DIGITAL TV IN AUSTRALIA AND THE USA:
A Cross-impact analysis of the adoption and diffusion of digital TV in Australia and the United States

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Abstract
The paper examines the adoption and diffusion of Digital Television (DTV) in Australia and the United States, identifying historical, technical, regulatory, marketing, and other commonalities and differences that appear to be most significant to its adoption, as both countries have experienced a 'sluggish' diffusion and adoption of DTV so far.

Using library research and borrowing the cross-impact matrix method from futures research, the authors develop 11 events related to the various influences and groups of stakeholders that had shaped the policy making and adoption of DTV. We then carry out a comparative analysis between the two countries to make evident their impacts, strengths, and directions of influence.

The authors suggest that the implementation of DTV in these two developed countries appears to be nearly identical. Even though Australian and US broadcasting models are fundamentally different, the diffusion process for DTV is primarily affected by the nature of digital technology and globalisation, two trends that may be diminishing the import of the nation-state in the technology adoption process.

The paper concludes that these broader economic and technical events may have greater import to DTV's successful diffusion than do traditional, cultural, and nationalistic factors suggested in earlier comparative broadcast studies.

A Cross-impact analysis of the adoption and diffusion of digital TV in Australia and the United States
The introduction of a mass communication system into a country or region is a significant development to that area's culture, politics, economy, and sociology and is often scrutinised and regulated by governments in order to safeguard the interests of various stakeholders. However, the introduction of a technology that simply modifies an existing system does not always appear so cataclysmic and can diffuse completely through a culture with or without proactive government intervention. For example, the unregulated remote control and regulated colour television introductions have achieved near universality over time in both Australia and the United States. In contrast, the adoption of digital television (DTV) in the two countries--an upgrade of the existing colour TV with better picture quality, interactivity and convergence of functions--has yet to receive enthusiasm from consumers.

Regulation of New Technology

Some would argue that technologies fail or are delayed simply because of a lack of consumer demand or because of poor marketing and/or regulatory policies. This supply-side technological imperative assumes all technology is good but that there will be significant variation in diffusion rates in different countries depending on the strategic and tactical policies imposed on the introduction of the technology into a given cultural environment. Under this model, failure to adopt is equated with a failure in policy.

In contrast, demand theorists postulate that the most significant diffusion events are, 'What services can each technology provide, and how much are consumers willing to pay for those services?' (Owen, 1999, p. 238). This is a position supported by The Justification Model (Hemelink, 1988), which sees decision-making about new technology as a form of social gambling since consumers only have partial knowledge about a technology and its effects. With such a model, the 'established base' (Green, 2001) or the existing technology of analog TV that DTV is to replace, is an important issue affecting the diffusion and adoption of the new technology. A consumer who is satisfied with the established base, needs additional incentives or 'enhanced value' such as an affordable price, better content, more channels and functions, before purchasing additional equipment such as a converter set top box that may cost as much as a new analog TV set.

Rogers (1995) and Manross and Rice (1986) indicate the factors that affect the adoption at an individual level as (1) perceived relative advantage (in comparison to the established base), (2) compatibility (with the adopter's prior experiences, life style, values and beliefs), (3) complexity (perceived ease of use), (4) trialability (ability to try out the technology at a smaller scale) and (5) observability (visibility of the technology to potential consumers via marketing and advertising). However, while this 'classical' diffusion theory is helpful in understanding supply and demand behaviour for agricultural and other innovations typically under study, the research seldom focuses on unique characteristics of a highly regulated government licensed industry.

The literature on comparative broadcast systems is similarly problematic because, as descriptive taxonomies of national, regional or multinational social institutions, it often 'fails to see the forest through the trees'—to identify how technology can be separated from macro cultural events endemic to the introduced society (see for example, Boyd, 1982; Browne, 1988, 1989 & 1999; Burke, 1984; Ganley & Ganley, 1987; Head, 1974 & 1985; Katz & Wedell, 1977; Lent, 1978; Paulu, 1974; Tydeman & Kelm, 1986). Moreover, most of these studies are out of date, placing significant emphasis on nation-states that recognize broadcasting as 'first and foremost a social institution' (Browne, 1989, p. 357). Unfortunately, this ideology may no longer be relevant as 'Globalization has unleashed forces that call into question the efficacy of the Westphalian nation-state. Challenged from above by globalization, from below by ethnic particularism, and from the side by other states, the nation-state is viewed by some as a threatened form of political organization' (Kraidy, 2002, p. 632). Under such conditions, the economic imperative will become more important to the diffusion of a new communication technology than 'whether the process of adoption is primarily cultural' (Hart, 2000, p. 36).

To address this question we will examine the implementation of the new broadcast technology of DTV into Australia and the United States, as it is perhaps the most ballyhooed broadcast technology since the advent of colour television.

First, we will provide brief examinations of the current situation of DTV in both Australia and the United States and identify unique or common diffusion 'factors' or events in each instance. Then these 'factors' and events will be applied to a cross-impact analysis to examine the commonalities or differences between the two countries.

What is Digital TV?

Digital television, seen as the next evolution of television, is compared to the change brought to vinyl records by compact discs. It is considered superior in engineering terms as it can overcome problems in over-the- air broadcasting caused by various physical and electrical interferences (www.digitaltv.com.au).

The two types of DTV mandated for both Australia and the United States are Standard Definition TV (SDTV) and High Definition TV (HDTV). SDTV provides a similar picture to the existing analog service, but with a wide screen format and improved reception, along with all the benefits of DTV as they become available. In contrast, HDTV has better image resolution, provides cinema quality viewing, surround sound and closed captioning. It also provides extras such as different camera angles, multi-channeling, the Internet and various forms of interactivity (www.aba.gov.au). It can also provide access to websites, text-based information and back–channel links to the broadcasting service providers as well as 'develop new services that take advantage of the economies of digital spectrum use and enhance TV as a medium with the development of Internet-like capabilities' (Flew, 2002, p. 111).

The Current Situation in Australia

There are about 10M Australian homes with TVs but since January 1, 2001 when digital was launched, only about 20,000 set top boxes have been sold. Australians buy about 1 million new TV sets a year, within the range of A$300-$700 (Familari, 2003). A set-top box that receives SDTV signals costs between A$300 and $699 and a HDTV set top box which can handle SDTV as well is priced between $799-$1079. Research has predicted only 46% of Australian homes will take up DTV by 2008 when the government expects Australia to reach full digital conversion (Rumble, Hoare & Schulze, 2002).

The Australian government recently proposed legislation forcing manufacturers to include a built-in digital tuner on all new TVs, which could increase the price of the average TV set by A$200. Some TV importers and retailers fear this would limit the choice of models available to the small Australian market, and negatively affect the sales of cheaper sets. However, the Department of Communications, Information Technology and the Arts (DoCITA), later stated that this legislation will only apply to the expensive sets. Most traders argue the way to increase DTV adoption is via a combination of improved content, more channels (Day, 2002) and a clear policy on DTV (Familari, 2003).

When colour TV was introduced to Australia on March 1, 1975, it had 4% of Sydney and 3% of Melbourne homes adopting the technology at the end of that year. By the end of 1977, 54% of Sydney and 48% of Melbourne homes had adopted colour TV (AC Nielsen, 1999). Therefore one could agree that DTV adoption in Australia has been sluggish because a colour TV set cost A$2000 in 1998 terms at the time, which would have been high for the majority of homes (Given, 1998). However, the change in the viewing experience from black and white to colour TV in 1975 would have been drastic and extremely attractive to consumers, compared to the change from analog colour TV to DTV in the 21st century.

The Current Situation in the US

With 106.7 million Television households, the United States is the largest television market in the world. However, as of December 2002 only 664 stations of the 1, 714 total licensed full-power television stations had converted to DTV (*Broadcasting and Cable*, 2002; NAB.org, 2003). This is a pace significantly slower than planned by policy makers who had anticipated a total conversion to DTV by 2006 or when 85% of households have DTV sets.

The main challenges of DTV to the broadcast industry are the high transition costs and the requirement to return their current analog bandwidth to the government in 2006 (NAB.org, 2003). Also, DTV in the US is only mandated for over-the-air broadcasting. As 70% of US television viewing is by cable, 15% by satellite and only 15% directly by over-the-air television, cable policy is critical to the development of DTV. However, the government has no jurisdiction over the technical adoption standards for cable television (Grebb, 2002).

There is also an ongoing tension between broadcasters and cable companies. The cable companies are required to carry all over-the-air television signals within a given distance from a market under the ‘must carry’ policy. Therefore, broadcasters are demanding that cable carry all of their new signals, be it one HDTV signal or six compressed SDTV channels. Cable operators are balking at this ‘encroachment’ of coaxial bandwidth, preferring instead to carry other ‘cable only’ programming that may be more profitable than one HDTV or several SDTV broadcast signals (Grebb, 2002).

Another challenge for DTV acceptance in the United States is the limited number of sets purchased by consumers. In the year 2000, only 625, 000 out of the more than 30-million TV receivers sold in the country were digital (Broadcasting and Cable Yearbook, 2002-03, 2003). To encourage consumer acceptance of DTV, the FCC required all sets sold in the US to be digital ‘Plug-and-play’ sets with built-in converters. This will be phased-in by screen size and will see all new TV sets, VCRs and DVDs having the capacity by 2007 (McConnell, 2002). However, the Consumer Electronics Association (CEA) fears this will lead to a US$250 increase in the price of each television set and threatened legal action (Moore, 2002). The problem of consumer apathy could be attributed to the perceived lack of added utility provided by digital TV in comparison to the established base.

Method

This study was performed by means of library research (Berger, 1998), which examined the latest research, policies and existing literature on the subject of DTV via

scholarly sources. In addition, searches of the Nexis.com and Lexis-Nexus databases were carried out to identify articles published on DTV in the major American and Australian periodicals and newspapers for the last 5 years. This approach provided the authors with insights into the various events that affect the diffusion and adoption of DTV. These causal events were then used to carry out a Cross-Impact Analysis (Bell, 1997), essentially examining the relationships between the various 'factors' or events affecting the adoption and diffusion of this new technology in both countries.

Cross-Impact Analysis is based on the assumption that the occurrence of particular factors/variables/events may depend on the occurrence of other factors/variables/events with reference to a given phenomenon (Bell, 1997). Therefore, we constructed grids for each country showing the interdependencies of different events by listing along the rows of the matrix a set of events that may occur and the events that possibly could be affected by the row events along the columns.

Using the library research, the authors prepared a list of eleven events affecting the adoption of DTV in Australia and in the US and, based on their knowledge on the subject matter, indicated how a given event would affect the others as 'very positive' (indicated on the grid as '++'), 'positive' (+), 'no effect' or 'neutral' (0), 'negative effect' (-) and 'very negative' (--). 'Positive' means that there apears to be a direct relationship between the two events where as one increases the other also increases. Negative means that as one increases, the other decreases (Bell, 1997). (eg. Higher income of a consumer is 'positively' related to adopting DTV, because the equipment is expensive and high income consumers have a higher capacity to purchase them than others.)

Except for the diagonal cells (which represent the same events paired with itself vertically and horizontally) the cell entries tell us how a column event may be affected should a given row event would occur. By summing the rows and columns, as to the number of events that are positive (+ or ++), the matrix totals are obtained, which help a researcher to examine the probable scenarios for the future of particular events, conditioned by the chances of occurrence of all other events of the matrix. (eg. Event 4 is not affected by events 3, 5 & 6 but is positively affected by event 8 and negatively affected by events 2, 7 & 9 etc.) (Smith, 1987; Bell, 1997). The sums will indicate how strong an event is (positively or negatively) in affecting the other events of the matrix. The higher the number, the stronger the event is.

DTV Diffusion Events

Browne (1989) had developed a list of six common factors that were evident in his study of broadcasting systems of six industrialized nations. These factors were also identified in Browne's (1999) replication and were found to be consistent. We used some of Browne's taxonomy in preparing a template for the matrix and identified several other factors derived from the library research. For the sake of clarity and because our research is speculative rather than empirical, we call these eleven factors 'events' rather than 'variables'. These events are labeled *E1 to E11:*

E1 Relationships between government entities and broadcast systems

E2 Relationships between non-government entities and broadcast systems

E3 Competition or co-operation between vested interests

E4 Regulation, communication policy and new media

E5 Internal relationships of broadcast system program decision makers and program makers

E6 Cost of technology

E7 Incentives for the industry

E8 Incentives for consumers to go digital

E9 Characteristics of the consumer

E10 Functions provided by the new technology

E11 Marketing and promoting the new technology

A detailed description of these events is provided in Appendix 1.

Table 1: Cross-impact matrix of events affecting the probability of successful DTV diffusion in Australia.

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	SUM
E1	**X**	++	++	++	++	++	++	++	**0**	++	+	**9+**
E2	++	**X**	++	+	+	++	+	++	**0**	+	+	**9+**
E3	++	++	**X**	++	++	**0**	**0**	++	**0**	++	++	**7+**
E4	++	++	++	**X**	**- -**	**0**	**- -**	**0**	**0**	**- -**	**0**	**3+**
E5	+	+	++	++	**X**	**0**	+	++	**0**	++	++	**8+**
E6	++	+	+	++	+	**X**	++	**- -**	**0**	**0**	+	**7+**
E7	+	++	++	++	++	**0**	**X**	**0**	**0**	++	++	**7+**
E8	**0**	**0**	++	**0**	**0**	**-**	**0**	**X**	**0**	**0**	++	**2+**
E9	+	++	+	+	+	**0**	+	+	**X**	++	+	**9+**
E10	+	+	++	++	**0**	++	++	++	**0**	**X**	++	**8+**
E11	+	+	+	+	+	**0**	**0**	++	**0**	**0**	**X**	**6+**
SUM	**9+**	**9+**	**10+**	**9+**	**7+**	**3+**	**6+**	**7+**	**0**	**6+**	**9+**	

E1 Government entities and broadcast systems
E2 Non-government entities and broadcast systems
E3 Competition/cooperation between vested interests
E4 Regulation, communication policy
E5 Program decision makers and program makers
E6 Cost of technology
E7 Industry incentives
E8 Consumer incentives
E9 Consumer characteristics
E10Functions of technology
E11 Marketing of the technology

The Cross-Impact Matrix Analysis for Australia

When the vertical sums of the grid are examined, one observes that E1 (Government entities and broadcast systems) and E2 (Non-government entities and broadcast systems) are both not affected by E8 (Consumer incentives) but are positively affected by all other events. This would indicate the need for consumer incentives to be catered for, in order to improve DTV adoption.

E3 (Competition/cooperation between vested interests) is positively affected by all other events and may be an area for policy makers to investigate in future regulations, as it is the strongest event in the matrix (10+).

E4 (Regulation and policy) is positively affected by all other events but is not affected by E8 (Consumer incentives), which indicates that E8 needs to be closely examined by policy makers.

E5 (Program decision makers and program makers) is negatively affected by E4 (Regulation and policy), is not affected by E8 (Consumer incentives), or E10 (Functions of technology), but is positively affected by the rest of the events. This may hint that regulation and policy had not been useful for consumers and may not be related in a meaningful manner to the functions of the technology. Program decision makers and program makers (E5) also need to take consumer incentives into consideration.

E6 (Cost of technology) is the weakest event on the matrix with a 3+ vertical sum and is an event that should receive the attention of all stakeholders to improve DTV adoption. It is negatively affected by E8 (Consumer incentives), but is not affected by E3 **(**Competition/cooperation**),** E4 (Regulation, communication policy), E5 (Program decision makers and program makers), E7 (Industry incentives) and E9 (Consumer characteristics). It is positively affected by the other three events.

E7 (Industry incentives) is negatively affected by E4 (Regulation and policy), is not affected by E3 (Competition / Cooperation), E8 (Consumer incentives) or E11 (Marketing).

E8 (Consumer incentives) are negatively affected by E6 (Cost of technology), is not affected by E4 (Regulation and policy) and E7 (Industry incentives). This is an important observation as these events could be the key to changing consumer apathy towards DTV.

E9 (Consumer Characteristics) are fixed as they are mostly demographic variables and are not affected by any of the other events and record a sum of ‘0’.

E10 (Functions of technology) is negatively affected by E4 (Regulation and policy), is not affected by E6 (Costs of technology), E8 (Consumer incentives) or E11 (Marketing), but is positively affected by the other events.

E11 (Marketing) is positively affected by all the other events except E4 (Regulation and policy).

Table 2: Cross-impact matrix of events affecting the probability of successful DTV diffusion in the United States.

	E1	E2	E3	E4	E5	E6	E7	E8	E9	E10	E11	SUM
E1	X	++	++	+	0	++	++	-	0	-	-	5+
E2	++	X	-	++	-	-	++	+	0	0	0	4+
E3	++	-	X	+	0	+	+	0	0	0	+	5+
E4	+	++	+	X	- -	-	++	- -	0	- -	- -	4+
E5	+	+	0	- -	X	0	+	0	0	0	+	4+
E6	++	0	+	++	0	X	0	++	0	+	+	6+
E7	++	++	+	- -	+	0	X	-	0	-	+	5+
E8	-	0	- -	0	0	++	-	X	0	+	+	3+
E9	+	0	- -	- -	- -	++	- -	++	X	++	+	5+
E10	+	-	-	+	- -	+	-	+	0	X	++	5+
E11	--	+	+	- -	+	0	+	+	0	++	X	6+
SUM	8+	5+	5+	5+	2+	5+	6+	5+	0	4+	7+	

E1 Government entities and broadcast systems
E2 Non-government entities and broadcast systems
E3 Competition/cooperation between vested interests
E4 Regulation, communication policy
E5 Program decision makers and program makers
E6 Cost of technology
E7 Industry incentives
E8 Consumer incentives
E9 Consumer characteristics
E10Functions of technology
E11 Marketing of the technology

The Cross-Impact Matrix Analysis for the United States

When examining the vertical sums for the 11 events, it appears that E1 (Government entities and broadcast systems) is negatively affected by E8 (Consumer incentives) and E11 (Marketing) but is positively affected by all other events.

E2 (Non-Government entities and broadcast systems) however, is negatively affected by E3 (Competition / Cooperation) and E10 (Functions of technology), but is not affected by E6 (Cost of technology), E8 (Consumer incentives), or E9 (Consumer characteristics).

E3 (Competition / Corporation) is negatively affected by E2 (Non-Government entities), E8 (Consumer incentives), E9 (Consumer characteristics) & E10 (Functions of technology); has no affect on E6 (Cost of technology), and is positively affected by the other events. This may be an important observation because competition, which actually should increase consumer incentives, is working in the opposite direction.

E4 (Regulation and policy) is negatively affected by E5 (Program decision makers), E7 (industry incentives), E9 (Consumer characteristics) and E11 (marketing), is not affected by E8 (Consumer incentives), and is positively affected by the other events.

E5 (Program decision makers) is positively affected only by E7 (Industry incentives) and E11 (Marketing) and is either not affected or negatively affected by the other events.

E6 (Cost of technology) is negatively affected by E2 (Non Government entities) and E4 (Regulation and policy); is not affected by E5 (Program decision makers), E7 (Industry incentives) or E11 (Marketing). It is positively affected by the other events.

E7 (Industry incentives) is not affected by E6 (Cost of technology); is negatively affected by E8 (Consumer incentives), E9 (Consumer characteristics) and E10 (Functions of technology), and is positively affected by the rest of the events.

E8 (Consumer incentives) is negatively affected by E1 (Government entities), E4 (Regulation and policy) and E7 (Industry incentives), and not affected by E3 (Competition and cooperation) and E5 (Program decision makers).

E10 (Functions of technology) is positively affected by E6 (Cost of technology), E8 (Consumer incentives), E9 (Consumer characteristics) and E11 (Marketing). It is either not affected or negatively affected by the other events.

E11 (Marketing) is negatively affected by E1 (Government entities) and E4 (Regulations and policy) and positively affected by all other events. As marketing is an important event in the creation of consumer interest for a new product, this could be an area for regulators and governments to look into such as providing consumer information and promotions of the technology and its related product for the public, in both countries.

Comparisons

When the horizontal sums for the two matrices are examined, E8 (Consumer incentives) indicates the lowest positive sums for both countries (+2 for Australia and +3 for the US).
E8 (Consumer incentives) also appears to be positively affected only by E3 (Competition / Cooperation between vested interests) and E11 (Marketing) for Australia. For the US, E8 (Consumer incentives) is positively affected by E6 (Cost of technology), E10 (Functions of technology) and E11 (Marketing). As E11 (Marketing) is a common event for both countries in terms of positively affecting E 8 (Consumer incentives), it would be an event that needs to be addressed by both nations.

Discussion

A traditional comparative analysis of both broadcast systems would suggest that the Australian and American broadcast models differ fundamentally. The Australian system is a hybrid of both the laizzez-faire American model of entertaining the largest audience and the European model where the media, '[are] seen as a public resource that is essential for life in the polity' (Kraidy, 2002, p.635). Yet while there are some minor fluctuations in the introduction of DTV in Australia and the United States caused by cultural idiosyncrasies--eg the relative low penetration of alternative viewing systems in Australia--there is little real difference in DTV implementation in comparison to that which occurred with the adoption of colour television systems (PAL v NTSC), for example. In fact, both countries have adopted nearly identical protectionist policies (Rennie, 2001), implementation strategies, manufacturing mandates and consumer expectations.

Admittedly, this research is descriptive of ongoing events and predictive of future events. The cross-impact matrix analysis is also somewhat dependent on author subjectivity and the views and biases embedded in the existing literature. Since DTV is just emerging from the nascent *innovation stage*, we can only speculate on outcomes. But up to now, the main concern in the US focused on whose technical standard would be selected (History of HDTV, 2002), while for the Australians, it was who was selected to go digital and the limitations on what each industry could or could not do (Shanahan, 1999). However, the similarities in adoption patterns are far more common. For example, in both countries DTV was allocated to existing free-to–air stations after significant industry lobbying, another expected iteration in an industry where entry is controlled by governments.

At the current early *growth stage* of DTV adoption, penetration is still less than 2% in both countries. It appears that the strongest events are linked to interactions with the consumer. Even though the government is still actively involved, the consumers appear to be more dominant in their inactivity than do an active industry or programming strategies. While governments may tweak their policies to speed diffusion rates, their actions are ultimately dependent on consumer behavior and, thus, the innovation process begins to look more like Rogers' (1995) classic diffusion model. Indeed, after implementation, government policy may even be superfluous to adoption (Owen, 1999).

An event that may have an impact after DTV moves further into the growth stage (10-15% penetration) is the interface of industry structure and programming variables. For example, in the current stage, E1 (Governmental entities) has a strong interaction with E3 (Competition-cooperation), not surprising since the US government compelled cooperation among the firms representing the Grand Alliance (FCC, 1996 & 1997) and the Australian government regulated DTV to safeguard the interests of all stakeholders (Shanahan, 1999). However, it is unlikely that the US government will be similarly involved in corporate operations in the future, even though the production industry has been slow with capital expenditure for DTV programming other than for purchasing the mandated technology (Warley, 2002). The Australian public broadcaster, the Australian Broadcasting Corporation (ABC), which is currently the most active in producing digital content in Australia, is facing heavy funding constraints from the government (Mackenzie, 2003). At the same time, the Australian Government or broadcasters of either nation simply cannot be expected to amortize payoff with such small current audience bases. Governments would have to either provide significant economic incentives for firms to produce all programs for HDTV, or compel broadcasters to only purchase HDTV programs—both actions of dubious political and economic feasibility.

Conclusion

While this study is only a snapshot in time of past transactions and a prognosis of what is likely to happen, it makes clear that DTV implementation in both countries has been nearly identical, suggesting that broader economic and technical events have greater import to its successful diffusion than do traditional cultural and nationalistic events identified in earlier comparative broadcast literature. As Browne (1999) related in his most recent comparative study of broadcasting in industrialized nations, '…issues of culture, economy, politics and demography have more and more supranational ramifications (p. 397). Simply put: because digital technology is more

integrative than analog technology--formats are interchangeable and transparent—and diffuses through a global marketplace, DTV will suffer little from its interaction with the nation-state and will be a pure demand activity, consistent with the Hemelink (1988) and Rogers (1995) propositions.

More broadly, as Hart (2000) claims in his analysis of the development of the Internet, there are new generic themes in the diffusion of technology: '(1) globalization is technological, (2) technological globalization acquires its practical character through the influence of business… and (3) pragmatism is the only viable alternative when adopting (a given technology) in conjunction with the rest of modern high technology' (p. 36). It would seem that these criteria accurately describe the diffusion of DTV in Australia and the United States, suggesting that in the industrialized world, at least, there will be little difference between governments as they respond to technological innovation.

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Appendix 1

The following is a detailed description of the eleven events E1 to E11 identified for the Cross Impact Matrix Analysis for the USA and Australia, using Bell (1997):

E1 *Relationships between government entities and broadcast systems*
(These include inputs of the executive, legislative and judicial entities.)

E2 *Relationships between non-government entities and broadcastsystems*
(These include the inputs of the industry, various stakeholders, lobby groups, grassroots organisations, and trade organizations.)

E3 *Competition or co-operation between vested interests*
(These include building alliances, struggle for exclusive rights, demarcation of functions between competitors and forms of media- eg. Between Pay TV / Cable and FTA, disagreements on standards / equipment /function allocations, mergers, sharing of resources, convergence, and criticisms of each other.)

E4 *Regulation, communication policy and new media*
(These include the strength of regulatory bodies such as the FCC in the USA, the ACCC -Australian Competition and Consumer Commission, The Australian Broadcasting Authority – ABA and the Department of Communication, Information Technology and the Arts –DoCITA and their style, strength and intensity of regulation such as being prescriptive, strict, over regulating, laissez faire, or hands-off market response.)

E5 *Internal relationships of broadcast system program decision makers and program makers*
(These include the vertical integration of production and distribution industries such as agreements between broadcasters and content providers, decision to produce / purchase digital content / co-productions, outsourcing, restructuring etc.)

E6 *Cost of technology*
(These include the hardware costs to broadcasters, digital content producers, content providers and cost of set top boxes / new receivers / subscription for the services for consumers.)

E7 *Incentives for the industry*

(These include tax concessions for broadcasters to go digital, free allocation of the spectrum, protectionist legislation against competitors, funding for public broadcasters for digital content production and hardware.)

E8 *Incentives for consumers to go digital*

(These include free set top boxes, better picture and sound quality available with the new technology, better and new content, more channels, more programming diversity / genres / choices, user friendliness of system, quality of programming, entertainment value, compatibility, relative advantage with respect to the established base, trialability, observability, affordable cost of hardware and subscription, prestige or status attached to adopting the technology, value, and efficiency of the new technology over the established base.)

E9 *Characteristics of the consumer*
These include demographics of consumers such as age, sex, level of education, family make up with kids, tastes, disposable income, class, domicile (availability of the new service in one's area), lifestyle, values, beliefs, and aspirations. Those belonging to the 'innovator' and 'early adopter' groups make up 16% of the population, who are younger, higher educated, adventurous and have higher disposable incomes (Rogers, 1995).

E10 *Functions provided by the new technology*
(These include, interactivity, email, Internet, shopping, electronic programme guides, convergence of technologies, functions, and industries.)

E11 *Marketing and promoting the new technology*
(These include availability of customer information, public relations, advertising, positive publicity, sales promotions, media coverage, and training of sales staff.)

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