of offerings. The most recent and radical move has been that by the supermarket chain, Tesco, in introducing a store card that pays a high rate of interest on credit balances, effectively making

Tesco also a bank — a rather well-performing one in the customer's eyes!

Oligopolies

This is the phase we now observe in much of the telecommunications, broadcasting, and information technology world. The key enterprises in each sector are becoming relatively few in number, they operate globally, and they subcontract significant parts of their business to niche-market companies. These global enterprises are also aware of the way in which digital technology has created great commonality, or convergence of electronic processing between the previously separate business domains of telecommunications, broadcasting, and information technology. As an enterprise, traditionally very strong in one sector, faces increasing competition it looks to other sectors and uses the convergence in digital electronics to penetrate these sectors using relevant skills, assets, and the cash flow from the existing businesses. Such a process, however, carries considerable risk and time delay in gaining experience. Often, enterprises choose to expand across the business domains through alliances that reduce risk and reduce time to market, but still satisfy the expansion objectives of the partners through sharing the gains. This process is now leading to the creation of global, multimedia enterprises.

Future Evolution of the Industry

The formation of global, multimedia enterprises might be thought to be the ultimate stage of the process, having exploited the advantages of technology convergence and economies of scale. The management of large enterprises is, however, difficult, and the management process saps much of the energy that should go into development of the business. This makes the business vulnerable to smaller niche-market operators who can be more flexible, move faster, and adapt in more strategic ways. The only solution in order to survive is for the conglomerate to restructure; it will do this by divesting various operations that are no longer central to its aims and by focusing the rest into operating units or companies with clear market compass and goal. In some ways, this appears to be a reversion in the busi-

ness process, but in fact the newly formed operating units now bear little resemblance to those prior to consolidation. The overall process is thus one that achieves an adaptation to change in the technology and market.

Setting aside regulatory factors, the scene is now set for an almost "technology-neutral" environment for the delivery of telecommunication and broadcast services. These services can now be thought of as part of a continuum of telemedia services rather than as separate entities. Digital compression technology, available for terrestrial television service by 1997, provides a means for removing spectrum scarcity on which the whole broadcast regulatory regime has been founded. However, it can only do this fully when the analog television service is closed down and more frequencies are freed. The same technology, available now for satellite direct-to-home services, is being implemented, thanks to standardization through the digital video Broadcasting (DVB) Project, to provide capacity of hundreds of program and other telemedia services in many countries around the world. In cable, the new hybrid fiber/coax systems have similar service capacity, but the time to build out to large population coverage is long and there always remain significant geographical areas for which such installations appear uneconomic. Multichannel multipoint distribution service (MMDS) systems (wireless cable) can have similar service capacity, particularly in Europe, where the 40-GHz band with 2 GHz or more available bandwidth has been allocated. Although this frequency allocation was strongly criticized some years ago, relatively low-cost technology is now available. This may solve the problem of bringing a wide variety of multichannel services to the more remote areas and may also be a delivery method used by new competitors in the telemedia service business.

The old distinction between broadcasting as a one-way process and telecommunications as a two-way process is also being broken down. Many opportunities for new business and for improving market share exist for broadcasters through the use of interactivity with the listener or viewer. Many broadcasters are experiment-

ing with the use of the Internet for this already. Telecommunications is also no longer inherently symmetrical in its two-way use of bandwidth. Fast downloading of data, audio, or visual images to personal computers is a rapidly growing business.

Cable systems have an inherent capability for broadband interactivity, and MMDS systems are being developed to provide both broadband one-way services and narrowband interactive telecommunications, the latter in the same way as is being used for the new radio local loop services. Both cable and MMDS can provide all telemedia services in a vertically integrated organizational structure. Terrestrial and satellite broadcasting networks are not adapted to provide interactivity, and here we shall see business alliances between the traditional telecommunication operators and traditional broadcasters to address the market for interactive services associated with broadcasting.

The implementation of interactivity into broadcasting or broadband service delivery creates a totally new dimension into the process. Although the interactivity will initially be used in relatively simple ways (e.g., ordering of goods or services related to the broadcast, access to further information, or access to pay-TV services), the technology exists now for a repartitioning of the broadcast chain as a result of the convergence of broadcast and information technologies through commonality of digital processing.

The future digital television, for which DVB has developed the specifications, has much in common technologically with the personal computer. This brings the well-known enterprises of the semiconductor and information technology (IT) industries into this new market for the future "information and entertainment appliance (IEA)" in the home. A significant part of the current debate relates to where content resides. We operate at present on a model in which content and its scheduling has been under the control of the service provider. In recent years, the consumer has been given more flexibility through increased numbers of parallel services, as well as the ability to store and reschedule services by means of the videocorder. The emerging technology of

large video servers means that in principle, the consumer needs to store nothing, but simply call up whatever service or content is desired at the appropriate time. This is the model of the Oracle Corp., who has put forward the concept of all the "intelligence" or content lying in the network and the IEA or "network computer (NC)" in the consumer's home being little more than a dumb display terminal. Not surprisingly, the Microsoft Corp. takes a different view, with the personal computer (PC) becoming increasingly more powerful and complex, with large storage capacity giving much greater local control, the network being used simply for transfer of material.

Almost certainly, neither concept will, in the way expressed, be the future model. The concepts are motivated by market control strategies of major enterprises, rather than carefully analyzed approaches to the future. A consumer, having become used to the flexibility offered by a device such as the PC with its disk storage, or equivalently the videocassette recorder (VCR) and a cabinet of videotapes, will only be willing to give that up if a network solution can provide the same or more facilities at equivalent or lower cost. This has enormous impact on wide-ranging aspects such as telecommunication tariffs. What will most likely evolve in the years ahead is a mix of both concepts. The internal electronics of the TV will be very similar to those of the PC, but the two will have different uses and functions in the home. Economies of manufacture will help drive down the prices of both, however, and in the end it may only be the display and applications software that is significantly different between the two. Also, the importance of interactivity through connection to a network or networks will steadily increase for the TV as it has already for the PC.

While network connection brings many advantages, we are just starting to see, in the use of the Internet, the way in which interactive connection to a network can lead to many problems (viruses, unwanted delivery of material, unrestricted access to unpleasant material). The addressing of these issues will be of major importance as networking becomes commonplace,

and these issues will fall more to the service providers than to the regulatory bodies to solve.

Conclusion

The process of change in the broadcasting world has only just begun. The change in regulatory structures and the technological developments in electronic delivery systems are leading rapidly to a "technology-neutral" environment for access to the consumer. This displaces the broadcaster from a traditional vertically integrated structure and into the role of one of an increasing number of content providers. Consolidation and diversification in other industries with direct contact into the consumer, such as the utilities, will lead to new enterprises operating across the broad field of service delivery to the customer, including communications. In this highly competitive environment, the branding and bundling of services will be a major trend. Competitive advantage will come through economies of scale and the ability to give confidence through brand name. The successful broadcasters, apart from niche operators, will be those who are developing a strong brand image and package of services in global markets. Almost certainly, some of those will be names not today particularly associated with broadcasting.

Government policy on spectrum pricing could have a major effect on the evolution of the communication industries. The revenues gained from broadcast use of the spectrum are much less than those gained from mobile communications use. In the U.S., the desire of the terrestrial broadcasters to protect their position against the mobile communications lobby, reduce the threat of new competition, and avoid extra taxation has had a major effect in defining the whole strategy of their advanced television program.

The rate of technological developments will continue at a frightening pace, driven by the semiconductor industry's norm of doubling device performance every 18 months. Much of the future competitive advantage, however, will come through advances in software architectures for the consumer interface. The devices placed in the consumer's hands are now so com-

plex that product or service differentiation will increasingly come from the user-friendliness of the product or service. Those involved in branding and bundling will pay great attention to this aspect as they will also to the real economics of the new technological developments. While almost anything is now technologically possible, successful businesses will be built on those systems that deliver the most appealing service in the market with the best reliability at the best price.

The market for many of the proposed new services, particularly those involving interactivity, is as yet unknown. Trials of full-service networks, such as that in Cambridge (U.K.), and the experience in bundling and pay-TV services of Sky TV, are very important to understanding consumer preferences when many new offerings are presented. It will be as a result of understanding from all such ventures that the new industry will be shaped.

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John R. Forrest received his undergraduate degree in electrical sciences at Cambridge University. After doing research for a Ph.D. in plasma physics at Oxford University, he went to Stanford University, Calif., in 1967 as a research associate and lecturer. In 1970 he joined University College London as a lecturer of electronic engineering, becoming reader and then professor in 1982. His research group, over the period 1970 to 1984, built an international reputation in the development of new radar and satellite communication systems. In 1984 he joined Marconi Defense Systems Ltd. as technical director, having responsibility for much of GEC's advanced technology development. In 1986 Forrest was appointed director of engineering to the Independent Broadcasting Authority with responsibility for the operation and ongoing development of the ITV, Channel 4, satellite TV, and radio transmission networks. He oversaw the privatization of the IBA engineering infrastructure in 1991 and became the Chief Executive of the new organization NTL. With the rapid growth and diversification of NTL into telecommunications and digital television products, he was appointed deputy chairman in 1994, a role he held until the acquisition of NTL by International Cable Tel. in 1996.

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and rental of computer workstations, videoconference systems, and audiovisual presentation services. He is also an independent director on the boards of a number of companies in the information technology, broadcasting, and telecommunications fields. He acts as a consultant to the European Commission on Information Technology and is a member of the advisory board to Stanford Research International in the U.K. Within the Digital Video Broadcasting (DVB) Project, he was chairman of the Commercial Satellite and Cable Module, responsible for developing the technical DVB standards, and was a member of the Steering Board, but has now taken on responsibility for the promotion of DVB standards internationally.