

RESPONDING TO TECHNOLOGICAL CHANGE – THE REGULATION OF THE INFORMATION SOCIETY IN THE EUROPEAN UNION

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The last decade has witnessed unprecedented change in the telecommunications and broadcasting sectors. Technological developments have fundamentally transformed the character and operation of these sectors. The *Broadcasting Services Act 1992* (Cth) and the *Telecommunications Act 1997* (Cth) are understandably struggling to accommodate this technological revolution.

The broadcasting sector is increasingly merging or ‘converging’ with the telecommunications sector. Traditional broadcasting and telecommunications services have evolved beyond that which was envisaged by the legislators. Further, new hybrid services have emerged which do not comfortably fit within the existing regulatory framework.

In these circumstances, the new regulatory regime implemented in the European Union in 2003 is of special interest. A comprehensive system of regulating ‘electronic communications’ has largely replaced the traditional sector-specific regulation of the telecommunications and broadcasting sectors. The aim of this article is to consider the rationale for the new regulatory framework, outline its operation, and evaluate the extent to which it succeeds in addressing the effects of convergence.

I THE RATIONALE FOR THE NEW REGULATORY FRAMEWORK

A watershed in the consideration of the impact of convergence in the European Union was the *Green Paper on the Convergence of the Telecommunications, Media and Information Technology Sectors, and the Implications for Regulation, towards and Information Society Approach* (the ‘Green Paper’),¹ a Consultation Document prepared by the European Commission in 1997.

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¹ *Green Paper on the Convergence of the Telecommunications, Media and Information Technology Sectors, and the Implications for Regulation – Towards an Information Society Approach*. COM (97) 623, 25-28.

The Green Paper defined 'convergence' to be the coming together of information technology, telecommunications and broadcasting activities. However, it was noted that convergence is not just about technology, but about new services and new ways of doing business and interacting with society.² It was noted that the convergence of information technology, telecommunications and broadcasting activities is likely to provide significant opportunities and benefits and will be at the heart of growth, competitiveness and job creation in years to come. Hence it was considered important for the regulatory regime to efficiently and equitably address convergence.

A Barriers to Progress

The main barrier to convergence identified in the Green Paper was the then current regulatory scheme.³ The regulatory scheme made it difficult for operators to formulate unified strategies and prevented operators from realizing potential economies of scale. This in turn resulted in higher unit costs and reduced competitiveness in the international market. Further the regulatory scheme impeded the delivery of innovative services.

The presence of multiple regulatory bodies and the need to obtain regulatory clearance from different regulatory bodies for a particular package of services created substantial overheads. The example provided was that of a network operator seeking to offer a package that contained both broadcasting and telecommunications services. In such a case, the network would need to be licensed both as a 'telecommunications infrastructure' and a 'broadcasting network'.

Further, the Green Paper noted that there was considerable variation within these different licensing regimes in relation to the time taken to obtain licences, the transparency of procedures, the duration of licences and the fees required. All these factors whilst explainable and perhaps even acceptable in the circumstances of the particular sector had the effect of stifling the development of services and preventing reductions in prices. As technology promotes integration and there was likely to be an increasing demand from both business and consumers for this integration, it was necessary to reassess the regulatory scheme.

B Principles Governing Future Regulatory Policy

The Green Paper outlined five principles that should be considered when formulating future regulatory policy in the sectors affected by convergence.⁴

A central theme of the Green Paper was the need for a lighter regulatory regime. In light of the speed, dynamism and innovative nature of the sectors affected by convergence, public authorities should be careful not to over-regulate. Regulation

² Ibid 25-28.

³ Ibid 38-39.

⁴ Ibid 45-46.

should be specific and proportionate, rather than general and all-encompassing in nature.

The future regulatory approach should seek to further the interests of consumers by providing greater choice of services, improving levels of service and lowering prices whilst protecting consumer rights.

Regulation should seek to provide a predictable framework which would strengthen business confidence and encourage investment. Uncertainty as to the nature and extent of the regulation of new services could deter business confidence. This does not preclude evolution of the regulatory framework, but it requires that changes to the regulatory framework be consistent with predetermined criteria.

Regulation should seek to allow an opportunity for all players to participate in a converged information society.

Finally, the Green Paper noted that independent regulators were central to the success of managing a converged industry. As the general trend is towards lighter regulation, the increased competition facilitated by convergence required an effective and independent regulator.

C Options for Reform

The Green Paper put forward three options for regulatory reform.⁵

The first option was to build on current structures. In this option, the existing vertical regulatory models would be retained. *Different forms and intensities of regulation would continue to apply to the telecommunications, broadcasting and IT sectors. Regulation would be extended on an ad hoc basis to meet the challenges of new technologies and services.* This option would minimize the need for dramatic change in the near future and so have an element of certainty that would be likely to encourage investment. However, such an option would entrench existing anomalies in the regulatory structure which deter investment.

The second option was to *create a new and distinct regulatory model for new activities which would co-exist with the existing broadcasting and telecommunications regulation.* This would require the legislators to identify and isolate 'new' services and activities which cross traditional boundaries and subject them to a new lighter regulatory regime. As converging markets typically produce 'high value' activities, this approach would be useful in providing tailored regulation for these services. The regulation of traditional core telecommunications and broadcasting activities could be refined at a more gradual pace.

⁵ Ibid 46-48.

The central difficulty of this approach is of course 'carving out' the new activities and determining which activities are subject to the new regime. One possible approach is the 'negative approach' of identifying the activities which are neither telecommunications nor broadcasting. Examples provided are that of Web-TV, the Internet and the operation of conditional access systems.

The third and most dramatic option was to *progressively introduce a single regulatory regime to apply to both existing services and new services*. This course does not require that all laws be rewritten. It requires that all laws be reassessed to remove inconsistencies within and across sectors, and that law are flexible to adapt to changing technologies.

Whilst this option is the most far-reaching, it need not be disruptive. The approach could be gradual with initial changes being implemented in key areas where it was important to have a consistent regulatory regime. Network operation and access are provided as examples of priority areas.

II THE ROLE OF PUBLIC CONSULTATION

Following the publication of the Convergence a widespread public consultation process was undertaken by the European Commission. The results of the consultation were published in a document titled *The Convergence of the Telecommunications, Media and Information Technology Sectors, and the Implications for Regulation - Results of the Public Consultation on the Green Paper* (the 'Results Paper').⁶

The Results Paper opens with the statement that the telecommunications sector is widely considered to be the single most important contributor to economic growth in the European Union⁷. Moreover the socio-cultural impact of the audiovisual sector is without comparison. These two factors contribute to making the design of an appropriate regulatory framework extremely important. The creation of an effective regulatory structure was necessary if technological developments were to flow onto economic growth and employment creation.

The consultation was undertaken in two distinct stages. The first stage was undertaken in December 1997 to May 1998 (the 'First Consultation'). The second stage was carried out in July to November of 1998 (the 'Second Consultation'). It is useful to examine each of these consultations in turn. The protagonists of the consultations were predominantly industry players with detailed, practical and useful insights into the operation of the electronic communications sector and the reality of effective regulation. The consultation was far reaching with 270 written

⁶ *The Convergence of the Telecommunications, Media and Information Technology Sectors, and the Implications for Regulation - Results of the Public Consultation on the Green Paper* COM (1999) 108.

⁷ Ibid 1-2.

responses from corporations, industry bodies, consumer bodies and Member States of the European Union.

A Results of the First Consultation

The results of the First Consultation illustrate that there is widespread near universal agreement on the reality of the technological convergence of networks that supply similar services in digital form. There was however considerable diversity of opinion as to the speed and scope of the effect of this convergence on markets and services.

There was general recognition of the continuing need for sector-specific regulation.⁸ Especially within the audiovisual sector, sector-specific regulation was considered necessary to guard public interest objectives. It was however recognized that such rules may need to be modified or the application of such rules may need to be modified to address the impact of new technology. Increased reliance on industry regulation coupled with increased reliance on general principles of competition law was considered effective mechanisms for regulation.⁹

It was recognized that it was important to ensure that all market operators were guaranteed equal opportunities of access.¹⁰

As a general trend, the telecommunications and information technology sectors were less disposed to stringent sector-specific legislation.¹¹ In relation to the telecommunications sector, this belief was fuelled by the increasing competition faced by players within the industry as a consequence of the telecommunications liberalization of the 1980s. The view was further strengthened by acknowledgements as to the rapid speed of change within the industry, market uncertainty and the pressure to invest and innovate.

The majority of contributors supported an evolutionary rather than revolutionary attitude towards reform. There was noticeable consensus for the use of a horizontal framework for the regulation of transmission and access.¹² That is, there should be similar technologically neutral laws applying to the transmission of data and access to networks. However, a vertical approach to regulation was favoured with respect to provision of services.¹³ That is, a vertical approach or sector-specific regulation was considered necessary to regulate services by reference to content or the specific characteristics of such services.

⁸ Ibid 3.

⁹ Ibid 6.

¹⁰ Ibid.

¹¹ Ibid.

¹² Ibid.

¹³ Ibid.

The contributors to the consultation process considered in some detail the three options for reform outlined in the Convergence Green Paper. Option one, of building on the existing regulatory framework, was adopted both by a majority of commentators and by a majority of Member States. It was acknowledged that option one would on occasion need to be supplemented by option two of creating a new regulatory framework for specific, identified, new services. Some commentators proposed a novel idea of combining options, of applying option one to services and applying option three to infrastructures.

B *Results of the Second Consultation*

The Second Consultation was a more defined forum that was largely confined to the following three issues:¹⁴

1. Ensuring equal access to networks and digital gateways;
2. Promoting investment and innovation;
3. Providing a balanced approach to regulation.

C *Access*

The issue of network access is of strategic significance in that it provides the means of linking three industry sub-groups – network operators, service providers and consumers of services. Access is hence a key determinant of the competition in the industry.

It was agreed that due to its strategic and commercial centrality, access issues presented the most urgent claim to the attention of regulatory reformers.

The discussions on access focused on two main issues. Firstly, the discussion addressed whether the initial aim of regulation should be the ensuring of competition of services or whether it was preferable to encourage the emergence of competition in infrastructure. Secondly, the discussion addressed the nature of the relationship between regulation of the electronic communications sector and the application of general principles of competition law.

D *Service Competition or Infrastructure Competition?*

There was a lack of consensus as to whether the regulatory framework should initially focus on service based competition or infrastructure based competition.

The proponents of service based competition argued that it was necessary to have early access to customers in order to establish revenue.¹⁵ Facilitating access to

¹⁴ Ibid.

¹⁵ Ibid 15-16.

infrastructure, especially the local loop was essential for the creation and commercial availability of content services. A large variety of such services were necessary for the growth of an information society. Undue pressure to invest heavily in infrastructure prior to accessing customers and building up revenue was an obstacle to the development of services. Services typically require a critical mass audience to be commercially viable. Enabling operators to achieve this critical mass at the earliest possible time frame would foster competition in the market for such services. Competition was of course in the best interests of customers as it generally led to greater choice and innovation of services.

Moreover, as such open access to networks for the maximum number of service providers on fair and equal terms would foster growth in services, it would be in the long-term also provide an incentive for investment in infrastructure.

Supporters of this view were largely new entrants or established broadcasters who viewed service based competition as an opportunity to provide their content and services on the wide range of platforms available in the convergent environment.

In clear contrast, proponents of the infrastructure competition approach argued that decisions such as local-loop unbundling formed a substantial deterrent to investment in new infrastructure. This was not in the interest parties, neither established players nor new entrants. Access was best provided on a managed network basis, utilising the technology and interfaces for the local-loop that were provided by the network operators. Operators should also be allowed to determine the nature of the use made of their platforms, especially in relation to future digitalisation. Predictably, the supporters of this position were largely incumbent telecommunications operators.

E Relevance of Player Seeking Access

It was interestingly suggested that the nature of the player seeking access should be a relevant consideration.¹⁶ Cable operators were concerned that the regulation of access would be focused on bottleneck facilities. In comparison, new entrants were concerned that dominant facility-based operators, who were also involved in the provision of services, would have an opportunity to leverage quasi-monopoly positions in carriage to gain an unfair advantage in content.

A question was raised by a national regulator as to whether local access networks formed natural monopolies.¹⁷ It was suggested that further analysis was required before regulation was imposed to attempt to provide competition.

¹⁶ Ibid 16.

¹⁷ Ibid.

F *The Significance of the Local Loop*

Proponents of competition based on infrastructure argued that it was possible to overstate the significance of local loop as an access bottleneck.¹⁸ The availability of alternative modes of access to customers, such as wireless, cable and satellite, meant that the local loop should not be overly targeted by regulators.

Other commentators noted that it was unrealistic to expect significant reliance on alternative modes of transmission.¹⁹ Whilst it may be premature to introduce immediate measures to unbundle local loops, it may be necessary to introduce other measures to limit access bottlenecks in local loops. This was especially important in remote areas with comparatively low populations with a lower incidence of network competition. It was noted that frequency spectrum issues would need to be addressed if wireless access was encouraged as a realistic means of reducing local loop bottleneck.²⁰

G *Relationship between Sector-Specific Regulation and Competition Law*

In the access debate, a key issue was the relationship between sector-specific regulation and the application of competition law. Three opinions emerged.²¹

1. Commentators who believed that the regulation should take the form of a predominant reliance on sector-specific regulation.
2. Commentators who supported a regulatory model that was based predominantly on the application of competition rules.
3. Commentators who sought a gradual increase in reliance on competition law and gradual corresponding phasing out of sector-specific regulation.

H *Role of Sector-Specific Regulation*

Proponents of the continuing need for sector-specific regulation argued that the public interest objectives necessary for the effective development of an information society could not be precisely governed by the application of competition law. Sector-specific legislation was necessary.²² Access was such a central issue that general rules of competition law were likely to be imprecise and inadequate.

Governing access by means of competition law would provide a degree of uncertainty on crucial matters of basic access and supply. Such uncertainty was likely to deter investment and growth in the industry. Moreover, competition law,

¹⁸ Ibid 7, 15-16.

¹⁹ Ibid 16.

²⁰ Ibid.

²¹ Ibid 16.

²² Ibid 7-8, 16-17.

which by its nature would govern problems of anti-competitive behaviour by *ex-post* decisions, was an intrinsically unsatisfactory means of regulating access. Anti-competitive positions could be entrenched by the time the *ex-post* decision was enforced and irreparable commercial damage done.

The majority of proponents of sector-specific regulation believed it should govern vertically integrated providers of local-loop facilities, voice-telephony and on-line services.²³ The majority of advocates also believed that sector-specific regulation should be aimed at ensuring non-discriminatory access, require a separation of accounting systems between facilities and services and regulate local-loop pricing. Finally, the majority supported regulation that would guarantee that all consumers have the ability to choose their service provider.

I *Bottlenecks*

Sector-specific regulation was considered essential in relation to bottlenecks to access. Regulation should seek to eliminate bottlenecks, and where this was not practicable, seek to monitor and control the operation of bottlenecks.

Interestingly, some commentators noted that in a converged industry the focus would move from access to network bottlenecks to access to content bottlenecks.²⁴ Proprietorship of premium content was seen a potential bottleneck. Broadcasters owning premium content and having both content and carriage rights had an advantage when launching new services. Alternatively, broadcasters owning premium content had the potential to abuse their position by compelling new entrants to purchase other services in addition to the premium content. Cable operators proposed that they should be allowed to bundle and offer services as they wished.

J *Scarcity of Resource*

Whilst technological neutrality of regulation was accepted as central to regulation of a converged industry, it was recognized that this principle would need to be modified in circumstances where there was a scarcity of resource.²⁵ The most compelling example of scarcity was in relation to the frequency spectrum.

K *Competition Law Approach*

Some commentators suggested that competition law should be the primary method of market regulation. It was argued that application of competition law was the most effective means of ensuring consistency of access regulation across differing platforms. Competition law was also intrinsically flexible and able to accommodate rapid technological change and market evolution. It was however acknowledged

²³ Ibid 17.

²⁴ Above n 6, 17.

²⁵ Ibid.

that mature markets were more suited to management by competition law than embryonic markets.

It was also put forward that the *ex ante* application of regulation could distort markets, and that it was preferable for the market to bring about sustainable levels of competition and consumer benefit. Specifically, it was noted that not all bottlenecks warranted *ex ante* legislation. The application of competition law could focus instead on essential facilities which would be impossible for new entrants to economically reproduce. However, an extensive interpretation of the essential facilities doctrine could also be counter-productive if it served to reduce the incentives for investment and innovation.

L *Balancing Public Interest and the Promotion of Open Markets*

Understandably, the opinions of the Member States of the European Union emphasized the need to take into account public policy considerations.²⁶ The protection of public interests, such as the need to ensure plurality of content, required a continuing level of vertical or sector-specific legislation. Similarly, the enforcement of the must-carry obligation required sector-specific regulation.

Public broadcasters argued that in order to ensure the continuance of non-commercial, community owned and operated services, it was important that there was a degree of public ownership of infrastructure.²⁷ This would assist such services in gaining access to such scarce resources as frequency and remaining viable.

The majority of respondents did not see a contradiction between the protection of public interests and the development of open, competitive markets.

There was universal agreement on the need to uphold public interest objectives such as universal access, affordable prices, pluralism, diversity, protection of minors and human dignity. It was acknowledged that in many of these areas, competitive markets alone could not secure the public interest, and that some degree of regulation was necessary.

M *The 1999 Review*

Subsequently, a Consultation Document entitled *Towards a New Framework for Electronic Communications Infrastructure and Associated Services* (commonly referred to as the '1999 Review') outlined the nature of change in the communications market and outlined the objectives of the new regime. The 1999 Review was based on Convergence Green Paper.²⁸

²⁶ Ibid 6 at p 16.

²⁷ Ibid 16.

²⁸ Ibid.

III THE NATURE OF THE NEW REGULATORY REGIME

A new regulatory framework for the communications sector was agreed upon by The Council of Ministers on 14 February 2002. The European Union formally adopted the regime on 7 March 2002 and it entered into force on 24 April 2002, the day it was published in the *Official Journal*. The new regime was set to apply from date set 15 months after its publication in the *Official Journal*, on 24 July 2003.

The new legislation seeks to provide a single regime to regulate all electronic communications infrastructure and services. The regulation consists of:

- Sector-specific legislation.
- Recommendations and various non-binding guidelines
- Existing competition rules of the EC Treaty.

The sector-specific legislation consists of:

- A general directive which outlines policy objectives applying to a common regulatory framework for electronic communications networks and services (the 'Framework Directive');²⁹
- A specific directives on the authorisation of electronic communications networks and services (the 'Authorisation Directive');³⁰
- A specific directive on access to, and interconnection of, electronic communications networks and services and associated facilities (the 'Access and Interconnection Directive');³¹ and
- A specific directive on universal service and user rights relating to electronic communications networks and services (the 'Universal Service Directive').³²

Recommendations of special relevance to the present discussion are:

- The European Commission Recommendation on Markets;
- The European Commission Guidelines on Market Analysis and Assessment of Dominance;
- The Decision on Radio Spectrum.

A '*Electronic Communications Networks*'

²⁹ Directive 2002/21.OJ [2002] L108/33.

³⁰ Ibid.

³¹ Ibid L108/7.

³² Ibid L108/51.

The Framework Directive states that the objective of the new regime is to provide a harmonized framework for the regulation of electronic communications networks and services.

‘Electronic communications networks’ is widely defined to mean transmission systems which permit the conveyance of signals by ‘wire, by radio, by optical or by other electromagnetic means, including satellite networks, fixed and mobile terrestrial networks, networks used for radio and television broadcasting and cable television networks’.³³

B *‘Electronic Communications Services’*

‘Electronic communications service’ is defined to mean a service normally provided for remuneration which consists in the conveyance of signals on electronic communications networks.³⁴

Hence the regime covers both fixed and mobile telephone networks, cable and satellite television networks and electricity networks where they are used for electronic communications services.

In addition, the regime encompasses ‘associated facilities’ such as conditional access systems.³⁵ The Directive encourages providers to use an open application program interface (API).³⁶

Services exerting editorial control over content using electronic communications networks and services are expressly excluded.³⁷

C *‘Technology Neutral’*

One of the objectives is for the regime to be “technology neutral”.³⁸ The prior regime was not technologically neutral as different regulatory standards applied to access to frequencies for telecommunications and broadcasting networks. Similarly, services provided over mobile and fixed networks were subject to differing regulatory standards.³⁹ The aim is to ensure that like services are regulated in a like manner irrespective of the mode of delivery.

D *Changes to Licensing Regime*

³³ Above n 29, Article 5.

³⁴ Ibid.

³⁵ Ibid, Article 19.

³⁶ ‘API’ means the software interfaces between applications and the resources in the enhanced digital television equipment for digital television and radio services.

³⁷ Above n 29, Article 5.

³⁸ Ibid, Article 10.

³⁹ S Farr, *EU Communications Law* (2002) 7-8.

The Authorisation Directive replaces the prior system of individual licensing⁴⁰ with general authorizations.⁴¹ Providers of electronic communications networks and services are not required to apply for a licence. Providers may be required to provide a notification of their intention to offer networks and services. The Annex to the Directive contains a list of conditions that apply to providers of networks and services. Providers are all subject to the general conditions. These conditions replace the former licence conditions. The former licence fees are replaced by provisions relating to administrative charges.⁴² The Directive maintains an additional special scheme for the allocation of frequencies and numbers⁴³.

E *Changes to Access and Interconnection Arrangements*

The Access and Interconnection Directive regulates the relationship between providers of networks and services and associated facilities. The Directive places a variety of obligations upon operators of public communications networks. Operators have an obligation, when requested by other undertakings, to negotiate interconnection for the purpose of providing publicly available communications services.⁴⁴ Operators have an obligation of transparency in relation to interconnection and/or access and are required to make public information relating to technical specifications and network characteristics.⁴⁵ Operators have an obligation of non-discrimination, to apply equivalent conditions to equivalent services in equivalent circumstances.⁴⁶ Operators have an obligation to grant open access to technical interfaces, protocols or other key technologies that are indispensable for the interoperability of services.⁴⁷

F *Changes to the Allocation of Radio Spectrum*

A Recommendation of particular relevance to the present discussion is the *Decision on Radio Spectrum*. The Decision provides a legal framework for ensuring consistent conditions apply to the availability and use of radio spectrum in all markets, including electronic communications, transport and research and development.

G *Single Regulatory Authority for the Electronic Communications Sector*

Finally, the package of reforms includes the creation of a national regulatory authority to oversee the 'provision of electronic communications networks and services'.⁴⁸ The stated objective is to establish a 'harmonized framework' for the

⁴⁰ Directive 97/13. OJ [1997] L117/15.

⁴¹ Above n 30, Article 4.

⁴² Ibid Articles 15-16.

⁴³ Ibid Articles 7-14.

⁴⁴ Above n 31 Article 7.

⁴⁵ Ibid Article 8.

⁴⁶ Ibid.

⁴⁷ Ibid.

⁴⁸ Ibid Article 9.

regulation of this sector.⁴⁹ As well as regulating telecommunications matters⁵⁰ such as networks, installation and access to facilities, the NRA will oversee the broadcasting sector including the important matter of the management of radio frequencies.⁵¹

IV THE NATURE OF TECHNOLOGICAL CHANGE

A *Digital Technology*

The prime reason for the convergence of the information technology, telecommunications and broadcasting sectors is the increased reliance on digital technology.

As a result of the application of digital technology, almost any type of information (including text, sound and images) can be transmitted on a variety of digital transmission infrastructures (including wireless, television, fixed telephone, mobile telephone and Internet) and utilised in its original form by the recipient.

Traditionally, radio and television services were largely transmitted in analogue form.

Analogue technology involves variations on an electrical signal transmitted down a wire or over a radio link. Transmission is in the form of a waveform with maximum and minimum amplitude. These waveforms are called analogue. Sound and pictures are converted into continuously varying electrical signals and transmitted using a frequency channel or bandwidth.

Analogue transmission requires a dedicated frequency channel per programme. That is, analogue transmission requires a portion of the electromagnetic spectrum to be wholly dedicated to the transmission of the particular service.⁵² In contrast, digital transmission deploying compression technology enables several programmes to be carried on a single frequency channel.

Today digital technology is rapidly replacing analogue technology, and most services in the telecommunications and audio-visual sector are transferring from analogue to digital technology.

The process of converting information into a form that can be processed by a computer is termed 'digitalisation'. Essentially, computers perform operations in response to instructions. These instructions are relayed by a series of switches which can be either in an on or off position. In binary code the digits '1' or '0' are used to represent the positions of these switches. A single binary digit is termed a

⁴⁹ Ibid Article 3.

⁵⁰ Above n 29, Articles 9-15.

⁵¹ Ibid Article 12.

⁵² N Reville, *Broadcasting Law and Practice* (1997) 45-93.

bit. Eight bits read together is called a byte. Hence this technology involves converting information into a sequence of binary digits or 'bits'. Virtually any form of information, including text, sound or moving pictures can be encoded in binary notation.⁵³

An important advantage of digitalisation is the fact that it facilitates the application of compression and routing technologies. Whilst analogue signals are measured by their bandwidth, digital signals are measured by their bit rate representing the number of bits that can be transmitted per second. This bit rate can be readily reduced through compression techniques.

In the past, spectrum scarcity limited and shaped network architecture. It also influenced the speed of development of the information age. The ease and availability of compression technology has led to an exponential increase in the volume of data that can be transmitted. In the broadcasting sector for example, this has and will continue to facilitate an expansion in the number of channels made available to consumers.⁵⁴

B Improvements in Transmission Infrastructure

Another significant driver of convergence is the improvement in transmission infrastructure. Traditionally, copper wire formed the basis of the telephone industry. Twisted copper cable or 'coaxial cable' was widely employed in carrying television programmes. The signal carried by coaxial cable needs to be regularly amplified as it loses a degree of amplitude. Similarly radio signals, electromagnetic waves transmitted through space, lose a degree of amplitude with distance.

The advent of fibre optic technology significantly enhanced transmission capabilities. Optical fibre systems largely carry signals encoded in digital form and its signal carrying capacity is near unlimited. The fibre is so efficient that unlike copper wire, coaxial cable and radio, the amplitude of the signal is not affected by distance.⁵⁵

Advances in satellite transmission technology are also facilitating convergence. Due to the vast areas able to be covered by satellite, a single satellite can replace an entire network, or many hundreds of kilometres of terrestrial stations. Satellites employ line of sight communications and hence can utilize comparatively high frequencies. This enables satellite to provide large capacity and high quality links over a large area. Finally, satellite transmission can supply bandwidths not always available for terrestrial off-air broadcast networks. Hence satellite transmission is well suited to the transmission of digital radio and digital television.

⁵³ L J H F Garzaniti, *Telecommunications, Broadcasting and the Internet: EU Competition Law and Regulation* (2000) 102.

⁵⁴ C Marsden and S Verhulst, *Convergence in European Digital TV Regulation* (1999) 3-4.

⁵⁵ A Michael Noll, *Highway of Dreams* (1997) 21.

V THE EFFECT OF TECHNOLOGICAL CHANGE ON NETWORKS

This technological change is first and foremost facilitating the *convergence of networks*.

The traditional world of communications required distinct infrastructure for each communications service.⁵⁶ A nationwide wired, intelligent circuit-switched network conveyed voice. A single voice channel had to be set aside for each call. A separate system of broadcast stations utilizing wireless technology carried video to users in a defined region. Data was added onto voice by a system which required information to be converted from digital to analogue and back again.

Digitally transmitted material can be carried over broadcasting networks or over terrestrial wired or wireless infrastructure. Digitalized information can be conveyed over any physical infrastructure – wireless, fiber-coax, microwave or direct broadcast satellite.⁵⁷

VI THE EFFECT OF TECHNOLOGICAL CHANGE ON SERVICES

The convergence of networks is in turn enabling the provision of *converged services*.

Traditionally, telecommunications, media and computing services could be characterised by the nature of the service they provided, and the nature of the communication involved.

Telecommunications services were traditionally a ‘one-to-one’ service. In comparison, broadcasting services were a ‘one-to-many’ service. Computing services were a ‘many-to-one’ service, with multiple information sources being able to be accessed by an individual user.⁵⁸

Today these fixed characteristics are disintegrating. The telecommunications sector begins to depart from its traditional point-to-point form of communication and provides services such as video-telephony and video conferences. The telecommunications sector begins to convey content. Similarly, the broadcasting sector begins to depart from the point-to-multipoint form of communication that has previously characterised its existence.

⁵⁶ OECD, ‘Convergence or Collusion?’ (1999) *Information Computer Communications Policy* 29 47.

⁵⁷ OECD, *Webcasting and Convergence: Policy Implications* (1997).

⁵⁸ P Larouche, *Competition Law and Regulation in European Telecommunications* (2000) 334.

VII THE METAMORPHOSIS OF THE BROADCASTING SECTOR

Today, new and evolving broadcasting services enable end-users to manipulate and control, to varying extents, the information received.⁵⁹

A Digital Television and Radio

Digital television is the delivery of digital data to a television. This digital data can be delivered via terrestrial, cable or satellite transmission.

Digital television offers a variety of benefits to the user. Firstly, it can provide high definition images, widescreen viewing (16:9 in comparison to 4:3 aspect ratio on traditional televisions) and surround sound comparable with a cinema.⁶⁰ In the context of the present discussion, the more compelling attraction is that it enables interactivity.⁶¹ The viewer has the option of accessing information in addition to the television programme via a remote control. Digital television also offers the promise of accommodating viewing choices and preferred times of viewing individual users.

In order to receive digital television programmes, a viewer requires either a digital television set or alternatively an analogue television set with an attached digital decoding device. 'Set-top boxes' enable existing analogue sets to receive digital broadcasts. As a combination of analogue and digital television programmes are on offer, digital television sets need also be able to receive analogue programming.

Digital radio offers the opportunity to combine audio and video, or to provide links from radio to Internet sites. CNN and BBC make portions of their broadcast available on the Internet, effectively expanding their geographic market. Other players are providing live broadcasts of music and sports available on the Internet.

B Video on Demand and Near Video on Demand

'Video on demand' enables users to view videos on television. The decisions to when to start the video, stop, rewind and forward the video are all within the discretion of user. Whilst the video is received on the television, it has the characteristic on a one-to-one service rather than a traditional one-to-many broadcasting service.

'Near video on demand' enables users to select and choose to watch a video at one or more of a number of times scheduled by the programmer. The viewer does not have the ability to control the starting and ending time nor does the viewer have the

⁵⁹ Ibid 334.

⁶⁰ R Nicholls and L Spong, 'Digital Television in Australia' (May 2002) 5(1) *TeleMedia* 10.

⁶¹ Ibid.

ability to rewind or fast forward content. Near video demand is hence a one-to-many service with merely a greater degree of flexibility afforded to the viewer in relation to the time of viewing of the video.

C *Datacasting Services*

'Datacasting' describes the transmission of data using the radiofrequency spectrum.⁶² Such a service could provide news information like traditional teletext services or integrate Internet and television content as provided by WebTV by Microsoft. Datacasting can be provided through television having set-top decoder or alternatively on digital television with inbuilt reception capacity. Alternatively, datacasting services could be received by tuner cards within personal computers.⁶³

Subject to applicable regulation, datacasting services could encompass a broad range of interactive and multimedia services. Possible services include electronic programme guide with links to material, online classifieds and guides with audio and visual information, home shopping, home banking, music, books, computer games and Internet access.⁶⁴ Such services could be made available to anyone with television access.⁶⁵ Hence datacasting offers the possibility of making the benefits of the computer age available to the groups other than the computer literate. The services offered by datacasting could also be useful to service geographically isolated communities.⁶⁶

VIII THE METAMORPHOSIS OF THE TELECOMMUNICATIONS SECTOR

Similarly, new and evolving services depart from the traditional 'one-to-one' characteristic of telecommunications transmission.

A *Internet*

The Internet operates over copper and fibre optic circuits, as well as over coaxial cable and wireless connections. Thus, the Internet significantly contributes to the merging of media sectors which were historically distinct because they required independent delivery architecture.

In the absence of the Internet, the effect of convergence on the customer was dependent upon the application of the new technologies by the telecommunications and media sectors and the creation of agreements and mergers between companies. The Internet employs an open standard to create a global network of interconnected computers. Hence it is able to provide a veritable smorgasbord of information (data,

⁶² R Nicholls, 'ABA Proposes Datacasting Trial' (May/June 1999) 3(1) *TeleMedia* 10.

⁶³ Ibid.

⁶⁴ A Hamilton, 'Datacasting – The Future of Digital TV Hangs in the Balance' (April 1999) 2(1) *TeleMedia* 134.

⁶⁵ Ibid 135.

⁶⁶ Ibid.

voice, images) on any type of network. Traditional media sectors such as telecommunications sector and the broadcasting sector are increasingly facing competition from the Internet. The Internet is able to distribute television programmes, radio programs, software and voice telephone services.

The Internet has replaced what many were expecting of interactive television.⁶⁷ A decade ago, forecasters were visualizing people using the television to conduct wide-ranging home shopping, home banking, play games and research. The reality is that nearly all the uses expected of interactive television is now made possible on the Internet. Sophisticated web navigational software has made the information on the Internet very accessible and user-friendly.

B *Internet Streaming*

An Internet user typically dials up a service provider and receives content through a dedicated, one-to-one connection with the service provider.

However the practice of 'Internet streaming' has the potential to change the nature of Internet transmission to something resembling a one-to-many 'broadcast' service.

Internet streaming refers to the practice of transmitting pre-recorded or live audio and video files through a special multicasting website to multiple users simultaneously.⁶⁸ The audio and video files are converted into compressed digital signals and transmitted to multiple users in real time. The users cannot control or manipulate the content.⁶⁹

C *Internet Telephony*

Voice telephony using the Internet can be in the form of a PC-to-PC communication, a PC-to-phone communication or a phone-to-phone communication. Internet telephony employing gateways, enables the transmission of various forms of communication (voice mail, fax and voice telephony) originating and terminating from a variety of devices (telephones, fax machines and PCs).⁷⁰

IX THE EFFECT OF TECHNOLOGICAL CHANGE ON CORPORATE STRUCTURES

The opportunities provided by the advance in technology are resulting in the dramatic restructuring of some of the world's largest industries. Corporations in the telecommunication sectors, information technology sectors and media and

⁶⁷ B L Egan, *The Economics of Multimedia* (1996) 28.

⁶⁸ R Costelloe, 'Internet Television and Radio Services' (September 2000) 4(5) *TeleMedia* 58, 58-59.

⁶⁹ Ibid.

⁷⁰ M Mueller and C Tinellis 'Internet Telephony' (December/January 1999) 2(7) *TeleMedia* 1.

entertainment sectors are increasingly coming together through mergers and various contractual agreements.

In order to successfully design and provide new services corporations are seeking to obtain the necessary skills, technology and infrastructure. In the convergence environment it is difficult for a single player to serve the entire value chain. This has led to the vertical and horizontal integration of firms. Telecommunications corporations are entering the business of cable television. Computer software companies are entering into alliances with television networks. Publishing firms are merging with video entertainment companies. Such alliances enable corporations to place themselves in a position to reduce risk associated with change and respond quickly to new developments. Other benefits to be gained through such alliances include the maximisation of revenue through content repackaging and brand exploitation.

Content providers are increasingly coming together with companies which have communications infrastructure. This is leading to the meeting of old media (content based corporations) and new media (delivery or carriage based corporations). A leading example is the 1999 acquisition of Time Warner of AOL. The firms described their alliance as the creation of a 'networked world' where 'home gateways' would provide access to a large range of converged services including email, telephone, entertainment and ecommerce.

Further, carriage players in different sectors are coming together. A leading example is the acquisition by Microsoft of the cable television operator Comcast. Another example is the alliance between CompuServe, American On-line and WorldCom.

Therefore, there is a growing need to assess the impact of convergence on the laws that regulate telecommunications and broadcasting services. Where similar services are regulated differently on the basis of the platform on which they are transmitted, a market inefficiency occurs that may stifle development and artificially distort prices. Where a service is subject to more than one regulatory regime, this can create a disproportionate regulatory burden on such services. Uncertainty as to the nature and extent of the application of the existing legislation to new services can form a significant barrier to investment by corporations in these markets.

The new regulatory model implemented in the European Union offers an innovative solution to the problems caused by convergence. Given the nature and extent of the technological change affecting the broadcasting and telecommunications sectors, the replacement of sector-specific legislation with a comprehensive regulation of 'electronic communications' appears inevitable. The issue then becomes not whether to adopt such a regime, but when and how such a framework is adopted. In this regard, the European Union system offers a bold and comprehensive model for consideration by law reformers and legislators.