Connecting the Nation

An historical institutionalist explanation for divergent communications technology outcomes in Canada and Australia

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Abstract

Australia's slow rate of progress in rolling out broadband technologies became a major election issue in 2007, resulting in the National Broadband Network (NBN), the largest public infrastructure investment in Australia's history. Numerous international comparative reports reveal that Australia's lag in the deployment of broadband technologies in relation to Canada, another geographically large, sparsely populated federal system, is significant. Nevertheless, Australia's poor broadband performance is no different than the sluggish adoption of many other forms of electromagnetic communications technologies since the time of the telegraph.

This thesis adopts an historical institutionalist approach to explain why Australia trails behind Canada in the take-up of communications technologies. The thesis identifies the different approaches to enabling, coordinating and regulating communications technologies in each country. Importantly, different federal powers for communications technologies have resulted in longstanding differences in the deployment of communications technologies. The Australian government's exclusive powers to legislate for communications technologies resulted in a series of centralised, top-down, single national solutions. Conversely, Canada's decentralised, bottom-up, provincial and municipal solutions approach stems from the provinces' powers to legislate for communications technologies within the provinces. Constitutionally, the Canadian government's powers are for the most part restricted to issues of interconnection between the provinces. Australian policy-makers favour standardised national systems designed to provide equality of service provision which invariably takes longer to deliver services to citizens. While Canada's approach leads to different standards of service provision, the approach is faster in delivering communications technology services to citizens.

In explaining why a decentralised approach to deploying communications technologies results in faster take-up of new communications technologies, the concept of varieties of particularism is developed. The term 'varieties of particularism' refers to the unique social, political, economic, technological and geographical peculiarities that exist at the nexus of government, business and communications technologies. These various

characteristics differ for each region, jurisdiction, provider and user and present a complex series of challenges for the deployment of new communications technologies.

In the broadband era, the traditional monolithic telecommunications carrier model is increasingly obsolete. The research finds that single national solutions designed to meet citizens' communications technology requirements (such as those adopted by Australian policy makers) do not adequately address the varieties of particularism and therefore are slow to be deployed and to be taken-up by citizens. Further, the centralisation of political power in the communications industries prevents many citizens from participating in policy development – a 'build it and they will come' scenario – which neglects the human element of the 'network society'. Consequently, the centralised approach results in policy focused on particular technologies or devices predetermined by government, rather than user functionality which can be delivered by a mix of available technologies. The research finds that Australia's centralised approach discourages innovative uses of available technologies, whereas the Canadian decentralised approach enables citizens to be active policy and network participants where political issues are resolved at the regional or local level. In light of the NBN, the comparison with Canada demonstrates that Australia's centralised approach has important ramifications for future communications technology deployment.

Certificate of Authorship of Thesis

Except where indicated in footnotes, quotations and the bibliography, I certify that I am the sole author of the thesis submitted today entitled:

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Note: Use of Boxes
Boxes are used throughout the thesis to explain concepts or to provide technical details so as not to unnecessarily interrupt the flow of the text.

This thesis incorporates terminology from the fields of political science and information communications technology (ICT). To assist readers from different disciplinary backgrounds, definitions for major political science and ICT terms used throughout this thesis are provided in footnotes and in the glossary below:[1]

Adopt/adoption — Adoption refers to the point at which the state officially endorses or sanctions the deployment of a particular technology. This is an important step as the state can choose not to adopt certain technologies.

Connectivity — Connectivity refers to access to the physical infrastructure that enables the sharing of information, regardless of distance. A broader definition of connectivity[2] refers to 'the totality of interaction between a nation's telecommunications infrastructure, hardware, software, networks, and users of these networks, hardware and software. Thus, broadband lines, PCs, advanced corporate data networks and advanced use of wireless data services are certainly measures of connectivity, but so are human skills relevant to the usage of these infrastructures, technologies and networks'. Waverman et al. (2011) indicate that Australia and Canada compare favourably on the connectivity scorecard, therefore, for the purposes of this thesis, the term connectivity will refer to physical access to the various communications infrastructure. Based on the connectivity scorecard, it will be assumed that both populations have the necessary skills to make use of accessible infrastructure at a given point in history. Interconnectivity, on the other hand, refers to mutual connections between networks, such as national, provincial or municipal networks.

Convergence — As communications technologies advance, different technologies can be used for similar functions. The

[1] Some of the definitions presented in this glossary were informed by the works of: Blyth in Marsh & Stoker (2002); Brady & Collier (2004); Bridgman & Davis (2004); Bastow *et al.* (2000); Dyson & Wilks (1983); Gao & Rafiq (2009); Howlett & Ramesh (2003); Jordana & Levi-Faur (2004); Levi-Faur (2006a; 2006b); Peters (2005); Schmidt in Hay *et al.* (2006: 104-106); and Thelen (1999).

[2] See Waverman *et al.* (2011: 4) for a discussion of the concept.

development of the Internet has enabled varieties of content such as voice telephony, audio/video and data sharing, and television, radio and text information to be accessed via devices which were once considered distinct. Whereas "technological convergence" refers to the tendency for communications devices to perform multiple functions, hence "converging", it may also relate to the tendency for industries which were once diverged, particularly the 'three traditionally distinct technologies: computing, telephony, and media' (Read & Youtie 1996: 88), to converge. Nonetheless, converging technologies do not necessarily result in converging industries, as the perceptions, interests and traditions of institutions and industry players may well keep industries diverged to serve a particular purpose.[3]

Coordinate/coordinating Once a decision to adopt a particular technology is made, the state typically takes on the role of coordinating the deployment of the technology, particularly the associated infrastructure, to ensure that rights of way and property are protected. The state may also determine the manner in which particular technologies are used, by either encouraging or discouraging particular uses.

Critical junctures At certain points in history, choices made or not made tend to influence the periods of stability which follow. In historical institutionalism, critical junctures are often viewed as contingent events which force the state to change the prevailing institutional arrangements.

Deployment/deploying Once a decision is made to adopt a particular technology, it follows that the infrastructure to provide the relevant access and services must be deployed. However, deployment may also relate to the functional uses of the infrastructure which can be either encouraged or discouraged by the state.

Enable/enabling Technological innovations can occur independently of institutions, yet the state can determine which technologies are enabled. For example, the state may decide not to allow a particular technology to be deployed, or to delay its deployment. The state may also create barriers to entry to restrict or limit the industry players involved. Indeed, the state may decide to monopolise a particular technology in the interests of nation-building or other reasons of national interest such

[3] See Read & Youtie (1996: 2-4) for a discussion of the convergence/divergence issue.

as national security. The ability of the state to use its coercive powers to create such barriers to entry can have a major influence over the deployment, use and pricing of communications services.

Ideas The focus on institutions is useful to explain long periods of stability (see punctuated equilibrium), but is less useful in explaining institutional change. Critical junctures are typically viewed as large-scale events, which are exogenous to institutions, and which challenge the *status quo* or force change. However, these do not adequately explain how institutions may change endogenously through learning or deliberately adapting to the external environment (and consequently, change themselves over time). Consequently, the concept of ideas has been developed to demonstrate how an institution may change incrementally or through other dynamics such as policy learning or environmental change, particularly where 'ideas' encompass possible courses of action or strategies to deal with policy problems. Political conflict over different ideas, then, may become a source of institutional change. For example, the liberalisation of telecommunications industries throughout most of the OECD represented a significant change from the idea that telecommunications networks are natural monopolies. Subsequently, institutions changed themselves to implement the new idea, rather than necessarily reacting to a large-scale exogenous event which might be more accurately called a critical juncture.

Industrial culture Political traditions and national characters of government-business relations tend to become embedded in the institutions which influence a particular industry. These historical processes tend to reflect national biases for particular ideologies, views concerning the public interest, and the 'proper' role for government in industry which reinforce a peculiar 'way of doing things'. Industrial culture refers to the 'way things are done' in a particular industry and can be observed, in comparative perspective, through repeated preferences for particular approaches to industrial policy.

Institutions/institutionalism In political science, institutions typically refer to the formal mechanisms which govern collective action, including laws and state organisations, and the informal rules, routines and procedures which act to restrict or constrain individual behaviour. Institutionalism, then, relates to an approach to political science which views institutions as a major influence on policy and individual behaviour. Individual behaviour may still be rational, but within the limits, constraints and structures created by institutions.

Interconnectivity Interconnectivity refers to mutual connections between networks, such as national, provincial or municipal networks.

Path dependency Path dependency exists in the literature in both political science and telecommunications. For political scientists, the choices made at critical junctures tend to restrict future choices by establishing institutions. These institutions, in turn, create powerful inertial forces which make it difficult to undo or change once resources have been committed to a particular path. The outcomes of these initial choices, and indeed the future choices available, tend to be path dependent. For telecommunications scholars, path dependency refers to decisions to deploy particular technologies which involve significant investment, creating legacies that help or hinder the deployment of future technologies. For example, Canada's use of coaxial cable for television delivery helped the deployment of broadband infrastructure in later years, whereas Australia's use of over-the-air television signals meant that an extensive physical distribution network was not available for later use in the deployment of cable broadband.

Penetration The extent to which a communications technology is used by a polity or society is referred to as penetration. Other terms in common usage include teledensity (number of telephones per capita) and take-up.

Plausible/plausibility The concept of the terms 'plausible' and 'plausibility' are used here as opposed to the concept of 'falsifiability' in its application to Mill's method of difference in establishing causality. The use of the terms 'plausible' and 'plausibility' are not intended to be used in the context of being opposed to the terms 'implausible' or 'implausibility'.

Policy actors For any given policy problem, there will be a number of individuals and groups attempting to influence the policy agenda or policy choices. The number of individuals and groups involved will depend on the nature of the policy problem. In analyses of communications industries, policy actors may include government institutions, network and service providers, users, and other interest groups.

Policy agenda

The policy agenda refers to the policy problems or issues which are targeted for action by government or others involved in the policy process. Problems or issues on the policy agenda may be influenced by the ruling political party's policy platform or be a reaction to an emerging problem or issue of public or institutional concern. For example, a range of domestic and international pressures, particularly from policy actors, placed Australia's lagging broadband services on the policy agenda for both major parties in the lead-up to the 2007 election. International comparisons and media attention raised the profile of broadband as a policy problem which had been largely disregarded for many years.

Policy choice

Policy choices usually result in some sort of decision-making which either alters or perpetuates the . Decisions which change the *status quo* are usually referred to as 'positive' decisions, whereas 'negative' decisions consciously preserve the *status quo*. 'Non-decisions' usually relate to those choices which do not make it onto the policy agenda, but tend to reinforce the *status quo* by specifically excluding policy choices which would otherwise alter the *status quo*.

Policy content

A given policy's content typically consists of the policy instruments selected to deal with a given policy problem. Often, the nature of the policy problem (whether the problem is regulatory, distributive, redistributive or so on in nature) and the dominant values, beliefs, and ideas present in the larger societal and institutional frameworks may influence the variety of instruments available to address a particular problem.

Policy cycle

Public policy is often developed in a chaotic environment where policy actors debate political issues in an attempt to influence the policy agenda. Nonetheless, there have been numerous attempts to create order out of chaos through the concept of a policy cycle. The cycle usually involves some form of analysis, consultation, decision-making, implementation and evaluation. Evaluation might then lead to further analysis and a repeat of the cycle. Regardless, the policy cycle is an ordering and conceptual tool only, as the political nature of policy development and implementation may not necessarily occur in the neat and tidy fashion suggested by a formal policy cycle.

Policy legacy

The past influences or restricts the choices available in the present. Such policy legacies may eventuate from sunk-costs or earlier investment in last-generation infrastructure; attitudes, behaviours and expectations created by earlier policy decisions or instruments; legal precedent; institutional inertia; and so on.

Policy outcome	The outcome achieved by a particular policy is administratively assessed in terms of efficient and effective use of inputs to generate outputs which serve to achieve a desired outcome. However, this thesis borrows from Castles' (1998: 9-10) definition, where 'the term "policy outcome" [is] a shorthand way of referring to both the outputs of government programmes... and the real outcomes of policies in the sense of what actually happens to people'.
Policy problem	Typically, policy is formulated to deal with a given problem. While policy may be anticipatory or reactive, in either case the policy is formulated to address a policy problem either in the present or the future. The priority given to a policy problem will depend on numerous factors, including the awareness and willingness of policy actors and other factors which influence the prioritisation of policy problems on the policy agenda.
Policy regime	The long term patterns of policy styles and policy content constitute a policy regime. The term is used to describe enduring approaches to sectoral-level or industry policy and how institutionalised patterns of policy-making tend to restrict policy choices to those which 'fit' the preferences of the enduring policy regime.
Policy style	The manner in which the policy process is conducted is known as the policy style of a given jurisdiction. Different styles may exist at different stages of the policy process. Styles may differ on many factors such as the degree of consensus or imposition in decision-making processes, the extent of public participation in policy formulation, or the degree to which the style is anticipatory or reactive.
Punctuated equilibrium	Following the choices and institutional arrangements which occur at critical junctures, relatively long periods of equilibrium or stability tend to follow. When new ideas challenge the *status quo*, or exogenous shocks occur, a critical juncture may emerge which disrupts the equilibrium or stability until a new *status quo* emerges. Punctuated equilibrium refers to the relatively long periods of stability which are 'punctuated' by relatively short periods of disruption which occur at critical junctures.

Regulate/regulating

The state often establishes rules and mechanisms to control or govern society. Typically, these rules are accompanied by a government agency which monitors and enforces the rules. In communications technology industries, the state may regulate, or monitor and enforce the rules, which have been established by law or other mechanisms such as 'self-regulation'. Nonetheless, once a new technology is adopted and deployed, the state plays a major role in regulating the manner in which the technology is owned or used. This may include restrictions on ownership, mergers and acquisitions, consumer pricing, or rules enforcing competitive behaviour and consumer protection.

Take-up

Once a particular technology is deployed, the number of users or subscribers who take-up the particular technology is an important measure of the social, political and economic value of the technology. Indeed, as the number of users or subscribers to a particular technology increases, the value of the technology tends to increase. This is particularly relevant in networked communications technologies where the number of users or subscribers who can access the network increases the potential benefits available from subscribing to the technology.

Technological neutrality

Refers to non-discrimination, especially by the state (see *Section 2.3: Technological Convergence and the State*), in the use of particular technologies to achieve particular functions. For example, a person may watch a particular television program using a traditional television, or alternatively, watch the same program on a personal computer via the television station's website. In Australia, the television program might be broadcast over the free-to-air network and received via a rooftop aerial to the consumer's traditional television; whereas the same content via the television station's website might be delivered to the consumer via an ADSL connection provided by a telecommunications company. Put simply, technological neutrality means that consumers are at liberty to choose the means, or indeed, the variety of means, they use to achieve particular communications functions, rather than the state predetermining the particular technologies used to deliver and regulate particular content.

Chapter 1: Introduction

1.1 Overview

Despite the many similarities between Canada and Australia, Canada has continually outperformed[4] Australia in the deployment and take-up of almost every new communications technology since the time of the telegraph. At a time when unprecedented public investment in communications infrastructure is occurring in Australia, it is timely that this important yet under-examined phenomenon is explained. Consequently, this thesis sets out to explain the different communications technology outcomes in Canada and Australia over a long historical timeframe and to demonstrate the historical importance of institutions in understanding Australia's poor penetration rates of broadband technologies. The thesis argues Australia's current lag in take-up of broadband technologies is a continuation of a trajectory that commenced with the adoption of the telegraph and has manifested today in the deployment of the National Broadband Network (NBN). In comparison to Canada's decentralised, bottom-up policy approach, Australia's centrally-controlled, top-down policy approach has invariably left Australian citizens behind their Canadian counterparts in access to new communications technologies. The thesis finds that in these two most-similar jurisdictions, a decentralised policy approach is key to enabling businesses and citizens to participate effectively in the digital economy.[5]

There are three major policy narratives which inform the approach to the study. First, there is an overarching narrative which suggests that global ideas tend to influence domestic telecommunications policy approaches. Global events, such as the two world wars, shaped these ideas and triggered responses in the United Kingdom and the

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[4] The term "outperformed" is used throughout this thesis in relation to communications technology penetration rates. For example, if, at a given point in time, one country had more devices per capita than the other, then the country with the greater penetration of a technology is regarded to have outperformed the other. This approach is in keeping with the world rankings commonly produced by international organisations such as the World Bank and the OECD. No normative assessment of the outcomes is intended or indeed relevant to the purposes of this thesis.

[5] According to the Australian Department of Broadband, Communications and the Digital Economy (2009: iv), the digital economy is 'the global network of economic and social activities that are enabled by platforms such as the Internet, mobile and sensor networks. The digital economy refers to the devices most of us use each day such as computers, phones and game consoles. It includes the online maps that we consult, the web searches that we do to find information and our electronic banking'.

United States that required the mobilisation or redirection of entire economies: Australia and Canada were not unaffected by these trends. Second, there are different historical legacies or institutional traditions which predetermine approaches to the deployment of communications technologies in Canada and Australia: in Canada a decentralised, bottom-up approach and in Australia a centrally-controlled, top-down approach. Third, a complementary narrative suggests that the different approaches followed led to repeated patterns or outcomes over time. The decentralised, bottom-up approach has welcomed greater community innovation and led to faster take-up rates of communications technologies, whereas the centrally-controlled approach involves less community innovation and has produced slower take-up rates. Further, the decentralised approach tends to lead to a deeper and richer use of the particular technologies which correlates with citizen involvement in the relevant policy processes. Institutions, then, play an important role in each approach. In Canada, governments develop policies which respond to citizens/users at a regional/local level. In Australia, the government focuses on standardisation to provide single national solutions. These institutional differences are usefully described as policy regimes[6] which reinforce distinct industrial cultures in each country.[7]

Each approach has its merits, but observations of Canada's communications technology take-up since the advent of the telegraph suggest that Australia's centrally-controlled approach is a major reason for Australia's so-called 'broadband crisis' which led to the establishment of the National Broadband Network (NBN).[8] Taking such a long view is important for two major reasons. First, it indicates that Australia's current broadband crisis is little different from previous issues with new communications technology take-up rates since the time of the telegraph. While broadband

[6] According to Wilson (citing Dougherty & Pfaltzgraff 1997) policy regimes consist of the following characteristics: 'First, there is an organizational dimension made up of states, social or political institutions. Second, regimes consist of mutually accepted decision-making procedures and agreed upon rules for action. Third, regimes contain shared principles, norms, and beliefs. Finally, regimes are organized around a particular issue'. Wilson adopts an international perspective yet the definition remains relevant to the present study where communications policy is viewed as the 'particular issue'.

[7] The term *industrial culture* is adopted here to refer to the 'different styles of problem-solving and of accommodation of interests... which reflect and are reflected in institutional structures and ideologies of government-industry relations' (Dyson & Wilks 1983: 35). Further, the 'industrial culture of a country - broadly, its attitude to finance, employee welfare and technological change - impinges on industry in two ways, through legislation and through its own decision making' (Cox & Kriegbaum 1989: Section 2: 1). See 'Glossary'.

[8] Whether the lack of access to broadband services throughout Australia is a 'broadband crisis' has been argued by various politicians and industry specialists (Berg 2007; Budde 2003; Coonan 2006b; Grierson 2006; O'Sullivan in Jenkins 2007; and Thomson 2006).

technologies may be new, low take-up rates in Australia have occurred repeatedly since electronic communications technologies first became available with the deployment of the telegraph. Second, many of the theoretical and technological advances (which enabled modern broadband technologies) were discovered during the latter part of the nineteenth century.[9] Consequently, the technologies *and* the institutions which govern them have co-evolved. Governments have played a significant role in the use of communications technologies, and the way in which that use is controlled is the result of institutions established at a time when the telegraph was the dominant technology.[10] Subsequently, the institutional frameworks dating from this time have created lasting legacies which have influenced the adoption of later communications technologies. In each country, these legacies have limited the policy choices available in the respective communications industries as communications technologies have evolved over time, and, more recently, *converged* (see Box 1.1: Technological Convergence).

Further, the thesis argues that subsequent choices made at critical junctures along the evolutionary paths of electronic communications technologies have influenced the outcomes observed today (see Figure 1.8). As technology evolves, so too do the institutions of the state which influence the *adoption*, *deployment* and *take-up* of particular communications technologies. Policy and delivery institutions continue to play important roles in *enabling*, *coordinating* and *regulating* the deployment of communications technologies and related services, these roles affect the adoption and deployment of particular technologies which in turn influence their take-up, and these roles are used to study institutions in this thesis. Further, broadband technologies enable the convergence of communications functions, making the traditional divergence of the data, broadcasting and telecommunications industries technically obsolete. Yet institutional constraints persist, restricting the converging functionality

[9] Advances made by Morse (electromagnetic pulses used in the telegraph in 1844); Edison and Bell (discoveries leading to the invention of the telephone in 1876); Willoughby Smith and Bell (discovered that light could be used to produce and reproduce sound in 1878); Hughes (discovery of radio waves in 1879); Hollerith (development of the first digital computing machine in 1890); Marconi (wireless telegraphy in 1897); and Braun (development of the cathode ray oscilloscope in 1897, later used for the scanning system in televisions) all occurred during this period. This period heralds the genesis of the major modern technological advances such as fibre-optic and wireless broadband systems.

[10] For example, Canada's constitution (1867) gave responsibility for intra-provincial telegraph networks to provincial governments, whereas Australia's constitution (1901) gave the federal government complete responsibility for 'telegraph and other like services'.

which broadband technologies enable. Institutional variations, then, provide a plausible[11] explanation for the different communications outcomes observed in Canada and Australia; two otherwise most-similar countries.

Box 1.1: What is "Technological Convergence"?

The term 'technological convergence' is far from new. Indeed, many new communications technologies used infrastructure developed for earlier generations of technologies such as the use of telegraph wires to transmit early telephone messages. Nonetheless, the telegraph, telephone and later broadcasting industries were deliberately diverged by agreement between major providers or as a result of government regulations such as the 'common carrier' concept in telecommunications and censorship in broadcasting. In recent times, particularly since the advent of the Internet, improvements in telecommunications, broadcasting and information technologies have resulted in changes to consumer expectations and hence the reconvergence of markets which previously were more profitable as separate core competencies of the relevant providers.

Tunzelmann (1988 cited in Duysters and Hagedoorn 1998: 358) identified three levels at which patterns of convergence occur: 'the product-market level, the technology level and the firm level'. Familiar examples of convergence at each level include: (1) product-market level: watching pay-TV on a mobile telephone; (2) technology level: making a telephone call to a fixed landline using an IP-based application such as Skype; and (3) firm level: telecommunications providers such as Telstra entering the pay-TV market or CATV providers such as Rogers Communications entering the telecommunications market.

While it is arguable that technological developments drive convergence, the traditionally diverged content and carriage industries were deliberately segregated by governments and key industry players as each new technological capability occurred. It follows that technological convergence as it is referred to presently represents a 'tipping point' where the value derived from earlier diverged industries is increasingly reduced. Technological convergence, then, is much more than single devices which provide data, voice and video capabilities. Rather, it is a major change in the market environment which is very much within the realm of government policy. Indeed, Duysters and Hagedoorn (1998: 358) found that 'inertial forces' prevented the rapid convergence of the data, voice and video industries which was predicted to occur during the 1990s. This suggests that technological convergence is not something that is determined by technology alone but it can be influenced or even resisted by governments and key market players.

Institutions play an important role in the development of policy, and 'policy choices made when an institution is being formed, or when a policy is initiated... have a continuing and largely determinant influence over the policy far into the future' (Peters 2005: 71). The legacies of the past, then, influence the range of choices available in the present: the path dependency thesis (Arrow 2004; Arthur 1989; Greif 2006: 158; Hall in Mahoney and Rueschemeyer 2003).[12] As actors and their interests organise along institutional lines, self-reinforcing patterns emerge over time that help or hinder consumer access to the benefits provided by new communications

[11] As opposed to a 'falsifiable' explanation. In comparative politics, the quasi-experimental nature of the methodology does not lend itself to developing falsifiable hypotheses. However, the methodology *is* suited to developing *plausible* hypotheses (Pennings *et al.* 2006: 5).

[12] Nonetheless, the path dependence thesis tends to be tautological. This is discussed further in Chapter 3.

technologies. Hence, institutions may partially explain why Australia has lagged behind Canada in the adoption and take-up of communications technologies since the time of the telegraph with few exceptions.[13] Even as the time taken to adopt new technologies in both countries has converged, Australia continues to lag in the take-up of broadband services. The similarities between Canada and Australia provide a useful focal point for a comparison of the institutions which influence the respective communications industries and the different outcomes observed over time (Giacomello 2005: 65).

Since the widespread adoption of the telegraph, both countries operated communications systems which relied heavily on governments until the respective industries were liberalised, in line with global trends, in the latter part of the twentieth century. However, despite liberalisation, the deployment of communications infrastructure and services in Canada and Australia remains heavily influenced by government policy. Indeed, 'the relations between state and markets are not mutually exclusive' (Levi-Faur in Weiss 2003: 174-177) and institutional variables provide a plausible explanation for repeated observations of Australia's sluggish track-record in the take-up of communications technologies compared with Canada. For example, as broadband technologies became available in the 1990s, Canada pursued a world-leader strategy (Rock cited in Infrastructure Canada 2003) in deploying broadband technologies and achieved this aim in the early 2000s (OECD 2003: 123). Australia, on the other hand, adopted a 'wait-and-see' approach (Howard cited in Turner 2007) and remained in the bottom half of the OECD's broadband penetration statistics as late as June 2008 (OECD 2008a). Further, a World Bank (2006) report outlined how far Australia was lagging the rest of the developed world in access to high-speed broadband services (Osborne 2006). Consequently, broadband became a significant issue in the lead-up to the 2007 Australian federal election with politicians, journalists and industry players identifying a number of different reasons for Australia's 'broadband woes' in comparison with various other countries (Conroy 2007).

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[13] Mobile telephony is the only major instance where Australia has outperformed Canada. Nonetheless, the adoption and subsequent take-up of mobile technologies has displayed path dependent characteristics in both countries.

Nonetheless, comparisons between Australia and other countries which are fundamentally dissimilar[14] may not be helpful in explaining different rates of broadband penetration in these countries. At first glance, it is easy but misleading to assume that, via technological determinism,[15] developed nations will inevitably 'catch-up' with the respective leaders in penetration of communications technologies. Indeed, internationally, a relatively high correlation exists between the standard of living or gross domestic product (GDP) and broadband penetration/take-up (OECD 2008b: 26), suggesting that 'catch-up' is only a matter of time. However, Canada's and Australia's GDP per capita are historically similar. Hence, in selecting comparators for this study, it was important to compare nations of roughly similar size and economic development. These two countries provide a useful comparison to examine drivers (or causality) with more precision than a large study of dissimilar nations would.[16] Despite Canada's ranking in the penetration of broadband services falling from second in 2003 to tenth in 2008, of particular note is the absence of geographically-large countries (other than Canada) in the top ten throughout the period.[17] Further, Australia's ranking improved from seventeenth in 2006 to twelfth in 2007, only to fall back to sixteenth position by the end of 2008. Significantly, other geographically-large countries such as the United States, France and Germany overtook Australia while Canada maintained its lead.

At first glance, other plausible explanations for Canada's early lead are that Canada adopted broadband technologies before Australia or was able to use its existing cable television infrastructure to provide broadband services (Czernich *et al.* 2009). However, further investigation reveals that the first explanation does not hold true. Until the advent of the Internet, Canada had adopted communications technologies earlier than Australia. However, from the advent of dial-up Internet services the pace at which these technologies were adopted in both countries has converged significantly. Indeed, Australia adopted cable broadband before Canada and has almost double Canada's penetration rate for mobile telephones (see Chapter 2). The

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[14] Such as the OECD rankings for broadband penetration.

[15] See Box 1.1: What is "Technological Determinism"?

[16] Discussion of the merits of large and small-N studies (where 'N' refers to the number of observations, or in this thesis, the number of countries or cases) occurs later in the thesis.

[17] Canada shared the lead with smaller countries such as South Korea, Iceland, Norway, Denmark, Sweden, Belgium, Switzerland, the Netherlands and Japan.

latter explanation, however, remains plausible as the majority of Canada's broadband subscribers access the Internet via cable networks. Regardless, this does not explain why Canada had adopted cable television and pay television before Australia, which, in turn, enabled cross-platform competition in broadband services. Further, it does not explain why Australia chose to adopt certain technologies much later than Canada. The issues which determine the adoption of communications technologies and the outcomes of the relevant policies which govern communications industries is a complex puzzle. Despite the convergence (over time) to adopt new technologies, Canada has maintained a lead over Australia in the take-up of new communications technologies. To be sure, other variables play a significant role. However, this thesis is *not* arguing the outcomes are all determined by technology, or that over time the outcomes will somehow automatically converge. Indeed, the institutional arrangements play a much larger role in the outcomes than a technologically determinist stance would allow.

Box 1:2 What is "Technological Determinism"?

'Technological determinism' refers to the notion that technology causes important changes in society. Smith & Marx (1994: x-xi) argues that the concept is the result of widely-shared tacit knowledge obtained through the experience of using artefacts. For example, the user of a shovel would immediately recognise the potential for change when first seeing a mechanical excavator at work. For Smith & Marx (1994: x-xi), the 'materiality' of the artefact 'serves to reinforce a tangible sense of its decisive role in history'. In applying the concept of technological determinism to the research questions addressed here, technological determinism provides a ready explanation for the differences in communications outcomes. For example, Canada simply adopted the technologies before Australia, so it is only ever a matter of time before Australia 'catches up'. Indeed, from the perspective of technological determinism, it is inevitable that Australia will catch up. The approach assumes that technologies develop along a predetermined trajectory that different societies must follow, and that differences in outcomes are simply a result of being at a particular point along this trajectory.

Despite the tangible and practicable value in technological determinism which appears so readily obvious as an explanation for cross-national variation in technology adoption, the assumption of a technological trajectory dismisses numerous social, political, economic and cultural variables and assumes that businesses, governments and consumers have little choice but to be 'pulled' along this trajectory. Nonetheless, technological determinism does not explain 'off-trajectory' issues such as why Canada adopted CATV whereas Australians generally adopted individual antennae for their televisions or why more Australians use mobile telephones than Canadians. Clearly, new technologies can bring about major changes. However, governments, businesses and consumers can make choices that influence which path is adopted, or indeed, whether different or multiple paths can be taken simultaneously or at different points in time. Finally, technological determinism alone is unable to account for the institutional arrangements which help or hinder the adoption and take-up of new communications technologies.

What emerges from an investigation of the historical statistics on adoption and take-up of communications technologies is that Australia has consistently performed worse than Canada in adopting new technologies until the advent of dial-up Internet. Yet as the time to adopt has converged, Australia has continued to lag behind Canada in take-up despite market liberalisation. Figures 1.1, 1.2, 1.3, 1.4, and 1.5 (below) show the extent that Australia has lagged behind Canada in the relevant OECD broadband rankings from 2003 to the present. From a current news media perspective, Australia appears to be dealing with a 'broadband crisis'. From a longitudinal perspective, however, Australia is not facing a broadband crisis at all. Indeed, Australia is following a trajectory which commenced with the deployment of the telegraph. Consequently, this thesis attempts to map the puzzle (of communications technology outcomes) as the dependent variable, and focus on institutions as the independent variable, to provide a plausible explanation for the different outcomes which have persisted over time.[18]

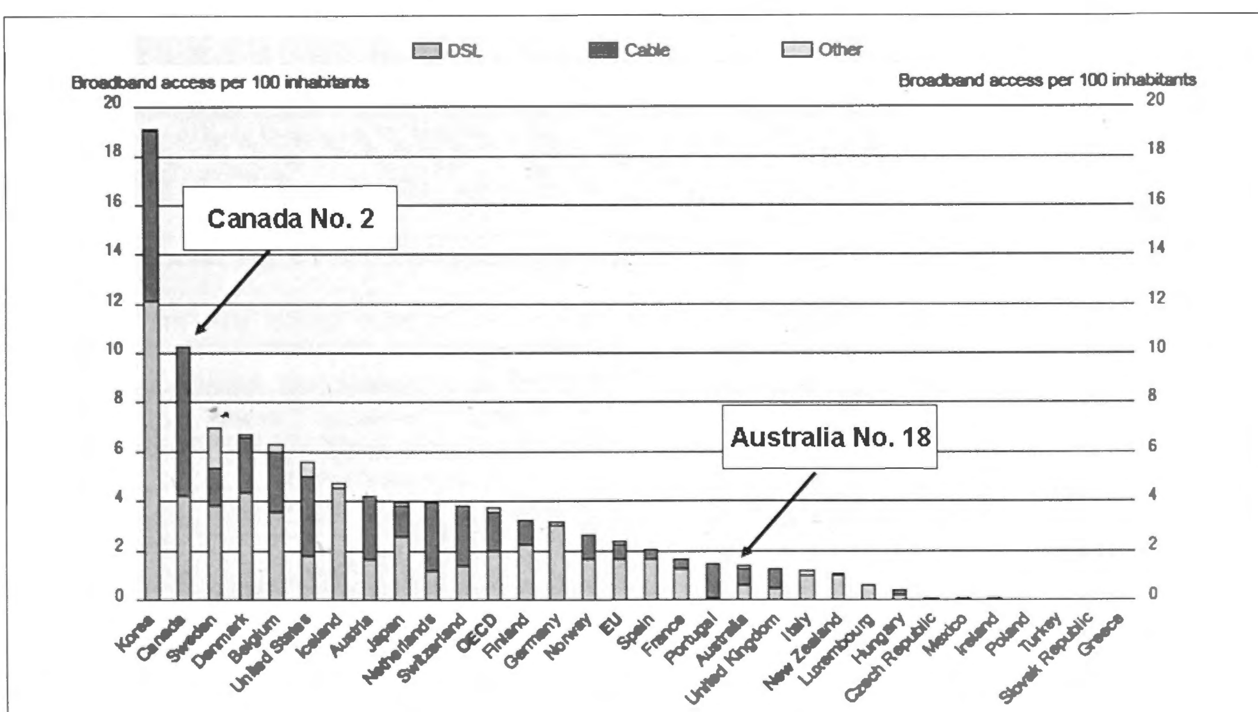

Figure 1.1: Broadband Subscribers per 100 People, June 2002[19]

[18] Succinctly, an independent variable (or explanatory variable) refers to 'a variable that influences, or is hypothesised to influence, another variable' (Brady & Collier 2004: 290). The latter variable is known as the dependent (or outcome) variable (Brady & Collier 2004: 284).

[19] Source: OECD (2003: 173) Telecommunications Outlook 2003

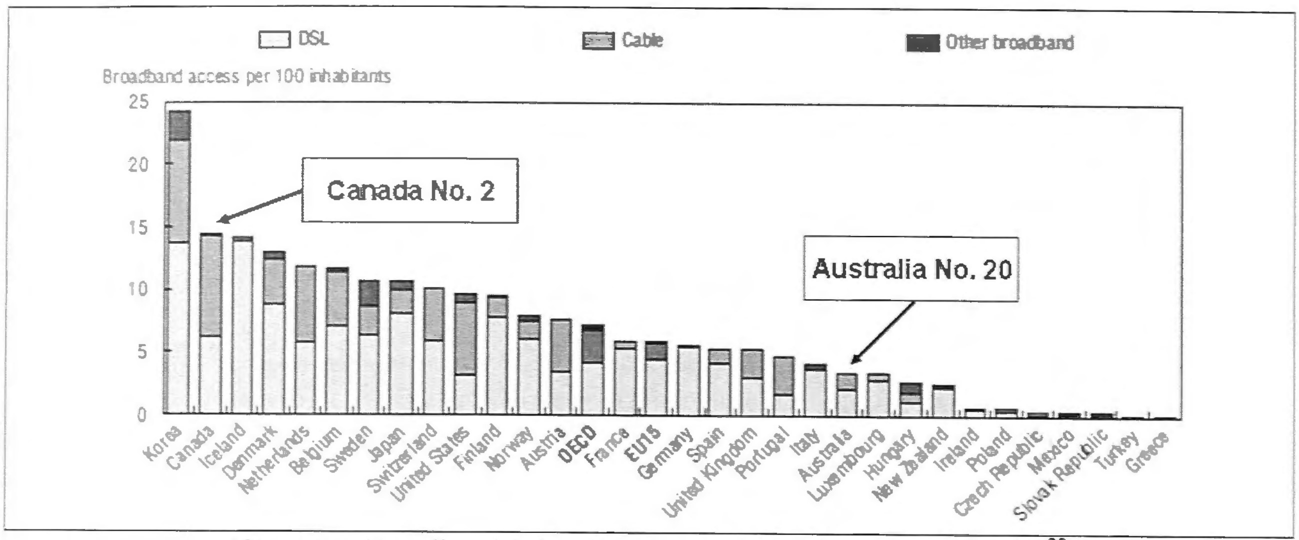

Figure 1.2: Broadband Subscribers per 100 People, December 2003[20]

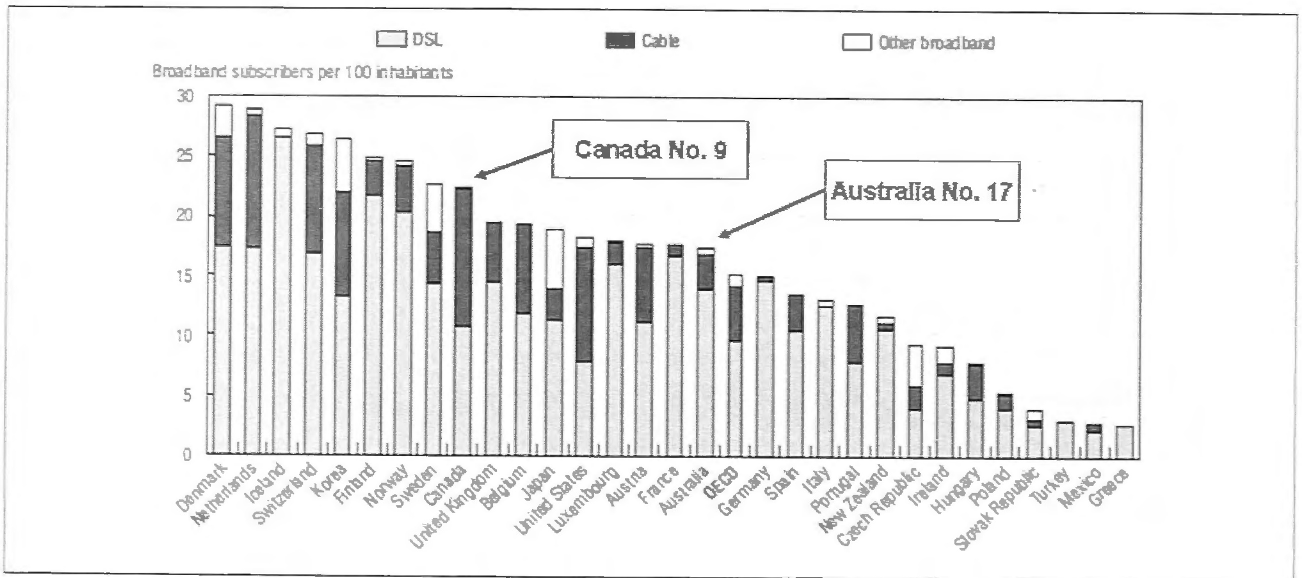

Figure 1.3: Broadband Subscribers per 100 People, June 2006[21]

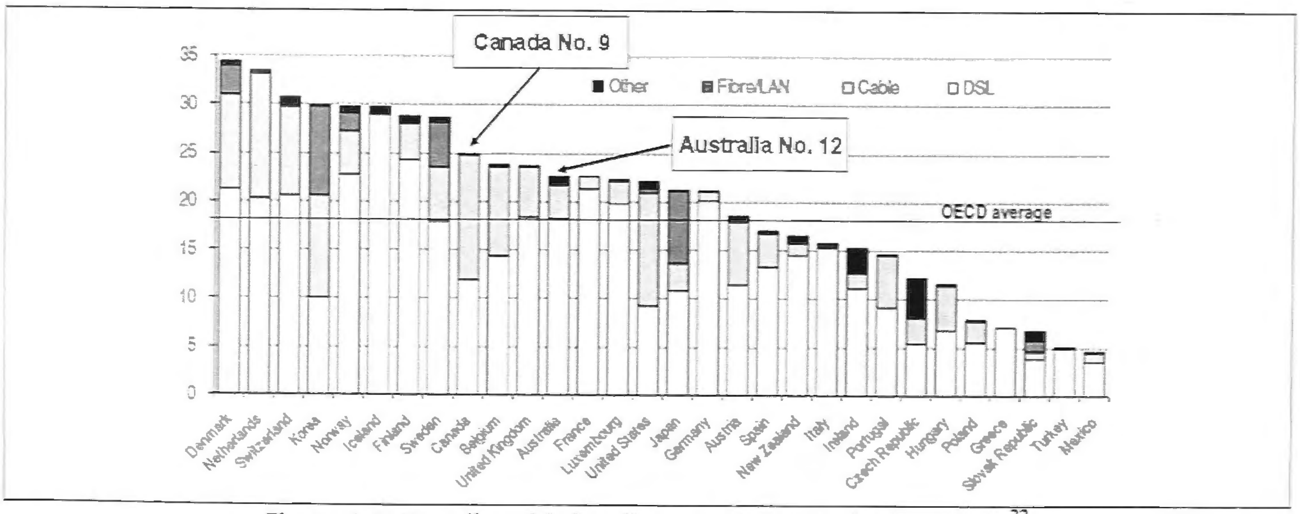

Figure 1.4: Broadband Subscribers per 100 People, June 2007[22]

[20] Source: OECD (2005: 128).
[21] Source: OECD (2007: 135).
[22] Source: OECD (2008b:25).

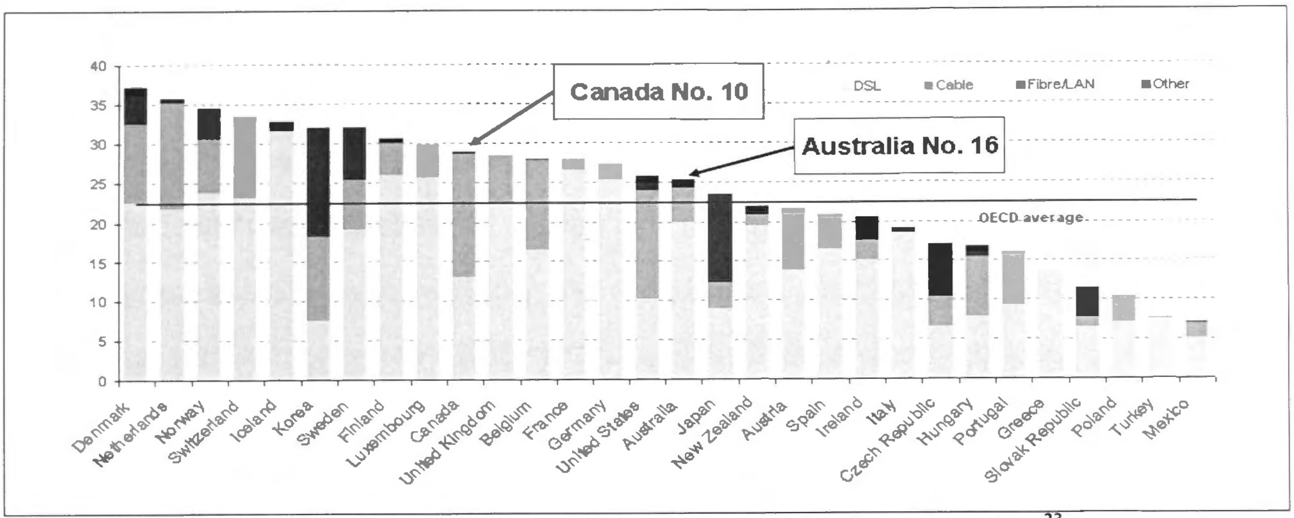

Figure 1.5: Broadband Subscribers per 100 People, December 2008[23]

The focus on Australia's telecommunications industry which featured in the news media and in political debates during the 2007 election campaign made broadband access an urgent 'policy issue' for Australia (see Anderson 1984: 47 for an overview of the concept). Broadband was viewed as a significant enabler of the digital economy with ramifications for Australia's economic future (ALGA 2008) if the 'policy problem' was not fixed. Telstra (Australia's dominant telecommunications carrier), was a focal point for criticism with many calling for some form of separation of the company's wholesale and retail operations and significant changes to the regulatory system (Hewlett & Sainsbury 2007). Nonetheless, there was remarkably little focus on or attempt to facilitate technological convergence (or the impact of the regulation of broadcasting and other related industries) in the debate over the state of broadband in Australia. Indeed, there was little focus on how Australia's communications industries had developed over time and how earlier decisions and institutional arrangements may have impacted upon Australia's capacity to adopt and deploy new communications technologies in the broadband era.

Most news media coverage on Australia's broadband outcomes was premised on a new problem which had emerged during the period of market liberalisation and the privatisation of Telstra. Underpinning this view was a sense that Australia had previously been an early adopter of communications technologies and had performed well in terms of adoption and take-up of new technologies since the time of the telegraph. However, a popular misconception has developed around Australia's

[23] Source: OECD (2009).

achievements in the adoption and take-up of new communications technologies, starting, in particular, with the pioneering achievements which connected Australia to the rest of the world via the Overland Telegraph Line in 1872 (Flinders Ranges Research 1999). Moreover, there is a prevailing view that successive Australian governments have performed satisfactorily in adopting new communications technologies (see PMG 1960; Green 1976 and the counter argument from the Federation of Australian Radio Broadcasters 1976) and that Australians, generally, are quick to take-up new communications technologies' (Barr 2000: 79; McCarthy cited in Freeman 198-:2; PMG 1960). Consequently, very little attention has been paid to the reality of Australia's performance over time (Frith 2009), particularly by way of direct comparison with a 'most-similar'[24] country.

This thesis takes issue with the prevailing view. While Australia's performance in deploying communications technologies may appear sound in a global context, in comparison with Canada, Australia has not fared well over time. Canada and Australia provide appropriate case studies for a most-similar comparison, given the various similarities between the two countries. Yet there are clearly different outcomes in terms of the availability and use of communications technologies which have persisted over time. This leads to an important question which contemporary debates over Australia's broadband future have failed to address adequately: Why?

During the 1990s, deregulation of telecommunications industries became popular throughout OECD-member countries with the expectation that competition would drive down prices and improve access to communications infrastructure (OECD 2002: 6). For a time, Australia was considered to be at the forefront of telecommunications deregulation (Spiller & Cardilli 1997: 127). Similarly, Canada deregulated its telecommunications industry with the introduction of the *Telecommunications Act 1993*. Yet by June 2008, Australia was still lagging behind Canada in the OECD rankings for broadband penetration and several other indicators (see Appendix 1 for a statistical overview). The comparative statistical data suggest that a lack of competition in Australia (compared with Canada) does not sufficiently explain the differences in

[24] The term 'most-similar' is used here in the context of comparative politics (see chapter 3).

broadband outcomes in these two cases (See Figures 1.6 and 1.7 below and the pricing information in Appendix 1).[25] Further, the roles of government, business and consumer (and the community) in the adoption, deployment and take-up of communications technologies are not adequately explained by focusing solely on a perceived lack of competition. Clearly, other variables have played a significant role in determining the differences in outcomes which have occurred repeatedly since the adoption of the telegraph in both countries.

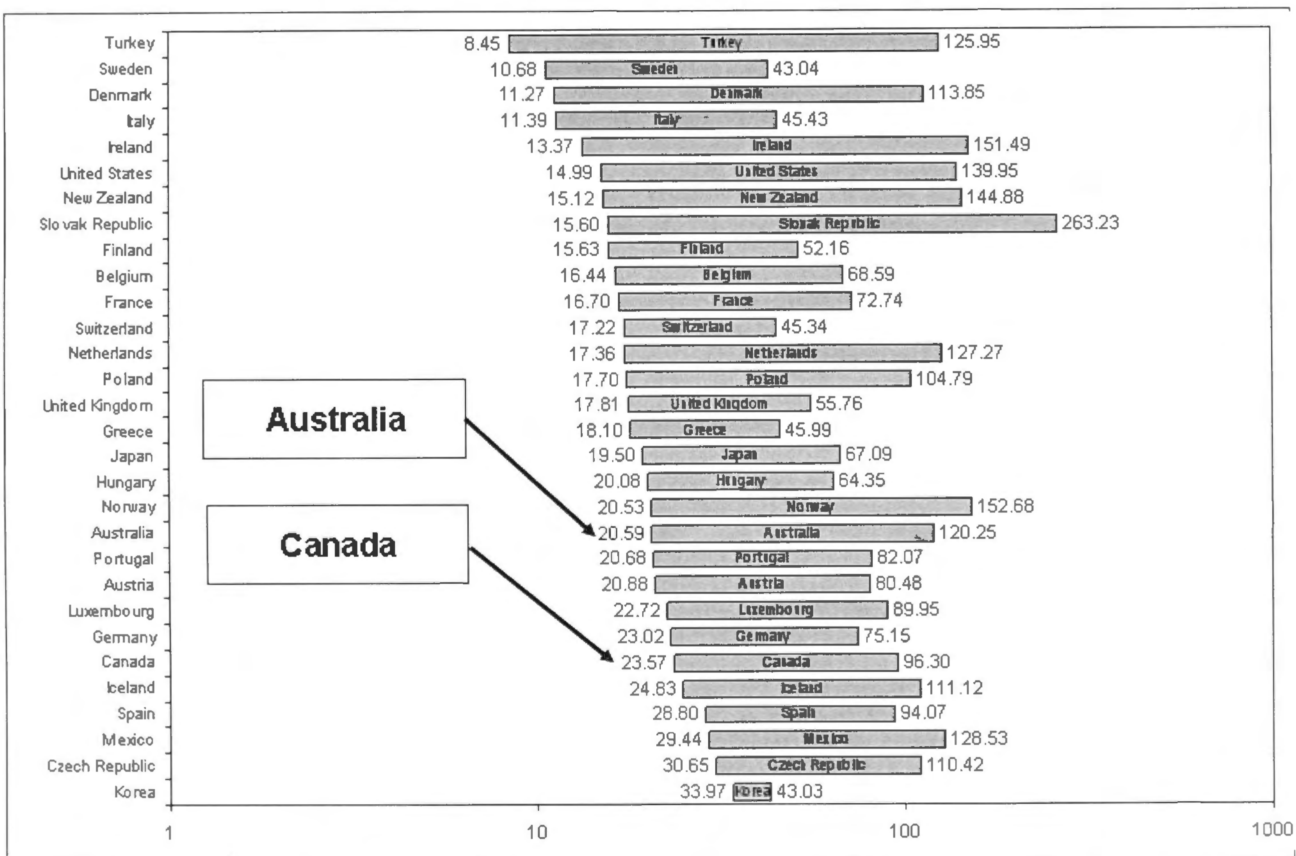

Figure 1.6: Broadband Subscription Price Ranges in USD PPP, September 2008[26]

[25] The figures indicate that in each range of prices (that is, monthly subscription prices *and* prices per Mbps) Australia has lower entry-level prices than Canada. It is generally accepted that lower prices are a result of stronger competition (OECD 2009: 80).

[26] Source: OECD (2009: 281).

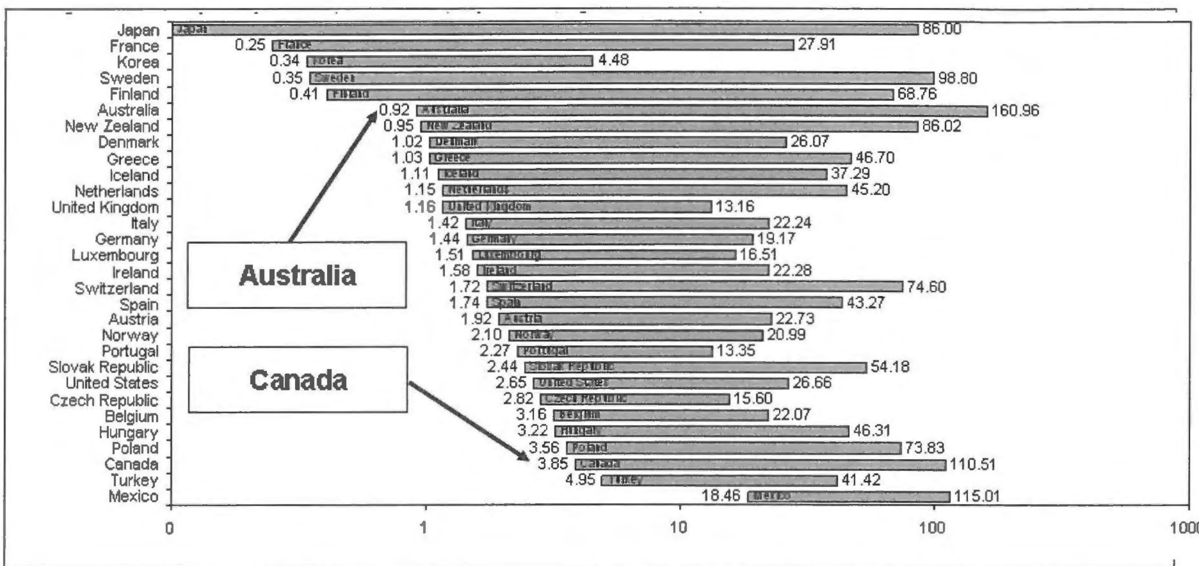

Figure 1.7: Broadband Prices per Mbps in USD PPP, October 2006[27]

Historically, governments in Australia and Canada have played an important role in enabling, coordinating and regulating communications technologies. This, in turn, has influenced the adoption, deployment and take-up of communications technologies by governments (at all levels), businesses, and consumers. An enduring historical feature of the Canadian and Australian communications industries is that Canada has persistently outperformed Australia by being quicker to adopt, and then to achieve greater consumer take-up (or penetration), of new communications technologies. A major constant in these long trajectories of communications technologies has been the crucial role of institutions in both Australia and Canada. New communications technologies have led to the development of new institutions in each country. These have often focused on the technologies as enablers of nation-building, yet they remain strongly dependent upon the constitutional jurisdictions prescribed to the different levels of government.

Given the persistent significance of communications technologies in nation-building in both countries (see Babe 1990: 6; Reid 2008: 99-101; Rudd cited in Lewis 2007), institutions have played an important role in 'defin[ing] possibilities for policy, and shap[ing] outcomes according to their own values and interests' (Davis *et al.* 1993: 6). Therefore, and with nation-building motives in mind, the development of telecommunications is a useful starting point to understand the policy legacies of

[27] Source: OECD (2009: 281).

contemporary communications industries (Wilson 2000: 7). Further, historical institutionalism provides a useful theoretical framework to 'explain differences across political systems', particularly in comparative research (Peters 2005: 82). While change did occur in the respective communications industries over time, it usually occurred in response to evolving communications technologies, with long periods of stability punctuated by change as each new technology was adopted and institutions were modified or created to govern the new technology. Indeed, many policy choices at each of these critical junctures were constrained by institutions, resulting in preferred policy content and policy styles, which have reinforced the 'way of doing' communications policy (otherwise known as policy regimes) in each country.

Communications technologies have evolved over time, and the capability to communicate electronically over vast distances has a long history of evolution. As technologies evolve, so do the institutions which set the rules and inform the structure of communications industries within nation-states. Indeed, for North (1990: vii): 'History matters... Today's and tomorrow's choices are shaped by the past. And the past can only be made intelligible as a story of institutional evolution'. Further, it has been argued that a new institutionalist approach[28] is useful 'as an adjunct to competition and temporal issues' (March & Olsen 1989: 22). Focusing on the institutions and the historical trajectories of communications technologies, then, reveals a deeper understanding of the adoption, deployment and take-up of communications technologies and the complexities of technological, functional and institutional convergence which have been accelerated by the development of high-speed broadband technologies.

If communications outcomes are viewed as the dependent variables, the institutions which influence the communications industries in each country represent significant independent variables in two otherwise most-similar countries. Institutions, then, are the focal point of this thesis. Accordingly, the thesis focuses on *path dependencies* in the communications industries of Canada and Australia and examines the evolution of

[28] Historical institutionalism is regarded as one of the three main varieties of 'new institutionalism' (Thelen 1999: 369).

communications technologies and the relevant institutions in an attempt to unravel some of the complexities involved in the adoption, deployment and take-up of these technologies.

1.2 Research questions

The thesis attempts to address the following three broad research questions:

1. Why has Canada consistently outperformed Australia in the take-up and deployment of communications technologies?

2. To what extent have government institutions influenced policy outcomes in the Canadian and Australian communications industries?

3. What policy legacies from the deployment of previous technologies have influenced the deployment and take-up of broadband technologies today?

1.3 Key findings and arguments

This thesis argues that Canada's decentralised approach to the deployment of communications technologies enables greater flexibility in deployment of services and faster penetration of new communications technologies than Australia's centralised approach. In addition, Canada is better placed to address the regional and local issues associated with technological convergence in the communications industries as entrenched interests are also less centralised. Nonetheless, the nature of the different approaches and the policy choices made in the past restrict the available policy options in the present due largely to political reasons. The following key findings and arguments are drawn from the working hypothesis which is developed in Chapters 2 and 3:

- Compared with Canada, Australia has been slow to adopt new communications technologies up until the age of the Internet. Despite the adoption of modern communications technologies in Canada and Australia occurring more-or-less simultaneously during the last two decades, the deployment and take-up of modern communications technologies in Australia has noticeably lagged behind Canada (except for mobile telephony).[29] The institutions which enable, coordinate, and regulate communications technologies in both countries are the result of choices made during critical junctures occurring at the adoption stage of each new technology. These choices set Canada and Australia on self-reinforcing trajectories which explain the different broadband outcomes in Canada and Australia today. Indeed, the Australian Government's decision to build the National Broadband Network reflects (with the benefit of hindsight) the historical trajectory of communications technology adoption which commenced with government control of each new communications technology in Australia from the time of the telegraph.

- The processes which lead to the adoption of new communications technologies often represent critical junctures which disrupt (relatively) long periods of stability in communications industries (see Figure 1.8). The institutional arrangements and the policy choices made during these periods of disruption influence the next phase of stability. The trajectories of communications industry policies, then, tend to be path dependent and marked by periods of punctuated stability.

- The path dependent nature of institutions tends to reinforce a peculiar policy regime which influences the available policy content and policy styles – or the policy mind-set - in the respective communications industries. Institutions reflect the historical practices of the communications industries in Canada and Australia, and it is apparent that 'the likely results of policy formulation are contingent on the nature and configuration of the interest networks and discourse coalitions that comprise [the] sectoral policy subsystem and affect its willingness and ability to propose and accommodate new policy ideas and actors' (Howlett & Ramesh 2003: 230).

- Mobile telephony in Australia is the only communications technology where Australia not only outperforms Canada, but does so by more than double.

[29] This difference is explained further in Chapters 2 and 6.

- During the present-day period of technological and institutional convergence, Canada's sectoral policy style has enabled faster deployment of broadband technologies and is more amenable to collaboration and innovative practices.

- Canadian governments (at all levels) facilitate cooperation between businesses and civil society organisations, particularly on a regional/provincial level, in deploying broadband technologies.

- As a result of communications policy being largely decentralised, national approaches demand greater cooperation among governments and market players in Canada. Hence, cooperation is an essential feature of Canadian industrial culture and communications industry participants are more willing to focus on competing in the market (rather than focusing on the regulatory system).

- To achieve greater penetration, a regional/local policy focus is more important than a national policy focus in deploying communications technologies.

- Particularism persists: pursuing a 'single business model solution' is unlikely to meet the particular needs of institutional, societal and individual users of communications technologies. Therefore, a system which meets the particular needs of particular groups is more likely to produce greater penetration of communications technologies.

- Compared with Australia, Canada's integrated regulatory framework, combined with a broad range of powers[30] which enable greater provincial, municipal and community involvement in the adoption and deployment of communications

[30] Initially, the Canadian Constitution gave provinces the legal power to regulate communications infrastructure within the province. Federal jurisdiction commenced at provincial borders, particularly to ensure the interconnection of communications networks, although over time the federal government now has the power to regulate all communications networks. Nonetheless, provincial, and consequently municipal, governments are not necessarily prohibited from owning, operating, or negotiating partnerships to deploy communications infrastructure. The term 'broad range of powers' is borrowed from Hogg (1985 cited in Alexander and Galligan 1992: 123) to describe the persistent willingness and ability of provincial and municipal governments to be involved in the deployment, management and operation of communications networks.

technologies has contributed significantly to Canada's higher rates of broadband access and speed of the services.

- In Australia, rapid changes in technology and the move to a market-based model of service provision did little to change the entrenched ideas which have dominated the institutional arrangements for governing the adoption, deployment and take-up of communications technologies since the time of the telegraph. It is argued that the old business model where the telecommunications carrier 'own[s], control[s] and dominate[s] the network grid and as much of the retail/commercial market as possible' (Axia 2007) persists in Australia. The introduction of NBN Co. to own the wholesale communications network (despite the intention to privatise this entity over time) is a continuation of the ideas which underpin Australian communications policy.

- Backed by clear constitutional powers, communications technology has been a major political issue for federal governments in Australia, since federation, creating the 'centralisation' of interests around the traditionally diverged communications industries. Also, Australian governments have shown a clear preference for state monopoly provision. These diverged interest groups have hindered the federal government's ability to address institutional issues associated with technological convergence. Canada's decentralised approach, on the other hand, has serendipitously avoided this centralised political effect, providing policy-makers with a diverse range of interests to take into account when addressing issues relating to technological convergence. Consequently, Canada's policy regime is better equipped to enable greater citizen participation in the digital economy.

- In addressing the varieties of particularism (see Box 1.3: Varieties of Particularism) that exist at the nexus of government, business and communications technologies, a local or regional policy focus is more effective than a national policy focus in deploying communications infrastructure.

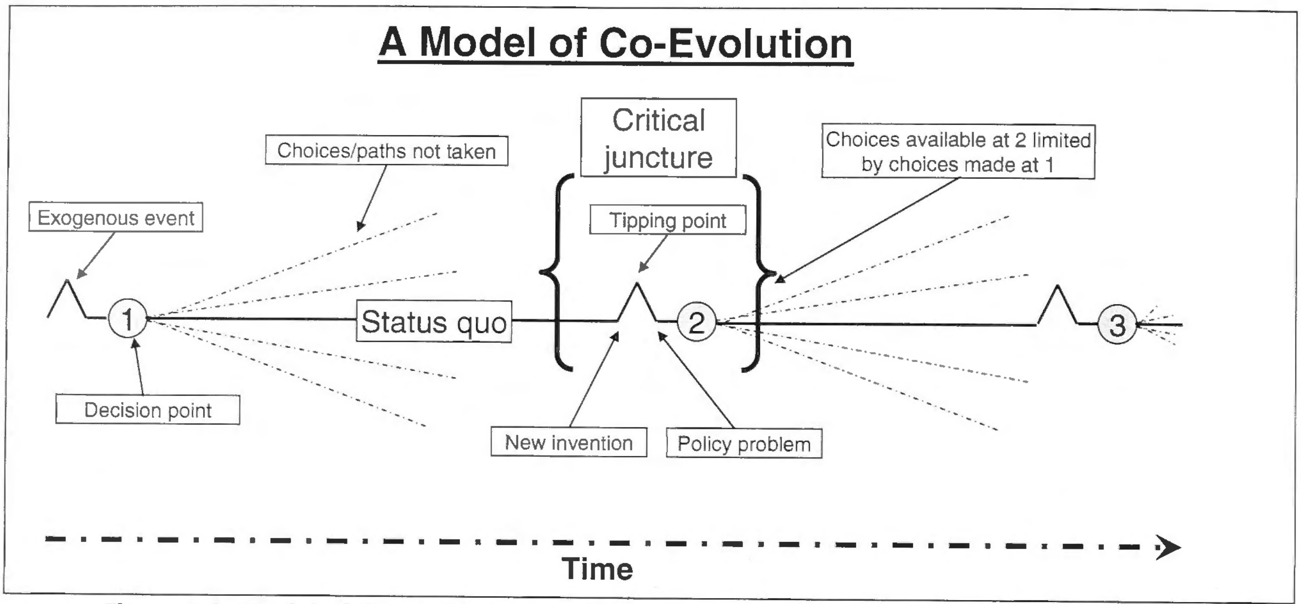

Figure 1.8: Model of the Co-Evolution of Communications Technologies and Institutions[31]

1.4 Approach

The economic, political and social similarities between Canada and Australia are well documented (Wood 2002) and provide a useful most-similar comparison (Alexander & Galligan 1992: v; Cooper 1998: 13-14) to attempt an explanation for the different communications technology outcomes. Research by Atkinson, Correa & Hedlund (2008: vii, 11) found that 'non-policy factors explain about three-quarters of the difference between nations in broadband performance': geographical challenges, housing arrangements and, in particular, the average length of the 'local loop' are issues which make it difficult to blame 'poor [broadband] performance on poor or non-existent policies'. However, the present study is deliberately designed to reduce the impact of such 'non-policy factors'. Australia is comparable with Canada which 'consistently and substantially outperforms Australia on broadband penetration, price and speed' (IPA 2009: 4) despite, for example, the average local loop length in Australia (3km) being less than Canada's (3.5km), suggesting that the non-policy related factors are significantly less important in these particular cases (Atkinson, Correa & Hedlund 2008: 11). This is one of the most puzzling aspects of the comparison of communications technology outcomes in these two countries.

[31] This model is explained in detail in chapter 7.

What is clear is that the institutions and the resulting industrial cultures in the communications industries of both countries have had a significant impact on outcomes in terms of access to and penetration of communications technologies – an impact which has occurred repeatedly throughout the history of communications technology adoption in each country. This is an important, yet under-examined, aspect of contemporary broadband outcomes which has largely escaped public debates concerning communications policy. Dyson & Wilks (1983: 31) suggest that such 'traditions of public authority find their expression within the industrial cultures through their embodiment in institutional structures'. The approach is adopted here to compare the respective institutions and industrial cultures and their influence on the development of communications policy and the resulting policy outcomes.[32]

Historical institutionalism is a dominant analytical approach of the 'new institutionalism' (Hall & Taylor 1996: 936; Peters 2005: 71; Hay & Lister in Hay *et al.* 2006: 17; Thelen 1999) and in political science views institutions as the recurring patterns of behaviour which establish the rules, 'routines, procedures, conventions, roles, strategies, organisational forms and technologies around which political activity is constructed' (March & Olsen 1989: 22). Further, Hall (1986, cited in Marsh & Stoker 1995: 54) suggests that historical institutionalism 'is capable of explaining historical continuities and cross-national variations in policy'. The approach informs the analysis of the institutions and the resulting industrial cultures which is useful to 'explain some of the deep and subtle differences between character of government-industry relations' (Dyson & Wilks 1983: 31) in the Canadian and Australian communications industries by identifying these cross-national variations throughout the evolution of communications technologies. This approach is useful for understanding the adoption, deployment, and take-up of technologies in historical and comparative perspective and has been adopted by numerous scholars (see for example Dyson & Wilks 1983; Groenewegen & van der Steen 2006; Hall & Soskice 2001; Hollingsworth 2000; Hughes 1969, 1993; Nye 1992; see also Lecours 2005: 5).

[32] The term *policy outcome* is adopted here to refer to 'the real outcomes of policies in the sense of what actually happens to people' (Castles 1998: 9-10). The term is used in its broadest sense, 'tak[ing] into account a wide range of factors, including policy regimes, policy determinants, policy instruments, and policy content' in the analysis of communications policy (Gordon *et al.* 1977 cited in Howlett & Ramesh 2003: 10).

This research project outlines the trajectories of communications policies in Canada and Australia since the introduction of the telegraph, focusing on how institutions have influenced policy outcomes in the respective communications sectors over time. The thesis focuses on two broad issues: (1) How government institutions in the Canadian and Australian communications industries help or hinder the deployment of communications technologies; and (2) The strategies pursued by governments in deploying communications technologies and why these strategies were pursued. The thesis then attempts to explain the different communications technology outcomes in Canada and Australia in the broadband era.

1.5 Rationale for the research

Broadband development is a major policy goal for western governments (DCITA 2006; GAO 2006; Industry Canada 2003; Kamath 2008). Broadband technology is considered important because it 'not only plays a critical role in the workings of the economy, it connects consumers, businesses, governments and facilitates social interaction' (OECD 2008: 7). Indeed, the United Nations (cited in French 2006) regards broadband as 'so vital for businesses that it can be seen as a new utility comparable to water and electricity'. Consensus exists on competition as the primary enabler of the diffusion and take-up of broadband technologies, particularly competition at all levels (investment in infrastructure, and service and content provision) of the telecommunications industry (OECD 2008: 10). However, broadband technologies have accelerated the convergence of communications technologies *and* the associated industries, suggesting that changes to traditional industry structures will have a significant impact on institutions and hence industrial cultures.

In explaining broadband outcomes, there is an absence of research comparing outcomes in the Australian and Canadian communications industries over time. While a recent major research project comparing the two countries focuses on lessons learnt from Australia's National Broadband Network and Alberta's SuperNet (Middleton & Given 2010), much of the comparative research involving a small number of cases (in the available literature) compares Australia with smaller or more densely populated jurisdictions including the United Kingdom, Hong Kong, Singapore, Korea and New

Zealand (see for example Heatley & Howell 2010; Chang, Lee & Middleton 2003; Middleton & Given 2010). There is much to be gained from such analyses in terms of understanding policy, industry structure and regulation. However, geographically smaller jurisdictions do not face the problems associated with the 'tyranny of distance,' or the additional investment (and higher consumer prices) associated with connecting regional areas located far from metropolitan centres (Coutts cited in Hurst 2010). Nor do these smaller countries face the issues associated with federalism; specifically, the political problem of 'bring[ing] together territorially delineated communities into larger, more complex, national communities' (Gibbins 2000; see also Symeou 2009). A comparison of Canada and Australia encompasses the similarities in both geography and political systems.

OECD member countries are often compared and contrasted in relation to their rankings on broadband take-up and access statistics. Yet 'relatively little work has been done to understand why some nations are ahead, and why some... are lagging' (Atkinson *et al.* 2008). Recent attempts at bridging this gap in collective knowledge tend to focus on the wisdom of competition and deregulation, with little attempt to conduct in-depth analyses of the institutions which structure the behaviour of government, business and civil society organisations in deploying and encouraging the use of communications infrastructure. Moreover, arguments tend to focus on consumer prices and the level of competition in the market. Given Australia's high levels of mobile telephony penetration in comparison to Canada's relatively low levels, focusing on competition alone leaves many questions unanswered, in particular why Canada leads Australia (and has always done so) in all other communications technologies.

Much research into the diffusion of communications technologies has focused on government policy programs and issues such as 'broadband deployment, pricing and access' at the macro (national) level (Lee *et al.* 2003: 227). More recently, research has considered the characteristics of users and households at the micro (individual) level to determine what drives the adoption of broadband services (GAO 2006; Oh *et al.* 2003). While 'public-private venturing [is a] dominant theme marking broadband-development policy' world-wide (Gillette 2008), there has been little research into the development of domestic institutions over time and how these impact upon the delivery of this important infrastructure. However, a counter-argument to the institutional approach adopted here is that domestic institutions are increasingly irrelevant in global markets. Interestingly, and despite the persuasive influence of globalisation and trade liberalisation in the 'New Economy' (see Harcourt 2001 for a succinct overview of the concept), national security concerns limit the realm of communications policy predominantly to the domestic sphere in the relevant industries (see, for example, Stewart 2008). Despite challenges to the relevance of domestic institutions in 'understanding the dynamics of public policy' in Europe (as a result of the European Union) (Brunazzo & Della Sala 2007: 2), there is no obvious reason to suggest that the domestic focus of the Canadian or Australian communications industries will be challenged in the foreseeable future and therefore a greater understanding of the impact of domestic institutions on the adoption and take-up of communications technologies remains relevant today.

Little attention has been paid to institutions and industrial culture within the bounds of domestic communications industries, with most domestically-focused research tending to compare the technical arrangements for regulation of the industry, the specific policy strategies undertaken in different jurisdictions (see, for example, Chang *et al.* 2003; Wallsten 2001 cited in Warschauer 2003: 70-71), or the ramifications of contractual relationships between governments and information communications technology (ICT) providers (Bastow *et al.* 2000). Given telecommunications (in particular) is predominantly a domestic industry, the impact of institutions and industrial cultures on outcomes within domestic communications industries is worthy of further research. Indeed, it is envisaged that such an understanding will provide insights into how the interaction of government, business and technology influence outcomes in the adoption, deployment and take-up of communications technologies.

1.6 Contribution to knowledge

This thesis makes four valuable contributions to knowledge. First, it is an original study of an important contemporary issue, from a perspective which has received very little attention in Australia. It seeks to fill a gap in the literature on the influence of institutions in the context of converging communications technologies. Second, it draws on a long-term perspective of policy development rather than a snap-shot of policy at a particular point in time. This is significant at a time when, as a result of the global financial crisis, the rationale of free market dogma has been subjected to greater scrutiny. Third, few comparative studies have considered the impact of historical patterns and path-dependencies which limit the available communications policy choices in the present era of technological convergence. Other studies have tended to focus on the traditional industries in isolation from one another, with few attempts to compare the patterns of technological adoption and deployment and the influence of the associated interests on national communications policies and objectives. Finally, the thesis develops the concept of varieties of particularism (see Box 1.3) to provide new explanations for cross-national variations in communications technology outcomes which are of importance to governments, businesses, civil society organisations and consumers.

1.7 Limitations on the scope of the study

This thesis is limited in scope to the observable outcomes of institutions in the communications sector. The term communications sector refers to the broadcasting and telecommunications industries which are increasingly converged as a result of advances in technology. The research project is largely an attempt to explain the impact of technological convergence on industry structures, the institutions and policies which guide these structures, and how these 'rules of the game' help or hinder the deployment and take-up of communications technologies. It does not attempt a normative evaluation of the usefulness (or otherwise) of communications technologies or how the characteristics or behaviours of individual users influence the deployment or take-up of communications technologies. Instead, this study examines how *policy regimes* are institutionalised over time and how these repeated patterns limit the available choices for communications policy in the present.

There are some obvious limitations to this study. First, the availability of detailed historical information and access to the inner workings of governments and businesses are limited. While elite interviews were conducted in an attempt to overcome some of these limitations, not all industry elites (both business and government) were available, or at times willing, to participate in the research. Indeed, much of the information provided by interviewees tended to serve more as a 'guide post' to major issues and events in each industry or jurisdiction. Piecing together the stories provided by individual interviewees required much verification with historical documents. At times, in their understanding of policies and issues relevant to their particular industry, interviewees tended to reflect established industrial cultures and corporate mantras. Making sense of the information provided by such primary sources proved more effective as a primer to study other primary source documents rather than an important source of information alone. Second, the available comparative statistics on the adoption, take-up and price of communications technologies rely on numerous inputs. While commonly used in research and in comparing outcomes between nation-states, the reliability of the data cannot be guaranteed. Nonetheless, these statistics are in common use and are sufficient for the purposes explored here. Third, the theoretical backdrop to this study is often drawn from an emerging literature which, not unlike the technology itself, spans numerous academic disciplines and traditions. For a long period of recent history, studies of communications technology deployment have been either the domain of legal, technical, or economics experts. Adapting the methods of political science to such a study is a relatively new approach in the field of inquiry, and therefore the approach and findings may be limited by the particular view inherent in the discipline. Finally, it is impossible to stay abreast of ongoing developments in technologies and policies such as recent problems with the deployment of the NBN (McDuling 2012) and the pending crisis in Canada's mobile telephony industry (*The Economist* 2011). Further, the impact of technological convergence and the advent of smartphones and tablets and various other devices for use with mobile broadband are yet to be reported adequately, making it difficult to make claims about emerging trends. It has therefore been necessary to limit the study to the recent past in order to facilitate the study's completion. No doubt there will be many areas for future research yet the long trajectory of this study is designed to overcome this limitation as practicably as possible.

Before presenting the detailed discussion, the following section presents an overview of the thesis.

1.8 Thesis framework

This introductory chapter outlines the focus, research questions and scope of the research. Chapter 2 maps out the puzzle of communications technology outcomes in each country from the time of the telegraph to the broadband era. The chapter commences with an analysis of the available statistics on the adoption and take-up of significant communications technologies. This analysis sets the scene for the historical narratives of the different trajectories addressed in Chapters 4, 5 and 6. Further, a major issue of broadband is that the capabilities of the technology have accelerated technological convergence, putting pressure on governments and institutions to facilitate the take-up rate. This is having a profound impact upon domestic institutions and the way in which policy is developed across formerly-diverged industries. To identify the major themes for comparison, Chapter 2 also outlines the impact of technological convergence on the state and the manner in which technologies and institutions co-evolve. As broadband brings into conflict previously diverged interests, some of the policy problems are examined. Importantly, the chapter establishes the working hypothesis which guided the research.

Chapter 3 outlines in more detail the methodology adopted in this study, focusing on historical institutionalism in comparative perspective. The chapter also outlines the approach which led to the formulation of the working hypothesis outlined in Chapter 2. Chapters 4, 5 and 6 are the major empirical chapters of the thesis. Chapter 4 outlines the historical trajectories of Canada's and Australia's approach (respectively) to governing the adoption, deployment and take-up of communications technologies from the time of the telegraph to the broadband era. The constitutional arrangements instituted during the telegraph era in both countries - resulting in the Australian federal government having powers for communications whereas in Canada the powers traditionally reside with the provinces - still impact upon institutional arrangements and industry structures today. The chapter highlights the importance of such a long trajectory in understanding the respective industrial cultures and the interests which are converging with the advent of broadband. As many of the major players and key concepts in the converging industries emerged during the telegraph era, it is important to begin at the beginning.

Chapters 4, 5 and 6 present historical narratives of the telecommunications, broadcasting and broadband industries (respectively) in Canada and Australia to facilitate the identification of critical junctures and path dependencies which emerge along these trajectories. Moreover, the narratives identify major issues which have influenced the policy regimes and industrial cultures which have developed over the lifetime of electronic communications technologies in the evolving industries in each country. The policy regimes are referred to as the 'mosaic' (Canada) and the 'monolith' (Australia) as these terms best represent the respective regional versus national approaches to the governance of communications technologies from the time of the telegraph into the present.

Chapter 7 evaluates the two cases to determine how institutions shape the policy regimes and industrial cultures within the communications industries of Canada and Australia, and how these affect policy outcomes in the respective industries. The chapter evaluates the different approaches to the adoption, deployment and take-up of communications infrastructure and services in large, sparsely populated federal jurisdictions. The consequences for regional and local innovation presented by the different constitutional powers for communications in Canada and Australia are of particular note. Moreover, the chapter demonstrates how Australia's centralised approach to communications policy has hindered technological convergence by institutionalising policy and industry sub-systems that resist convergence. Canada's decentralised approach has not facilitated such 'siloed' policy and industry subsystems resulting in diversified approaches to communications technology deployment that address the numerous varieties of particularism at the local level (see Box 1:3 Varieties of Particularism). In doing so, the chapter presents a model to explain the co-evolution of institutions and communications technologies and how policy regimes and industrial cultures influence the choices available at the time new technologies are adopted.

Finally, Chapter 8 draws the thesis findings together to provide a plausible, as opposed to falsifiable, explanation for the different communications technology outcomes in Canada and Australia. The chapter also relates these findings to the usefulness of historical institutionalism as an approach to understanding the legacies of the past which influence communications technology outcomes in the present. The chapter offers suggestions for further research and speculates on future approaches to developing communications policy in light of the research findings.

Box 1:3 Varieties of Particularism

A major finding of this research is that, in an era of technological convergence, providing a single technological solution to solve various connectivity problems is slower in addressing the diverse connectivity-related issues associated with various communications technologies in the near term. Similarly, grand, long-term approaches overlook regional and local opportunities and, in the pursuit of standardisation or quality/equality of service, 'lock-in' users to a technological solution designed to solve yesterday's communications problems. Over time, the process of central control prevents the development of community expertise, or cultural capacity (see Hughes 1993), which leaves citizens as passive recipients of communications services, rather than being an integral component of

In his study of electricity systems in Germany, the US and the UK, Hughes (1993 : 405) found that local conditions resulted in distinct technological styles, defined as 'the technological characteristics that give a machine, process, device or system a distinctive quality'. Hughes defined the local conditions external to the technology as cultural factors: 'geographical, economic, organizational, legislative, contingent historical, and entrepreneurial conditions... factors [that] only partially shape technology through the mediating agency of individuals and groups'. However, electricity systems are passive networks where users have limited choices about how the network is deployed or used, whereas modern communications systems provide suppliers and end-users with a variety of choices about the means of delivery and the use of such networks respectively. For the purposes of this thesis, the various 'cultural factors' (as defined by Hughes) and the various connectivity requirements of users present particular circumstances which must be taken into account to enable greater penetration of a particular technological function.

In the absence of a term to describe the connectivity problems dictated by the varieties of particular individual, organisational, geographic, demographic and infrastructure situations that policy makers may need to address (while attempting to predict the current and potential uses of communications technologies in such various conditions), the term 'varieties of particularism' is adopted here to encapsulate these diverse circumstances. The term is borrowed from moral philosophy where it is used to explain a form of morality where particular circumstances dictate particular approaches to morality, on a case-by-case basis, as opposed to a single moral principle that dictates all action (see Sinnott-Armstrong 1999).

During the present period of institutional disruption (created by technological convergence), attempts to address these varieties of particularism have been referred to elsewhere as technological neutrality, where the technology used to achieve a particular function is left to supplier or consumer choice, rather than being predetermined or directed by the state. In Australia, however, the policy preference for delivering communications technologies over time has been to offer centrally-controlled, limited technologies in an attempt to create a sense of universal, standardised service. Canada, on the other hand, has attempted to achieve universal service through a mix of technologies devised and deployed at the regional and local levels to work within the regional and local varieties of particularism. Further, Canada's approach provides greater access for citizens to the political process at the provincial and local levels, whereas state and local politicians in Australia have limited ability to influence centrally-controlled communications technology systems. This leaves citizens waiting until the federal government enables the deployment of infrastructure, as is occurring with the NBN today.

Hughes (1993: x) found that the policy issues in deploying electricity networks were more regional than national in three different national contexts. The present study finds that the same principle applies to communications networks. Therefore, a major explanation for the divergent communications technology outcomes in Canada and Australia, and indeed, for Canada's faster speed in achieving greater penetration of new technologies over time, is that decentralised institutions are better able to address the regional and local varieties of particularism, hence providing greater citizen involvement in the policy process and faster penetration of new communications technologies.

Chapter 2: Mapping the Puzzle

2.1 Introduction

This chapter examines, in detail, the differences in adoption and take-up of communications technologies in Canada and Australia from the time of the telegraph to the present. The chapter attempts to map the puzzle which is easily overlooked in large-N[33] comparisons involving thin analyses. It is argued here that a longitudinal approach, drawing on thick analyses,[34] provides a much richer understanding of the problems which have been highlighted by recent debates concerning Australia's broadband future. The differences outlined herein are designed to articulate the dependent (or outcome) variables which demonstrate that Australia's current 'broadband emergency' and its relative position along a technologically-determined 'broadband' trajectory are fallacious. Indeed, in comparison to Canada, Australia's current broadband situation is not unlike previous experiences with each new communications technology which has emerged from the time of the telegraph. To outline the extent of the different communications technology outcomes, this chapter provides a detailed analysis of the adoption and take-up rates of the major communications technologies in Canada and Australia in comparative perspective.

Following the detailed presentation of the dependent variables (communications technology outcomes), the chapter outlines some of the major issues which broadband technologies have created. How broadband is defined is a major issue in comparing the outcomes: indeed, today's broadband quickly becomes tomorrow's narrowband. As broadband enables the convergence of traditional industries, particularly the telecommunications and broadcasting industries, the legacies of the

[33] Where 'N' is the number of observations or cases.

[34] Historical institutionalism has shied away from 'thick description' in recent years (Steinmo in Della Porta & Keating 2008: 118-138). Although there is no clear link between thick analysis in historical institutionalism and thick description in case study analysis, the following from Dawson (in Mills 2009: 942-944) characterises the approach adopted here: 'Thick description is a term used to characterize the process of paying attention to contextual detail in observing and interpreting social meaning when conducting qualitative research... The aim of thick description is not to provide a definitive account but to venture a suggestion regarding the range of possibilities. In case study research, thick description is an essential part of the process of determining what the particular issues, dynamics, and patterns are that make the case distinctive. It is one of the foundational building blocks in constructing knowledge, and interpreting the interwoven strands of signification that comprise the fabric of human understanding'.

past heavily influence the manner in which the emerging (and converged) communications industry is governed. Finally, as communications technologies evolve, the institutions which govern the industry tend to evolve alongside the technologies, albeit either led by or held back by the state. The intention, then, is to 'map' the puzzle which emerges from a detailed analysis of communications technology outcomes in Australia and Canada over time to then explain the reasons for these observed differences.

2.2 Adoption and Take-up

As a starting point, it is helpful to define the major terms used in this section: *adoption* and *take-up*. These two terms outline the dependent variables examined in the two cases, focusing on two main questions: (1) When was each technology adopted in each country? and (2) What were the historical take-up rates of each new technology over time? In this thesis, adoption refers to when the state first permitted or enabled a new communications technology to be deployed. Although there have always been experimental, unofficial or even illegal deployments of new communications technologies, the state's monopoly on coercive force has ensured that new communications technologies have not been deployed, at least on a large scale, without sanction by the state. Take-up, on the other hand, refers to the actual use of communications technologies by consumers. It is note-worthy that, initially, the take-up of communications technologies was measured by number of devices per person. This is a somewhat imprecise measure as it does not indicate actual usage or the extent of the divide between the 'haves' and the 'have-nots', but in the absence of more precise historical information, the trends over time are still useful. More recently, the measure has focused on the number of households which use the relevant technology, providing a more accurate picture of consumer take-up.

2.2.1 Adoption of Communications Technologies

Australia's current lag in the take-up of broadband technologies is no different from the lag in take-up of earlier communications technologies. Indeed, the historical perspective suggests that the current 'broadband emergency' is not unlike Australia's experience with earlier new communications technologies. The rival trajectories reveal that Australia has significantly fallen behind Canada in the adoption of all major communications technology innovations up until the time of the mobile telephone. Indeed, the only technology which Australia adopted *before* Canada was HFC cable broadband. This is somewhat ironic, as Canada's cable television network had been deployed for many years and it was the Australian state which effectively kept cable television companies out of the telecommunications market for many years. Nonetheless, Australia's take-up of high-speed HFC cable broadband was limited to the Sydney and Melbourne metropolitan centres and the initial deployment was by Optus and Telstra competing for pay-TV customers (discussed in detail in Chapter 6). Mobile telephones represent an 'outlier' in that Australia is overwhelmingly in the lead when it comes to the take-up of mobile telephony (discussed in detail in Chapter 6). These issues will be explored in later chapters; in the meantime, the following section outlines the different rates of adoption of the major communications technologies.

Figure 2.1 (below) has been constructed using the available historical data and sets out the Canadian and Australia trajectories of communications technology adoption from the time of the telegraph to the present.[35]

[35] Access to the International Telecommunication Union (ITU) statistics database was provided by the Library of the Department of Broadband, Communication and the Digital Economy in Barton, ACT. Other statistical information was drawn from a variety of historical sources including Organisation for Economic Cooperation and Development (OECD) reports, Statistics Canada and the Australian Bureau of Statistics year books (assistance also provided by staff at the ABS Library in Belconnen, ACT, and various other primary and secondary sources accessed through the National Library of Australia with assistance from staff at the Petherick Room.

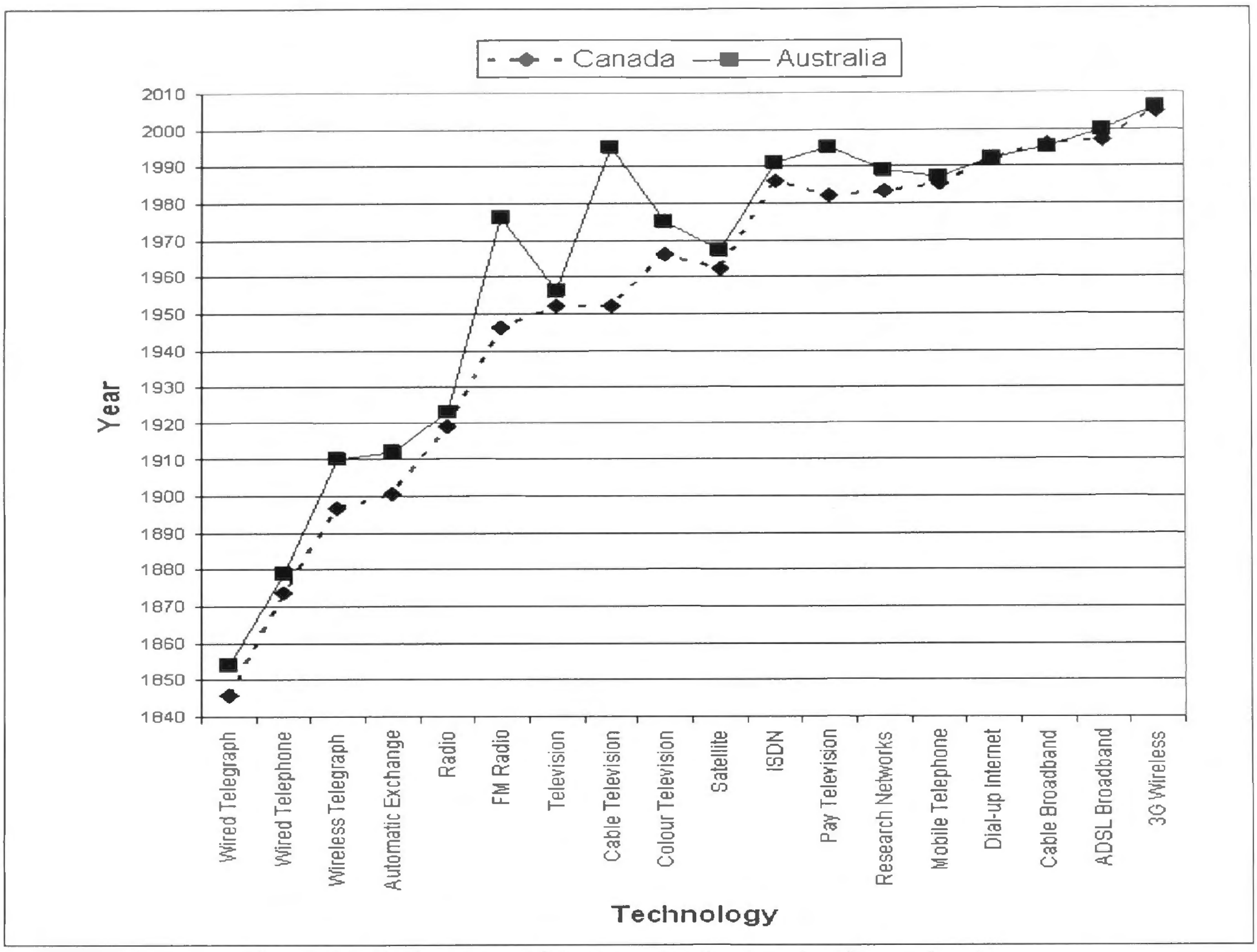

Figure 2.1: Trajectories of Communications Technology Adoption

Figure 2.2 (below) outlines the differences in years between the adoption of new communications technologies in Canada and Australia. A plausible explanation for Australia's relative slowness in take-up (in comparison to Canada) is the late adoption of communications technologies. However, Australia's speed of adoption since the introduction of the mobile telephone suggests otherwise. Despite convergence in the time to adopt new communications technologies in the last two decades, Australia's take-up of the technologies (discussed in the following section) continues to lag behind Canada's. As mentioned above, HFC cable broadband was the only technology which Australia adopted before Canada. However, this must be put into perspective. Canada's lag in adopting cable broadband was the result of debates over the structure of traditional industries which prevented cable television companies from competing in the telecommunications industry. Once this barrier to entry was overturned by the Canadian Radio-television and Telecommunications Commission (CRTC), Canadians were quick to take-up cable broadband, which remains the major broadband technology accessed by Canadians today. Australia only adopted cable broadband earlier than Canada as a result of a government decision to allow Telstra to deploy cable television infrastructure. While Australia adopted cable broadband before Canada, the deployment ended once Telstra had met the demand for metropolitan pay-TV (Telstra 1996) and cable broadband in Australia still lags behind DSL services in terms of consumer take-up of the technology (refer to Figure 2.12 in the next section).

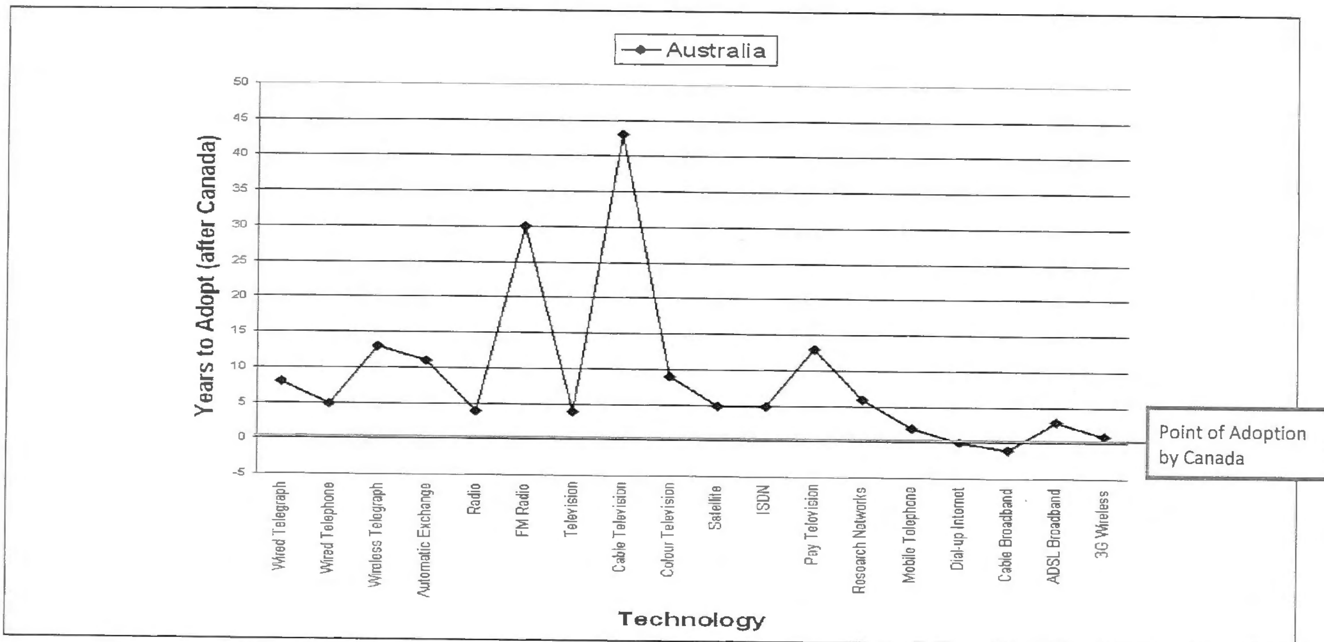

Figure 2.2: Years for Australia to Adopt Technologies (after Canada)

Finally, communications technologies can co-exist; there is no logical conclusion to their evolutionary development, and in some circumstances the feelings of nostalgia older technologies can still inspire readoption.[36] Box 2.1 (below) discusses how the characteristics of communications technologies may follow an evolutionary path of adoption, complementation, supplementation, and later reintroduction.

2.2.2 Take-up of the Telegraph

The characteristics of the telegraph make it difficult to assess the 'take-up' of a service which relied heavily on consumer access to a telegraph office. Households were unable to 'take-up' the telegraph as a stand-alone device like the telephone, largely due to the limitations of the infrastructure and the specialised skills needed to transmit and

[36] A simple example is the 'record player'. For many years, compact disks had rendered vinyl records obsolete. Soon after, devices to play records ceased to exist, only to return (particularly with the development of USB ports and connectors) as an advanced device to enable sounds recorded on vinyl to be converted to digital formats. Further, the nostalgia associated with older technologies (encapsulated in popular movie culture such as 8-track cassettes in *Armageddon* or the ham radio in *Frequency*) indicates how such technologies can still be persuasive despite their obvious obsolescence.

decode messages in Morse code. Initially, the statistical agencies of Canada and Australia[37] focused on the length of telegraph wire and the length of telegraph pole routes as indicators of telegraph penetration. In the latter part of the 19th century, the statistical agencies reported on the number of messages sent per capita, and later still the number of telegraph offices per capita. While the length of telegraph wires or pole routes offer an indicator of the extent of deployment, these figures do little to indicate consumer access to telegraph services.

One of the major problems with comparing the early statistics is the lack of information for an adequate comparison. For example, it appears from an analysis of the available statistics that Australians sent almost twice the number of telegrams than Canadians in 1884. However, the Canadian statistics did not include news and weather reports, whereas the Australian statistics do not distinguish between the types of messages. Further, Canadian statisticians suggested that some Colonial Australian statistics were not necessarily reliable (or at least comparable). For example, Australia far surpassed Canada for the number of postal items sent and received for many years. The Canadian *Year Book* (Statistics Canada 1890) noted that Australasia's high postal trade figures 'are probably caused by some defect in their system of enumeration, by which duplication occurs, or it may be by a more perfect system than is in use elsewhere... [nonetheless, the] system in Canada does not do justice to the correspondence of the country, as no notice whatever is taken of the large number of letters which come from foreign countries' (Statistics Canada 1891: 268).

The problem for the first part of the puzzle is how to measure the take-up of telegraph services. Figure 2.3 (below) adopts the number of telegraph offices per 100,000 people as the most reliable comparative measure, as the major limitation of the technology required consumers to access a telegraph office to send a message. As the graph indicates, Australians had less access to telegraph offices than Canadians until about 1890. However, the problem with this measure may be because other technologies, particularly the telephone, were not available. Further, as telegraph offices were predominantly collocated with post offices in Australia, the measure may indicate

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[37] Note that before 1901, each of the Australian Colonies managed their own telegraph offices and the statistics.

either an over-supply of telegraph services, or a standard service provided by post offices which were required to deal with Colonial Australia's high volume of mail. By about 1930, Australia's telegraph offices per capita peaked and remained very high until after the 1950s, whereas Canada's telegraph office per capita remained relatively stable, indicating that demand had been met since the peak of the 1890s.

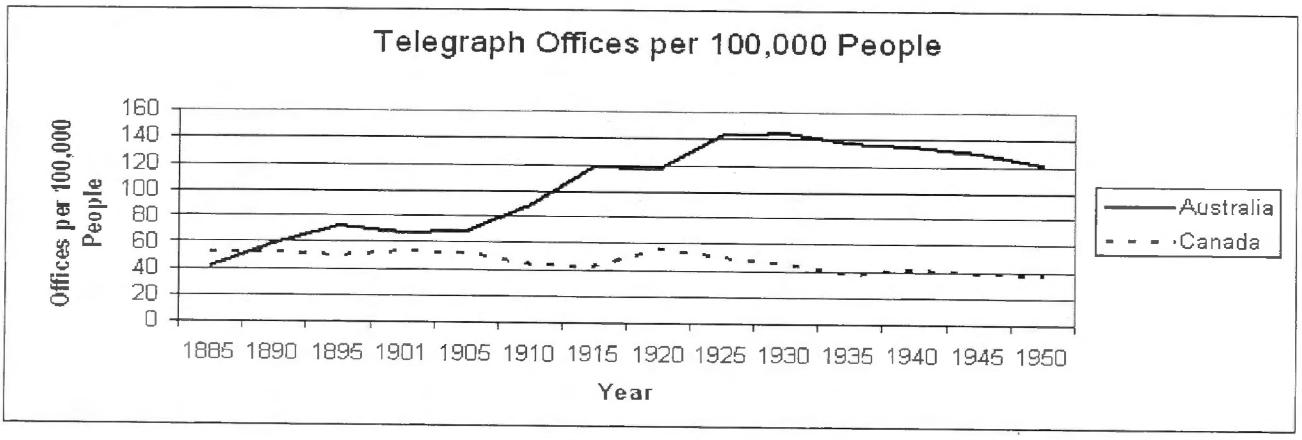

Figure 2.3: Telegraph Offices per 100,000 People: 1885-1950

The likelihood of oversupply of telegraph offices in Australia for a long period of time is exacerbated by the fact that telegrams could be ordered by telephone for much of the peak period. While the relevant importance of the telegraph remained in both countries due to the limitations of emerging telephone technologies (which were restricted to use over short distances in the early stages and the difficulties presented by submarine telephone cables in international communications for many years), Australia's reliance on the telegraph and the extent of the services indicates an element of path dependence, or technological 'lock-in'. Once the investment in the telegraph network had been made, there may well have been less incentive to deploy telephone services.

Box 2.1: Technological Characteristics of the Telegraph

The telegraph represents the first large-scale technological innovation which enabled the mass deployment of electronic communications devices. Provided a device could connect to a telegraph wire network, messages could be sent to other devices on the network. If networks interlocked, messages could be transmitted further and faster than any previous device. Because of numerous issues which limited the carriage of electronic impulses over metal wires, telegraph relay stations would often need to receive and then resend a message. In many ways, early telegraph technologies simulated the semaphore in that messages needed to be passed from one station to the next.

However, the distance an electronic message could be transmitted was well beyond the line of sight required for semaphore messages, which obviously faced additional problems at night time. As telegraph technologies improved and overcame the problem of distance (and later could operate in wireless and submarine environments), the telegraph soon replaced the semaphore and other traditional communications means. Nonetheless, there was some resistance to the new technology, particularly in its ability to displace workers and to make redundant traditional semaphore operators (especially in the Navy).

Telegraph messages were really only one-way (a reply constituting a separate message), and messages could only be sent from one device to another (requiring both the originator and the recipient of a message to either attend the telegram office in person or through some other intermediary means), and required skilled people to operate (and code and decode messages at each end of the transmission). In effect, the telegraph was only capable of one-to-one communication (or at best, one-to-'anyone else on the same wire' between the sender and the final receiver), requiring additional transmissions or other means of communication to convey a message beyond the original sender and intended receiver of the message.

2.2.3 Take-up of the Telephone

Measuring the take-up of the telephone presents less of a problem for comparison as by this time similar methods for presenting statistics were adopted throughout most of the developed world. Figure 2.4 (below) shows the different take-up rates by the number of telephones per 100 people. Apart from a dip following the impact of the Great Depression, Canada has led Australia in terms of take-up per capita since the early beginnings of the telephone. Nevertheless, the differences in take-up of the telephone do not demonstrate such penetration in Canada to indicate that the telephone was adopted as a substitute for the telegraph (to account for the significant difference that occurs after 1905 in Figure 2.3). However, given that Canadian telegraph offices were not necessarily co-located with post offices, there may be other factors involved. Indeed, the use of wireless telegraphy in Canada commenced much earlier than in Australia (see Figure 2.1) but there were no available measures which enabled a reliable comparison. Further, as long distance telephone and automated switching improved, Australia's increasing penetration of the telegraph into the 1930s indicates continued investment into a technology that was in decline.

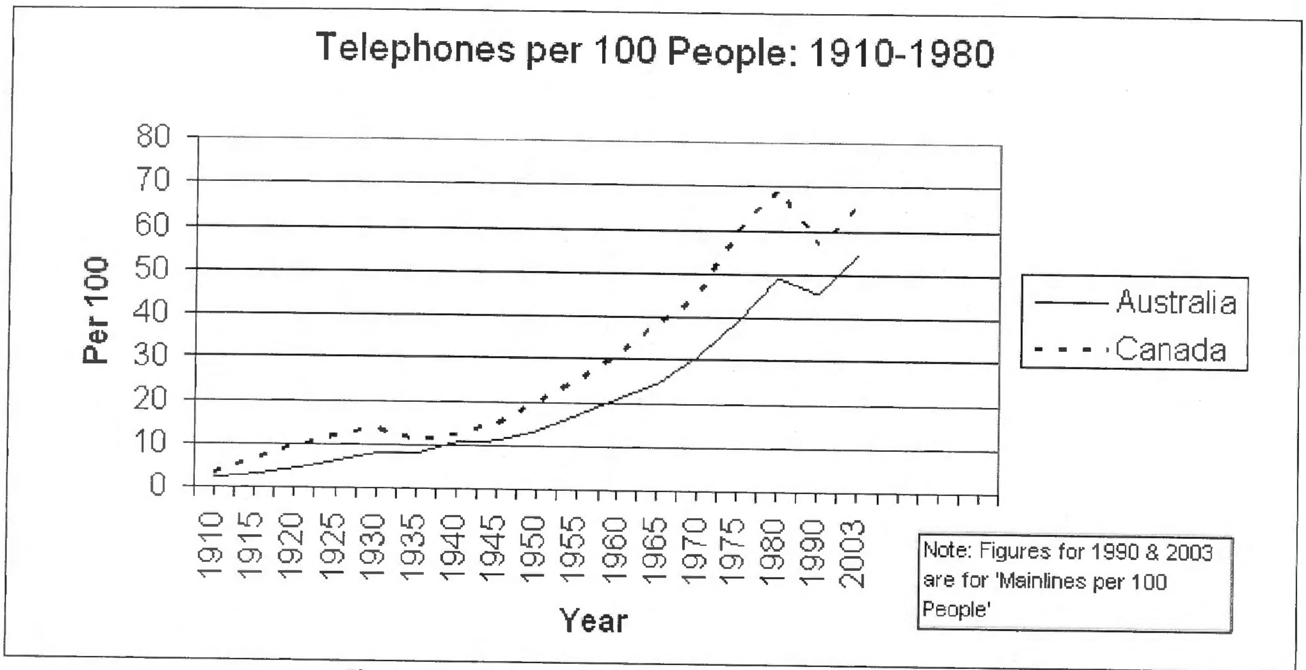

Figure 2.4: Telephones per 100 People: 1910-2003

However, it is worth noting that while Australia officially adopted wireless telegraphy in 1905, the Australian *Year Book* series from 1910 to 1919 (ABS 1911, 1914, 1915, 1917, 1919) reported: 'Up to the present no further concerted effort has taken place' (ABS 1919: 745) in deploying domestic wireless telegraphy stations from the limited number established in 1910. By 1920, Canada had numerous wireless telegraphy stations (excluding coastal wireless stations for shore to ship communications) which established communication between 'many stations throughout the country and with the outside world' (Statistics Canada 1921: 582). These wireless stations do not appear to be taken into account in Canada's measure of telegraph offices per capita, nor do the offices for Canadian-US telegraph companies. Further, Canada adopted radio-telephone services early on with the establishment of the Marconi Wireless Company in 1903, making the statistics more difficult to compare directly with Australia.

Box 2.2: Technological Characteristics of the Telephone

Initially, telephones were installed along telegraph wires and displayed the same characteristics of one-to-one and one-to-'anyone else on the same wire' as the telegraph. Before wiring technologies enabled many one-to-one conversations to occur on the same wire, many telephone services were 'party lines', where anyone on a given telephone wire could listen in to a conversation between others on the same line. Some form of control over the actual sender and receiver of telegraph messages (that is, the people who actually sent and received messages in Morse code) by the service provider prevented the unintentional interception of telegrams.

However, with early telephones and party lines, there was no intermediary and the only notable skills needed by operator and receiver were the abilities to hear, speak, and operate the equipment (a much less arduous task then encoding, sending and decoding messages in Morse code.

However, the distance an electronic message could be transmitted via a telephone wire was substantially less than a telegraph transmission. Indeed, the requirement for long distance communications and later communication across vast distances via submarine wires, the technology simply did not exist. As telegraph technologies improved and overcame the problem of distance (and later could operate in wireless and submarine environments), the telegraph soon replaced the semaphore and other traditional communications means. Nonetheless, there was some resistance to the technology, particularly in its ability to displace workers and to make redundant semaphore operators (particularly in the Navy).

Telegraph messages were only one-way (a reply constituting a different message), and messages could only be sent from one device to another (requiring both the originator and the recipient of a message to either attend the telegram office in person or through some other intermediary means), and required skilled people to operate (and code and decode messages at each end of the transmission). In effect, the telegraph was only capable of one-to-one communication, requiring additional transmissions or other means of communication to convey a message beyond the sender and the receiver of the message.

2.2.4 Take-up of Radio

The per capita measure used to compare telephone penetration was also adopted for other communications technologies. Australia adopted radio broadcasting technologies only a few years after Canada and the most reliable statistics are provided by the issuing of radio receiver or 'listeners licences' in both countries. Figure 2.5 (below) shows the comparative take-up of radios, with Canada leading Australia from about 1945 until 1970 in terms of radio take-up. One of the major difficulties in comparing the take-up of radio devices is the licences themselves: many people in both Canada and Australia refused to pay for the licences, although Australia appears to have had much harsher penalties and a more rigorous investigation system to penalise those who used unlicensed radio devices. Indeed, the issue of listening licences, and later television receiving licences, was a major concern for Canadian politicians, leading to the requirement for all broadcast-receiving licences to be removed in 1953. Australia, on the other hand, continued to require broadcast-receiving (that is, radio and television) licences until the 1970s. Further, the statistics for radio devices are unlikely to be reliable or comparable after the 1970s due to the proliferation of portable transistor radios during the 1970s. Up until this point, however, Canada was clearly in the lead.

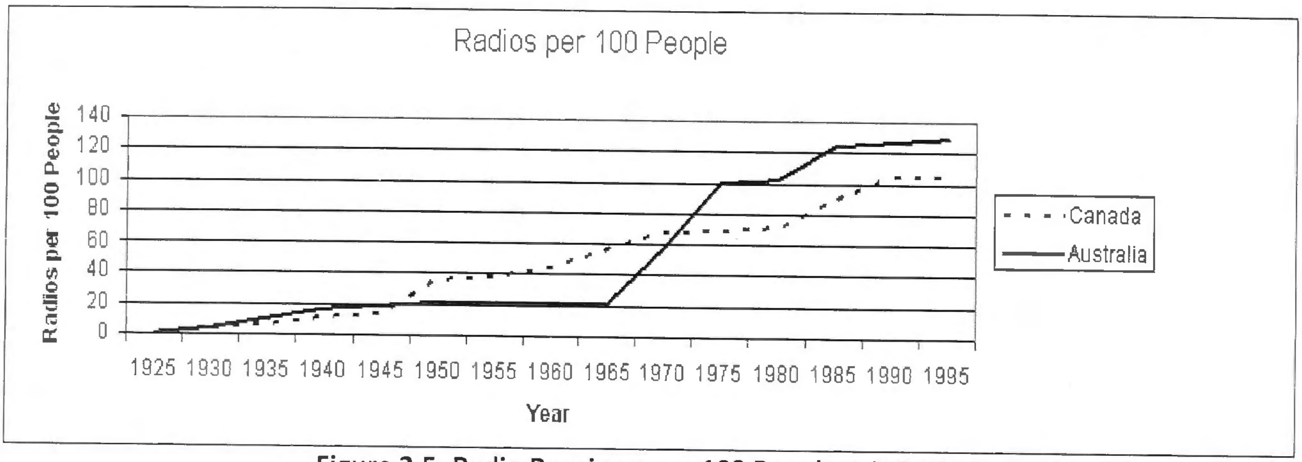

Figure 2.5: Radio Receivers per 100 People: 1925-1995

2.2.5 Take-up of Television

Canada adopted the television earlier than Australia, and the requirement for broadcast-receiving licences in Canada was removed. Figure 2.6 (below) indicates that Canadians have continued to surpass Australians in the take-up of televisions since the adoption of the technology. What the table does not indicate, however, is the number of channels available to Canadians. Given that much of Canada's take-up of television devices accessed programs using CATV, Canadians were able to access a greater range of television channels, particularly those broadcast from the US. Indeed, one industry expert stated that the US channels encouraged illegal viewing by Canadians close to the border to boost viewer-numbers for advertising purposes. The large cable networks established to distribute television broadcasts would later enable the cable television providers to offer specialist or pay television (pay-TV) services some 13 years before Australian audiences could access the service. Despite both Canadian and Australian governments resisting the introduction of pay television services due to a perceived lack of a potential market for the services, Australian governments continued to delay pay-TV for much longer. While Australians can now access pay-TV services, there remains a significant difference in the number of available channels for Australian audiences (approximately 100 in Australia compared to approximately 500 in Canada), with most Australians accessing pay-TV services via satellite dishes.

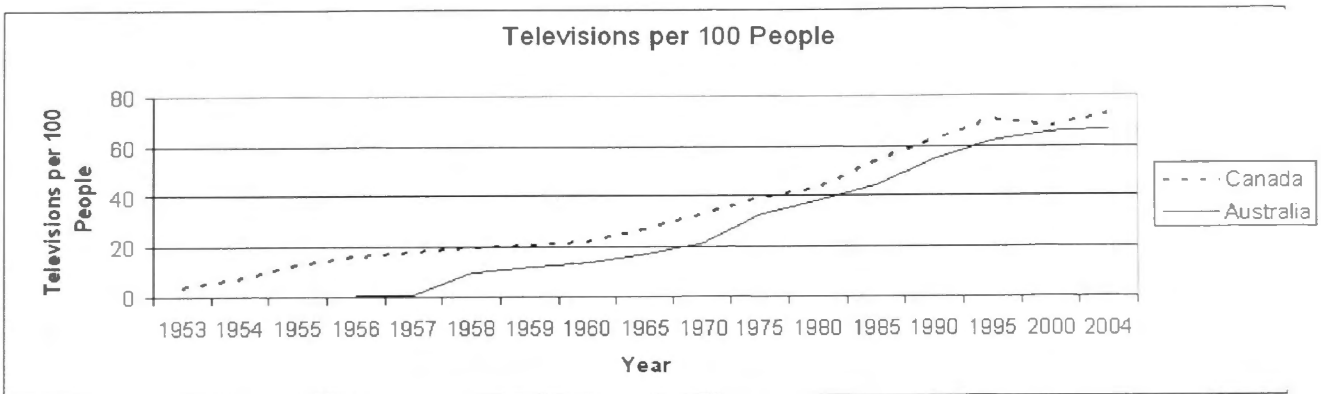

Figure 2.6: Televisions per 100 People: 1953-2004

2.2.6 Take-up of Broadband

Measuring the take-up of broadband services is much more problematic than its technological predecessors. Broadband access requires much more than a simple device (such as a telephone) to be connected to a communications network. For a typical household user, broadband access requires a personal computer with an appropriate modem, connected to an advanced communications network (which enables data transmission), and the services of an ISP to access the World Wide Web (WWW). Without an ISP, a user can be connected to the WWW, but this requires a server which is permanently connected to the WWW – a solution which is beyond the budget of the typical household. Access to broadband services, then, requires access to a range of devices and networks, in addition to the skills which a user requires to use the services meaningfully. Recently, the distinction between users who have and do not have access to broadband services has been termed the 'digital divide' (Compaine 2001: xi). Nonetheless, given the comparable education-levels of Australians and Canadians, the socio-economic aspects of individual users may be safely ignored in this study. This section focuses on take-up of relevant devices and networks required to access broadband services.

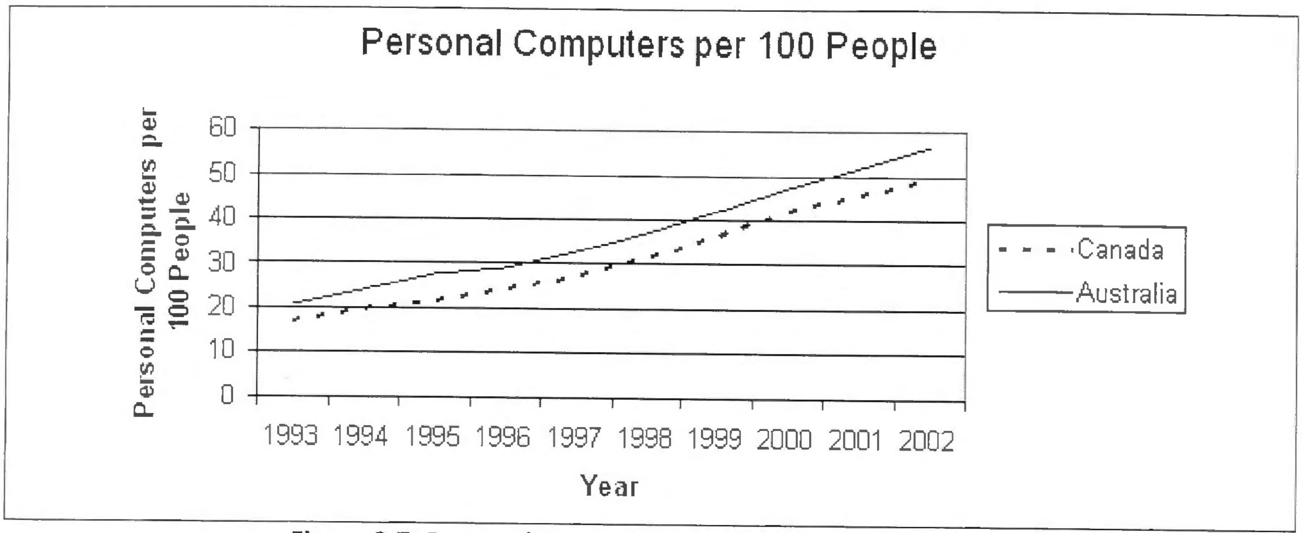

Figure 2.7: Personal Computers per 100 People: 1993-2002

As a starting point, the major device needed to access broadband services is a personal computer. Figure 2.7 (above) indicates that, since the introduction of the WWW, Australians have continued to surpass Canadians in the take-up of personal computers. Curiously, Australians have not followed this trend with the take-up of Internet services (Figure 2.8 below), which includes dial-up access to the Internet. What makes this difference more surprising is that both Canada and Australia adopted dial-up Internet technologies in the same year (see Figure 2.1).

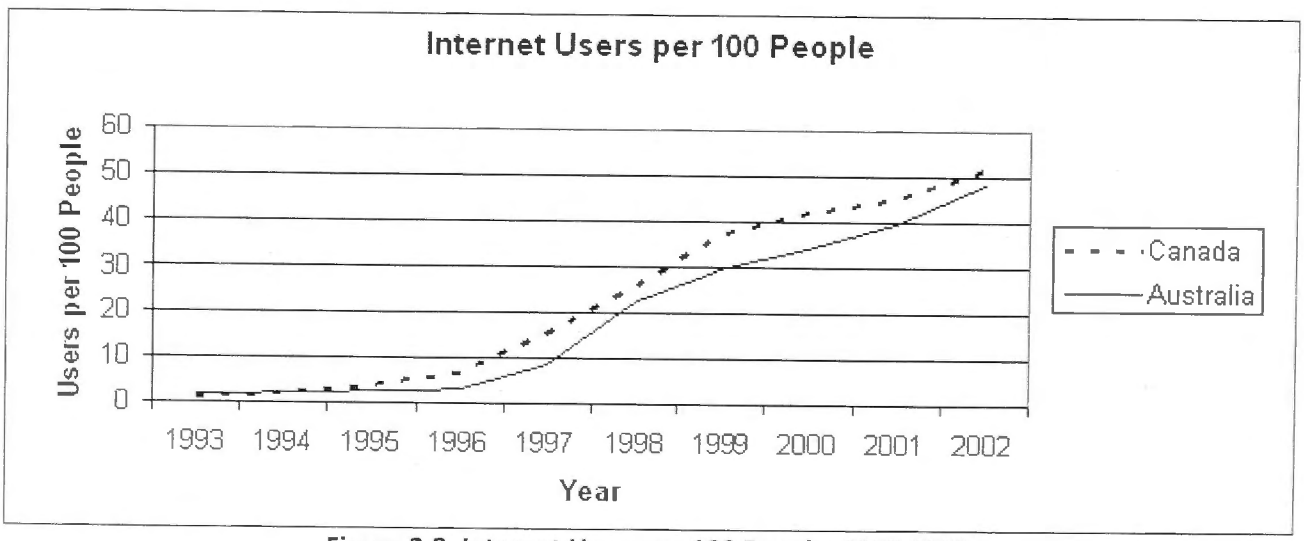

Figure 2.8: Internet Users per 100 People: 1993-2002

Broadband connections to the Internet indicate that Australia continues to remain behind Canada in the take-up on a per capita basis. Figure 2.9 (below) indicates the extent of the gap between the two countries which continues to the present day. Note that the initial per capita measure used to indicate communications technology penetration continued until 2004 when the OECD started to focus on household access, a much more reliable indicator of penetration than the earlier approach.

Interestingly, the announcement of the NBN appears to have reduced the number of subscribers in Australia, possibly as many consumers were reluctant to subscribe or to renew broadband contracts until the NBN became available.

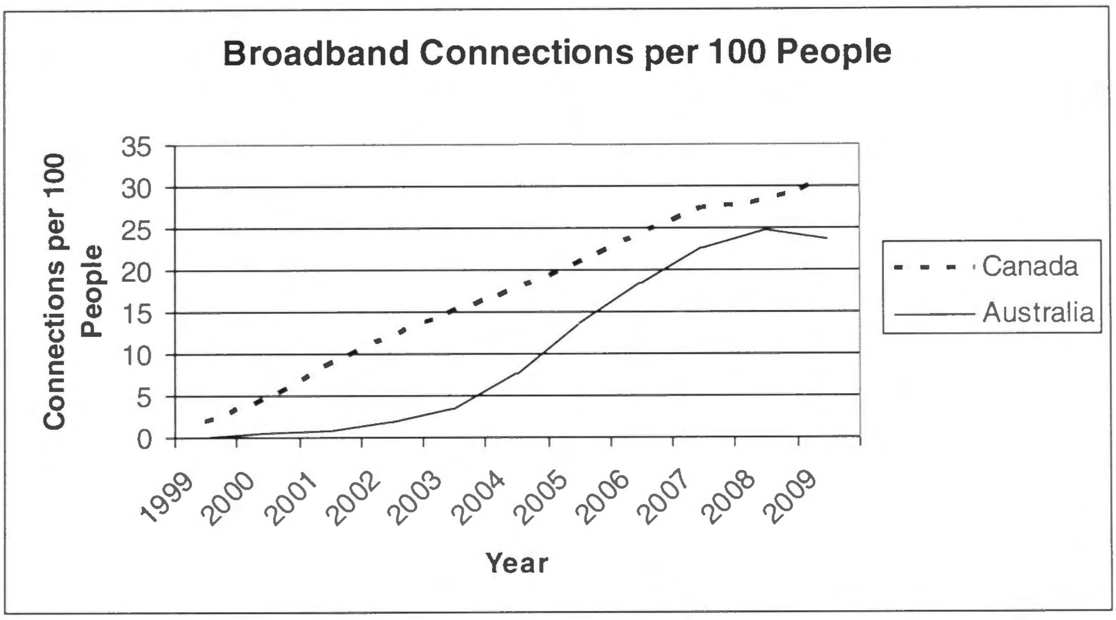

Figure 2.9: Broadband Connections per 100 People: 1999-2009

Nonetheless, the changed measures indicate that Australians cannot match the Canadians in the take-up of broadband services by household (Figure 2.10 below).

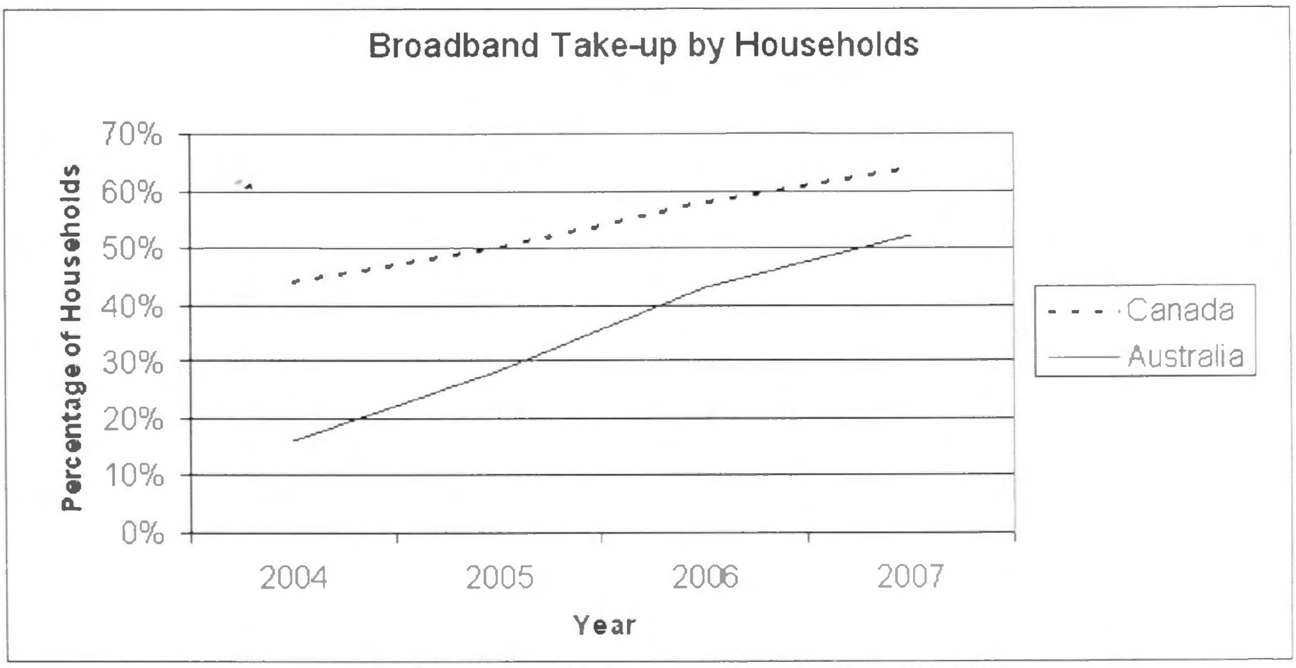

Figure 2.10: Broadband Take-up by Households: 2004-2007

One of the major problems with the OECD statistics for broadband services is the definition of 'broadband'. A recent measure of 'broadband' was an 'always on' Internet connection with a download speed of 256Kbps or more. As the OECD relies on national statistical agencies for the source data of most of its comparative statistics, the different measures used by different countries tend to distort the levels of penetration (Coonan 2007). Nonetheless, recent innovations in collecting information on broadband connection speeds, such as Akamai's *State of the Internet* report series enable more accurate data on comparative broadband speeds, using speeds recorded via Akamai's extensive server network established within most developed nations (Akamai 2009). The comparison of speeds recorded in Australia and Canada by Akamai in 2008 indicates that, of those households with broadband access in Canada and Australia, the majority of Australian users experienced lower connection speeds than their Canadian counterpoints (see Figure 2.11 below).

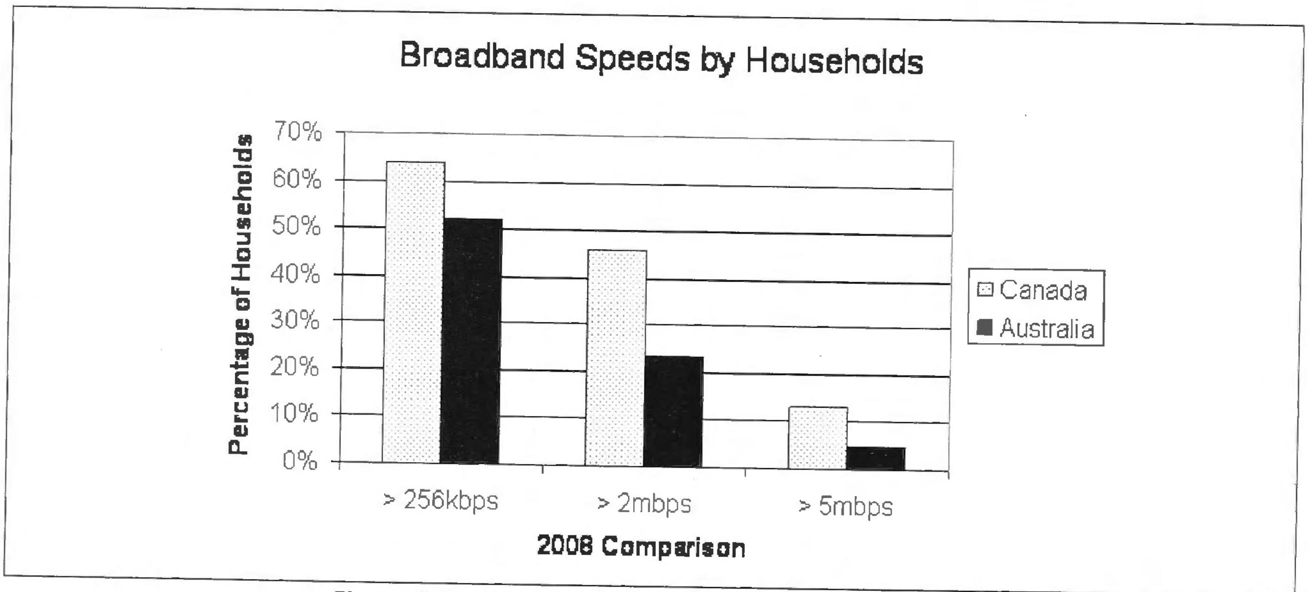

Figure 2.11: Broadband Speeds by Households 2008

The speed of a broadband connection (both upload and download) is important because faster speeds enable access to a greater range of services. For example, a typical ADSL service with a download speed of 256Kbps and an upload speed of 64Kbps (an entry-level broadband plan) is insufficient for effective two-way video conferencing. Indeed, Industry Canada's National Broadband Taskforce (Industry Canada 2001: 2) identified a symmetrical (two-way) transmission speed of 1.5Mbps per individual user as the standard required for 'full motion, interactive video applications' over the Internet. Although Canada continues to report to the OECD using the 256Kbps standard, the extent of broadband penetration in Canada is markedly better than Australia when the faster speeds are taken into account. Moreover, recent ACCC reports (2003, 2004, and 2005) regarded broadband services as those equal to or exceeding 200Kbps. Indeed, broadband speeds in Australia were labelled 'fraudband' by Fairfax Media Chief Executive David Kirk (*Sydney Morning Herald* 2007).

A major difference between broadband take-up in Canada and Australia is the different technologies used to access broadband services. Figure 2.12 (below) indicates that more Canadians access broadband services via cable, rather than ADSL which is the dominant technology in Australia. In many cases, cable access enables symmetrical connectivity, a requirement for interactive use of Internet video technologies which are important for e-health and e-education applications. In many ways, Australia's earlier decision to stall the adoption of cable television services encouraged the deployment of ADSL (asymmetrical) broadband services which often do not provide an adequate upload speed for full-motion video interactivity. This is a major shortcoming in the existing Australian infrastructure.

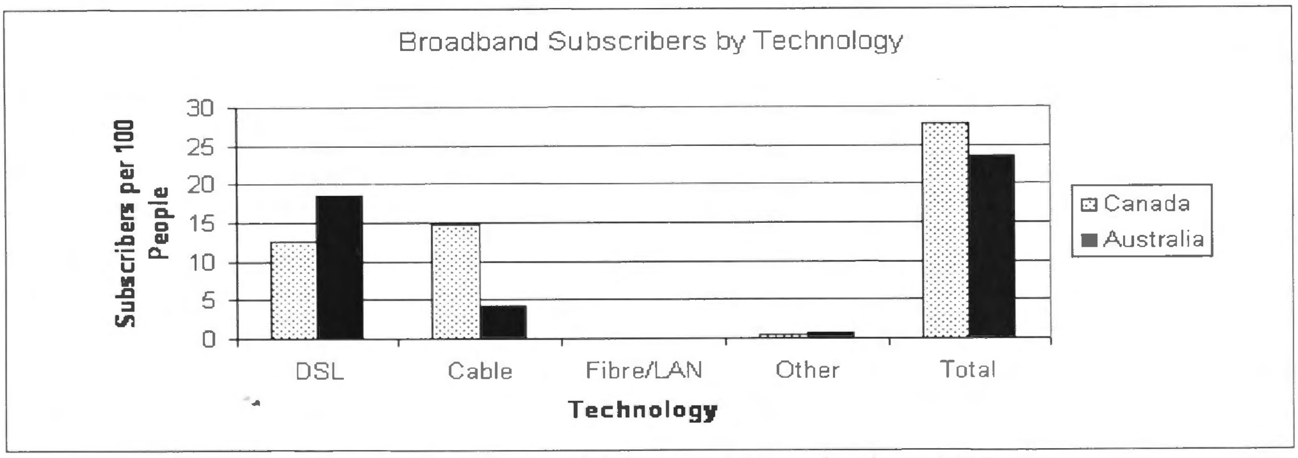

Figure 2.12: Broadband Subscribers by Technology: 2008

Put simply, the collection of statistics for broadband speeds by household is a new undertaking by governments and reporting and research organisations. For this reason, it is difficult to make a comparison of broadband take-up by households where broadband is regarded as a connection in excess of 256Mbps. Nonetheless (based on figures in the Akamai *State of the Internet Report* for Quarter 3, 2008), Australia lags considerably behind Canada in the take-up of high-speed broadband services when transmission speed is taken into account, and if the definition of broadband is limited to connections equal to or above 1.5Mbps, Australia is much further behind Canada in the take-up of high speed broadband than the existing OECD statistics suggest.

2.2.7 Take-up of Mobile Telephones

Mobile telephones are the only significant communications technology which Australians have taken-up faster than Canadians. Mobile telephony is increasingly an area of concern for Canadian governments (*The Economist* 2011), while the rapid take-up of the technology in Australia is certainly an outlier in terms of historical take-up rates.

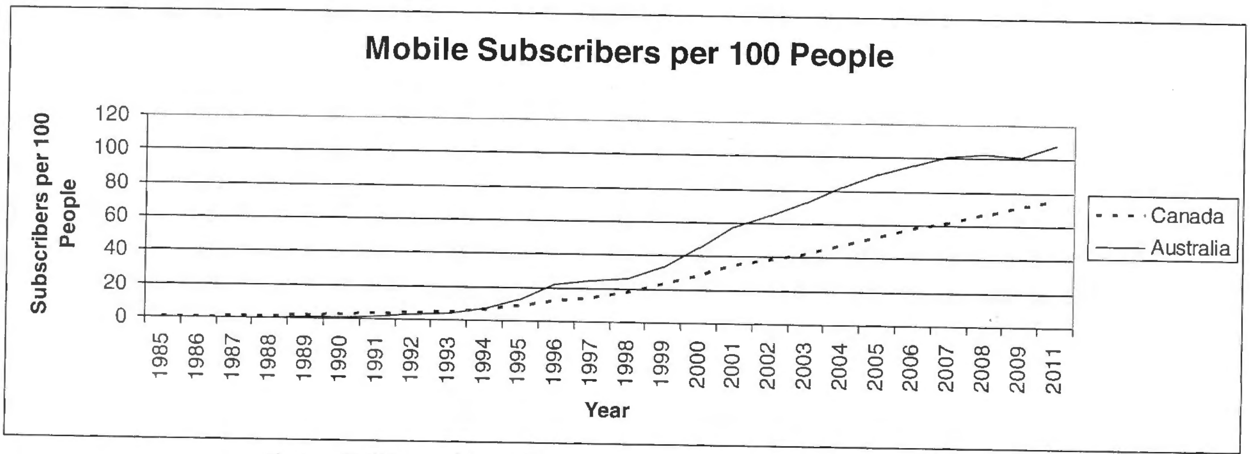

Figure 2.13: Mobile Subscribers per 100 People: 1985-2011

Figure 2.13 (above) shows that the penetration of mobile telephony is the only communications technology in which Australia is a clear leader, especially in the last two decades. By 2007, Australia's mobile telephone take-up had exceeded more than one mobile telephone subscription per person, and Telstra's NextG network enabled some of the fastest mobile broadband transmission speeds in the world (see Box 2.3). Mobile telephony is increasingly used for access to broadband services in Australia, and Telstra's 4G network (which leads Optus' and Virgin Mobile's 4G networks) dominates a sector which has been left largely untouched by government policies designed to achieve social outcomes such as the Universal Service Obligation (Bingemann 2012). In historical context, Australia's lead in mobile telephony as an outlier is discussed in detail in Chapter 7.

Box 2.3: The Relationship Between Mobile Telephony and Mobile Broadband

Mobile telephony was introduced before the development of broadband technologies and therefore an historical legacy makes it difficult to discern the differences between cross-national reports for fixed-line broadband and mobile broadband. This issue is complicated by the different standards for smartphones and tablets which have only recently been reported by organisations such as the OECD and the Akamai *State of the Internet* series of reports. As with the definitions of the term 'broadband' outlined in the introduction to chapter 6, 'mobile broadband' may refer to various definitions and can often overlap with 'wireless broadband' due to the use of various technologies including Wi-Fi and other technological standards for cellular technologies. While this is an important and emerging issue in Canada and Australia, particularly as the use of tablets and smartphones in e-commerce, banking, education, and so on increases, it is difficult to assess the impact of mobile broadband in the historical institutionalist context adopted in this thesis. In addition, technological convergence (see Box 1.1) makes the distinction obsolete in many ways, while also making the measurement of mobile broadband use via smartphones or tablets difficult to capture. It is therefore necessary to defer the impact of emerging mobile broadband technologies to future research.

2.2.8 Summary of the Relative Adoption of Technologies

What emerges from the analysis of the statistics above is that Australia has always lagged Canada in the adoption and take-up of new telecommunications technologies. Even as the time to adopt new technologies has converged, Australia continues to lag in the take-up of communications technologies with one exception: mobile telephony. An interesting observation at this point is that, regardless of government or market provision of communications services, the result remains the same: Canada leads Australia in the penetration of new technologies. Mobile telephony represents an 'outlier' that will be explored in more detail in Chapter 7. In the meantime, it appears that Australia's current broadband crisis is not extraordinary in historical perspective.

Nevertheless, comparison of the statistics for adoption and take-up over time presents only part of the puzzle. Given that broadband technologies facilitate the convergence of formerly diverged industries, there is an important role for the state to play in addressing the policy issues created by the (re)convergence of technologies, industries and institutions which is occurring at the present time. The next section examines the role of the state in addressing the issues stemming from technological convergence and also examines the major theoretical frameworks for understanding the influence of technology on society and vice versa.

2.3 Technological Convergence and the State

Rapid technological convergence is creating a dilemma both for coordinating the deployment of new communications networks and regulating existing communications networks. The dilemma stems from the legacies of traditional institutions of the state which created 'distinct regulatory structures for telephony, broadcasting, cable television, and satellites' (Weinberg cited in Gillett & Vogelsang 1999: 297) at each stage of technological adoption. In the broadband era, these distinctions, made on the basis of the particular devices used to communicate, rather than communication per se (or the function performed by the different devices) are increasingly irrelevant. Broadband is a major enabler of cross-platform communication and its rapid deployment is creating 'massive upheavals that challenge established institutional and industrial structures' (Jussawalla 1993: 1). Nonetheless, the legacies of device-based industry structures persist in that government interventions targeting devices are pervasive in communications markets (OECD 2008: 12). Despite the dilemma for contemporary industry structures created by technological convergence, the social and economic impacts of the diffusion and application of broadband in particular mean that communications networks are a major concern for governments worldwide (OECD 2008: 7) and state intervention is inevitable in the foreseeable future.

State intervention in the deployment and use of communications technologies operates in three main ways. First, the state enables the deployment of communications technologies by effectively giving permission or providing resources for communications networks to be established. Second, the state coordinates the deployment and use of communications networks by establishing institutions which attempt to bring order to the deployment of the physical infrastructure and to determine who can access the infrastructure and associated services. Third, the state regulates communications networks to ensure that the behaviour of network actors and users conforms to laws or principles designed to operate in the public interest. The ways in which the state enables, coordinates and regulates communications networks may be referred to as the state's communications policy.

For most liberal democracies, the 'key goal of communications policy is to promote the welfare of... citizens, primarily through productivity gains' and economic growth (Hundt & Rosston 2006). In Canada and Australia, nation-building in the telegraph and telephone eras preceded the focus on the welfare of citizens: the dominions required infrastructure to facilitate national defence, national markets, and a united polity. In the early part of the twentieth century this had largely been achieved in both countries and communications technologies became public utilities, or essential public services. The deployment of widespread basic telephone services, commonly couched in terms of a universal service obligation (USO), became for the most part ubiquitous by the 1980s. With each type of communications technology, the communications policy goals followed a particular path: from nation-building, in meeting the needs of the state; becoming public utilities, in meeting the essential service needs of citizens; to promoting competition, in the latter part of the twentieth century, in an effort to increase productivity and economic growth by providing more choices and lowering prices for businesses and consumers.

Competition policy in communications industries is a relatively recent development. Following the advent of the telegraph, communications technologies were, for the most part, believed to operate best as natural monopolies, in that the industry could only operate efficiently with one, heavily-regulated provider of the conduit used to communicate (Grossman & Cole 2003: 1). Natural monopolies reduced the duplication of telegraph and telephone lines, achieved economies of scale over a specified geographical area, and, in the case of regulated monopolies, guaranteed a rate of return on the provider's investment. Since the telegraph, governments have tended to intervene in communications industries using a mix of two approaches: ex-ante and ex-post. The ex-ante approach is anticipatory intervention which 'is mainly concerned with market structure, that is the number of firms and level of market concentration, entry conditions, and the degree of product differentiation', whereas the ex-post approach is passive intervention which 'is mainly concerned with market conduct — the behaviour of a firm with respect to both its competitors and its customers' (ITU 2009).

Globally, the evolution of the respective communications industries has occurred through periods of punctuated stability. As new technologies have evolved, market structures have changed, and a degree of stability in communications industries has occurred when technology, market structure, and public policy are synchronised (Bolt *et al.* 1990: 3). The dominance of Western Union in the North American telegraph industry, the Bell System in the telephone industry and Marconi in wireless communication demonstrate how 'market power has accrued to the technology innovator' (Bolt *et al.* 1990: 1) which led to periods of stability until a new technology impacted upon the market structure. General periods characterised by multiple vendors or natural monopolies appear, at face value, to present a sufficient understanding of how the communications industries have changed over time. However, this view of the trajectory of communications technologies is only useful when examining a particular device-based industry.

The dilemma created by device-based industry structures tends to inform how policy-makers understand broadband in an era of convergence. This is in no small part a reaction to the market power of the dominant providers of communications services, many of which established their position in the respective industries in the early days of the telegraph and the telephone. Indeed, Wilson (2000: 7) argues that 'the early history of the telegraph and telephone industries is extremely relevant to an understanding of contemporary telecommunications' and to understanding the industry structure, given that 'many of the firms established themselves during this period and continue to be the dominant players in the industry today'. However, limiting this exploration to the telegraph and telephone industries is insufficient if we are to understand the larger effects of convergence in the broadband era. Further, governments successfully regulated broadcast content, but it is much harder to do so with broadband-facilitated Internet content.

Technological convergence is leading to convergence in other areas of the communications industries, 'blurring the boundaries between media, information technology and telecommunications' (Cunningham & Turner 2002: 117). Not only the distinctions between industries, but the 'distinctions that had once linked systems of delivery to their characteristic content' are increasingly meaningless (Cunningham & Turner 2002: 4). Traditionally, a distinction was made between the functions of industries, particularly *process* (information technology), *content* (media) and *carriage* (telecommunications); leading to what is referred to as *functional convergence* (Barr 2000 cited in Cunningham & Turner 2002: 5). Firms have reacted to technological and functional convergence by forming strategic alliances or undertaking mergers, creating what Barr (2000 cited in Cunningham & Turner 2002: 5) refers to as *institutional convergence*. Clearly, the behaviour of firms in a period of major convergence affects the state's ability to develop policies which enhance productivity *and* protect the public interest.

The focus on competition as the primary driver of productivity and protecting the public interest has led to the development of the principle of *technological neutrality* in communications policy formulation. The principle is an attempt to promote cross-platform competition across the formerly divergent industries. Van der Haar (2007) examined the application of the principle in the European Union's (EU) regulatory framework, where: 'legislation should define the objectives to be achieved, and *should neither impose, nor discriminate in favour of, the use of a particular type of technology* to achieve those objectives' (cited in Van der Haar 2007: 2, emphasis in the original). She identified four rationales for regulating on the basis of technological neutrality:(1) *non-discrimination*, where the state should not discriminate on the basis of technology; (2) *sustainability*, to prevent the regulatory framework from becoming quickly out-dated; (3) *efficiency*, so that regulation can 'evolve with changing market conditions in order to avoid inefficient regulation', and (4) *consumer certainty*, so that consumers receive the benefits of regulation such as protection and *universal service*, irrespective of the particular technology used to access services.

Technological neutrality raises a number of issues which challenge approaches to state intervention in the traditional divergent industries. Technological neutrality is necessarily *ex ante* in establishing the rules of the game, and *ex post* in that it applies 'the same rules across all sectors' (ITU 2009). At face value, it is rational to assume that consumers will be able to choose the platform which best meets their particular communication needs in a technologically neutral environment. This, in turn, should encourage firms to innovate in delivering communications services to meet the particular needs of consumers. In practice, however, the principle of technological neutrality is applied, in varying degrees, using a mix of the four rationales. These different rationales tend to result in different outcomes in the market. Indeed, the OECD (2008: 12) suggests that 'policy makers may need to re-examine whether technological neutrality is still an efficient policy structure', given that technological bias is still evident in regulatory approaches throughout the developed world.

Despite technological, functional and institutional convergence in the communications industries, policies which focus on devices persist. A contemporary example is the adoption of digital television and radio in Australia, where licences have been issued to industry players with a guaranteed period of oligopoly to enable sufficient time for the incumbents to make an adequate return on the cost of upgrading facilities from analogue to digital capability. Digital radio and television services can already be delivered via broadband technologies, yet the distinct industry structures restrict innovation in terms of content delivery, leaving consumers to be passive recipients, rather than active participants, in content development and delivery. The one-to-many communications paradigm of television persists in the institutional structure despite major changes in the technology which enable interactivity. Where user-generated content (UGC) does occur, it tends to be restricted to the area of popular culture or the provision of commercial content to traditional producers for free (Ornebring 2008). Communications policy occurs in the domain of government and dominant businesses, working to exclude (or at least pay 'lip service' to) citizens, interest groups and industry bodies from the policy process (ASTRA 2004).

The persistence of device-based state intervention questions the usefulness of technological neutrality as an organising principle for policy makers. No doubt entrenched interests play a major part in restricting policy options for state intervention (ITU 2004). Indeed, the dominant view that competition can deliver benefits to consumers in all aspects of communications is being challenged by the concept of *high-technology natural monopolies* which may exist at the networks that connect the consumer to the local exchange, known as the *local loop* (Ferguson 2004: 203; Gillett & Vogelsang 1999: 284). The 'local loop is a high-initial cost infrastructure' which relies on physical labour such as 'trench digging, cable laying, delivery and installation of electronic boxes, physical maintenance and so forth' (Ferguson 2004: 203), and necessarily situates the delivery of broadband technologies amid a variety of local conditions. This is true for 'telephony, television, and Internet' services (Gillett & Vogelsang 1999: 284; see also Nakamura 2000); therefore the local element of broadband networks is a policy issue affecting all levels of the state, not just the central administration.

Broadband represents *high technology* in that it is contemporarily the peak of communications technological development. Yet the problems facing policy makers in enabling, coordinating and regulating broadband networks tend to reflect, in principle, the same problems faced by policy makers since the advent of the telegraph. The distinctions between process, content and carriage have been dealt with by states in the past, bringing about the regulatory concept of the *common carrier*, where communications services are available to the general public at non-discriminatory rates and the provider cannot control the content of messages (BCAP 2009). Issues of convergence are not new;[38] rather the concentration and scope of convergence brought about by broadband networks bring the issues into sharp relief (Australian Press Council 2009). What is occurring, however, is a 'collision... of the regulatory paradigms' which have governed the historically distinct communications industries (Hogendorn 2005: 19).

The term *legacy* is often used to refer to previous generations of communications networks and devices, but it can equally be applied to the policy framework in the contemporary era of convergence. Whitt (2004) argues that communications networks have not evolved into the discrete networks which are presupposed by the legal and regulatory legacies of the state. For Whitt (2004), communications networks are horizontally integrated in three layers: the lower layer of the physical infrastructure, the middle layer of enabling technologies such as Internet Protocol (IP), and the upper layers of content and user applications. The legal and regulatory legacies, on the other hand, view communications networks divided by industry labels such as 'wireline telephony service, wireless telephony service, cable television service, broadcast television and radio service, and satellite broadcast service' formed on the basis of the old industry distinctions. These distinctions have the effect of creating 'vertical silos' in communications policy communities that do not match the 'market reality' in which businesses operate.

[38] Indeed, 'convergence' was alleviated by 'divergence'. In Canada, telegraph companies collected news and sold it to newspapers until 1910. Indeed, most 'non-locally-based news correspondents' in Canada *'were* telegraph operators' until the principle of the 'common carrier' segregated content and carriage (Babe 1999: 41).

In addition to the *general legacies* of industry distinctions which exist throughout the developed world, *particular legacies* exist within nation-states which impact upon the way that communications policy addresses the two key goals of increasing productivity and protecting the public interest. Invariably, these particular legacies within nation states, or 'national regulatory traditions and policy styles', continue to exert a determining influence on policy outcomes 'when much conventional wisdom might have expected them to be smoothed over by technological change' (Levy 2001: 19). Historically, communications policy has tended to react to the evolution of communications networks. Noam *et al.* (1994: 17) suggest that network evolution can be identified in distinct stages:

> 1. **The cost-sharing network.** Expansion is based on the logic of spreading fixed costs across many participants, and increasing the value of telephone interconnectivity.
>
> 2. **The redistributory network.** The network grows through politically mandated transfers among users.
>
> 3. **The pluralistic network.** The uniformity of the network breaks apart because the interests of its numerous participants cannot be reconciled, and a federation of subnetworks emerges.
>
> 4. **The global network.** Various domestic subnetworks stratify internationally and form networks that transcend territorial constraints.

Network development, then, tends to be unilinear, in that there are distinct 'stages of a universal sequence' from basic to more advanced (Steward 1955: 14).

They also argue (Noam *et al.* 1994: 17) that most states 'are still engaged in the cost-sharing and redistributory' phases of network evolution. The unilinear concept is useful in that it does not rest on the logic of devices operating on discrete networks. For instance, faith in regulated monopolies to deliver universal service at uniform prices met, for a long time, the policy goals of nation-building and providing public utilities. Promoting competition necessarily stimulates the evolution of a pluralist network, where participants compete for resources and benefits (for example, from regulation) and will attempt to overcome the particular legacies which exist in the market. Technological convergence facilitates the removal of artificial industry barriers and enables global networks to evolve. Indeed, broadband technologies have enabled multiple networks which 'transcend territorial constraints'. Social networking tools such as Facebook and collaborative repositories of knowledge such as Wikipedia are striking examples of the growth of such networks in the upper layers (code and content) of communications networks, but concerns for national security and national culture restrict the growth of private networks in the lower (infrastructure) layer (see Whitt 2004, discussed earlier). Despite the obvious growth in the upper layers of communications networks, it is difficult to prove that the evolution of communications technologies is necessarily inevitable: the role of the state is significant in helping or hindering network evolution (Noam *et al.* 1994: 28).

To understand the state's role in the deployment of communications technologies, it is first necessary to examine briefly some of the theories concerning the interaction of society and technology. Contradicting theories concerning the interaction of society and technology abound (Kraft & Vig 1988: 4) and the major views can be summed up as follows:

Technological determinism: The phenomenon where 'a technical innovation suddenly appears and causes important things to happen' is known as technological determinism. It may be regarded as 'an approach that identifies technology, or technological advances, as the central causal element in processes of social change' (Croteau and Hoynes 2003: 305). Technological determinism can be categorised as 'hard' and 'soft' on the basis of the extent of technology's agency in societal change. Hard determinism refers to the agency imputed to technology, where 'the advance of technology leads to a situation of inescapable necessity'. On the other hand, soft determinism refers to 'the presence of a particular communication technology [which] is an enabling or facilitating factor leading to potential opportunities which may or may not be taken up in particular societies or periods (or that its absence is a constraint)' (Finnegan 1988: 38).

Technological (social) constructivism: Technology does not occur in a social vacuum. Technological constructivism suggests that human action shapes technology, and technology cannot be understood without understanding how that technology is embedded in its social context. 'Social and cultural forces determine technical change': technology does not determine social change (Hughes in Smith & Marx 1994: 102).

Technological momentum: Technological momentum adopts a position which falls between technical determinism and social constructivism and 'infers that social development shapes and is shaped by technology' (Hughes in Smith & Marx 1994: 102). Technological momentum is a 'more complex concept than determinism or social construction' and it is also time dependent (Hughes in Smith & Marx 1994: 102). It can also refer to the 'increase in the rate of: 1) the evolution of technology, 2) its infusion into societal tasks and recreations, 3) society's dependence on technology, and 4) the impact of technology on society' (Dyer 1995: 255). Technological momentum is a useful concept in explaining the evolution of technology in response to societal needs and the infusion of technology into work and leisure activities.

The state, through its coercive powers, has the ability to apply 'accelerators and brakes' (Winston 1998: 15) which help or hinder the deployment of communications networks. Communications policy is formulated to address 'social necessities' or to apply 'constraints' to communications networks (Winston 1998: 15), often framed in terms of economic development or the public interest. However, the intervention of the state cannot determine or construct technological development entirely. Rather, it tends to react to the 'supervening social necessities' which include the 'consequences of other technological innovation', the 'concentration of social forces working directly on the processes of innovation', and the '[s]trictly commercial... needs for new products and other limited marketing considerations' (Winston 1998: 9). The state, then, represents the 'continuation, despite the bombardments of technology, of all the institutions of our culture in forms subject to alteration but not revolutionary change' (Winston 1998: 13). Technological advances may occur rapidly but the deployment and infusion of new technologies tends to be mediated by the institutions of the state.

Nonetheless, states tend to announce communications policies in terms of the unavoidable consequences of technological inevitability. For example, the 1981 Canadian Department of Communications report, *The Information Revolution and Its Implications for Canada*, stated that:

> [L]ike the industrial revolution, the information revolution is unavoidable. Consequently, the objectives of public policy should be not to prevent the revolution from occurring, but rather to turn it to our

advantage' (Serafini and Andrieu, 1981: 13 cited in Brannigan & Goldenberg 1985: 166).

Technological determinism is also used to explain changes in 'the nature and structure of corporations, industry, government industry relations and the values and norms that make up our idea of ourselves and of progress' (Schon 1967: xiii cited in Brannigan & Goldenberg 1985: 170). Neither technological determinism nor social constructivism sufficiently explain the complex interactions which occur in the development of communications policy, or in the structure of markets for communications infrastructure or goods and services which are established or maintained by the institutions of the state. Technological momentum, as a way of conceptualising the interaction of technology and society, accommodates the state's ability to influence outcomes in the communications industries, while allowing for technological advances to influence, and in turn, be shaped by, society. This thesis adopts technological momentum, a form of 'soft' determinism, where there is a need for nation-states to 'catch-up' with technological advances to remain internationally competitive while at the same time acknowledging that institutions can and do make a difference to how, when and, indeed, if communications technologies are adopted. Technology and institutions, then, tend to co-evolve, and the next section considers the co-evolution of communications technologies and institutions in detail.

2.4 Co-evolution of Technology and Institutions

Technological and institutional convergences create a new industry, referred to here as the communications industry, and a new market for communications infrastructure, goods and services, referred to here as the communications market. Broadband presents a problem for policy-makers by bringing together the telecommunications and broadcasting industries. For many years, the rationales for telecommunications and broadcasting policy were markedly different; mainly due to the nature of communication conducted over each medium. Traditionally, two-way messages sent and received through telecommunications services occurred between two or a few parties, whereas broadcast messages were sent one-way from the originator to numerous recipients.[39] Telecommunications and broadcast networks developed separately, using different infrastructure, and often with distinct purposes: telecommunications for individual communication in the private sphere; broadcasting communication in the public sphere. Broadband enables one-to-one, one-to-many and many-to-many communication, both one-way and two-way, over the same network and therefore the distinction between the private and the public spheres is blurred. The problem for policy-makers is reconciling the competing purposes of previously distinct communications networks, and achieving economic growth without infringing upon access to relevant information in the public sphere, and individual liberties in the private sphere. Broadband challenges existing ideas about the public interest: the role of communications policy, then, is inextricably concerned with *problem solving*.

Nevertheless, the ways that the state reconciles the often competing goals of economic growth and protecting the public interest does not occur in a political vacuum, and the impact of historical institutions in framing policy goals and desirable policy outcomes is necessarily the subject of significant influence by businesses operating in the respective markets. Communications scholars such as Babe (1990: 3-4) have adopted Marshall McLuhan's concept of 'pattern recognition', where observable patterns inform the selection of a course of action, as an important tactic in understanding the influence of historical experience in framing communications problem-solving options. Babe (1990: 4), in his study of Canadian telecommunications history, emphasised 'the role of corporate and governmental power in implementing industrial devices [or 'technologies'] and processes and in structuring industries' to determine the policy trajectory which occurred in Canada (Babe 1990: 244). Indeed, the choice of a particular technology is often a political decision which may not be based on the most suitable technology solution for a given problem (Andrew & Petkov 2003: 83). It follows that in comparing communications policy outcomes, it is necessary to understand the broader framework in which policy decisions are made (Firth & Mellor 2005).

[39] That is not to say that broadcasting and telecommunications networks no longer develop separately. However, broadband networks enable both broadcasting and telecommunications via the same medium. Further, businesses such as Telstra, Australia's largest telecommunications carrier, and Rogers Communications, originally a Canadian radio broadcasting firm, are now involved in both the traditional telecommunications *and* broadcasting industries.

Technological change is acknowledged as 'an important contributor to productivity growth' and '[i]nvestment in technological improvement and in the complementary assets and activities needed to support innovation is a positive sum strategy for improving living standards' (Rosenberg *et al.* 1992: 1). Hence, communications policy must be flexible enough to enable innovation and investment in innovation to occur, without adversely affecting the public interest: the institutions of the state play a significant role in establishing the rules. Further, in his Nobel Prize lecture, North (1993) suggested that 'integrating technological and institutional analysis' is an important approach to developing 'our understanding of the complex interplay between institutions, technology, and demography in the overall process of economic change' over time. Therefore, the ways in which technological innovation, its adoption and deployment, and the 'rules of the game' in which institutions and businesses operate (and relate to one another and to society) (March & Olsen 1989: 22) is the result of historical learning processes which 'shape the way institutions evolve' (North 1993).

If we accept that broadband represents a vast improvement in society's ability to communicate, and that 'institutions form the procedures and routines that become part of technology; how they are involved in innovation of new technology; how they adjust mainly through trial and error; how they coevolved with technology; and how this makes for an evolutionary process' (Nelson cited in Hayden 2006: 1992), it follows that an analysis of communications technology adoption and take-up requires an understanding of how institutions have enabled, coordinated and regulated the communications industries over time. Adopting technological momentum as the approach to understanding the interactions of technology and society over time requires an analytical approach which incorporates historical institutionalism, the policy process and the policy problems raised by advances in communications technologies. If new technologies and societal habits change significantly, it follows that *institutional adaptation* must occur if the state is to remain effective in achieving economic growth and protecting the public interest. In adapting to the emerging media communications industry, then, 'institutions and belief systems must change for successful reform since it is the mental models of the actors that will shape choices' (North 1993). If institutions are to facilitate new technologies to enable the creation of economic growth (while protecting the public interest), communications policies and communications technologies must co-evolve.

To understand how *policy choices* are made the focus now turns to the policy process in light of the co-evolution of communications technologies and communications policies. This requires an understanding of the key elements of the policy process from an historical institutional perspective; specifically, the 'interaction of values, interests and resources, [and how this is] guided through institutions and mediated by politics' (Davis *et al.* 1993: 15). Further, policy tends to emerge from 'identifiable patterns of interdependence between key social actors such as parties, corporations, unions, professions, and citizens' (Considine 1994: 1-2). The reciprocal influence of technological momentum on both communications policies and communications technologies adds an additional dimension - technology - to the policy process. This additional dimension exists at the nexus of government, business and communications technologies (see Wilks & Wright 1987: 234) where there is much more independence than technological determinism would suggest (Leiss cited in Brannigan & Goldenberg 1985: 7). Nonetheless, the ways of dealing with policy problems in the communications industries, as observed in this study, are peculiar to the two cases at hand. The next section considers how policy choices about broadband technologies, in particular, are the subject of much political debate and how the technologies themselves create additional problems for policy-makers which extend far beyond simply choosing to adopt a particular technology.

2.5 The Problem with Broadband

One of the major problems with broadband is the different understandings that politicians and political commentators, in particular, have about the capabilities of broadband applications and their potential uses. On one hand, many suggest broadband technologies improve the availability of information, encourage innovation, provide efficiencies for businesses and citizens through better access to information, health and education services and government policy-making processes (see, for example, Hudson 2011; AAP 2011). On the other, some suggest that broadband technologies are predominantly a medium to provide greater access to entertainment services (see, for example, Gittens 2007). During the 2007 Australian election campaign, Labor communication spokesperson Stephen Conroy's press conference on Labor's broadband infrastructure plan at Parliament House was interrupted by Coalition Senator Bill Heffernan over the party's proposal to use money from the Future Fund to invest in fast broadband infrastructure. Heffernan, while attempting to downplay the importance of broadband, admitted that he had 'never sent an email in [his] life', prompting comments which suggested the Coalition was beset by luddism (*Daily Telegraph* 2007). The following day on the ABC's *Insiders* program, Piers Akerman, a conservative critic, referred anecdotally to how the capacity of digital cameras changed on a weekly basis and that broadband infrastructure was no different – spending the Future Fund on an ever-changing technology would therefore represent the irresponsible use of taxpayer's money. With the announcement of the NBN at an estimated cost of $43 billion, the Coalition continued to attack the relevance of the infrastructure to Australia's future. The point is that the many reasons for enabling super-fast broadband connectivity – far from being predetermined - were lost in the politicking of how Australia's lagging broadband infrastructure should be brought up to date.

Luddism and ideological debates about how to fund broadband infrastructure do not, however, diminish the volatility which resides at the nexus of government, business and communications technologies. Each perspective tends to have a large 'blind-spot' and it is worthwhile to attempt to explain the complexity in simple terms here. In doing so, the elements of a modern communications system provided by the ITU (2006) are useful to conceptualise the different policy perspectives. In a policy (rather than a technological) sense, broadband can be referred to as 'the capacity to transmit large quantities of electronic signals (including data, video, text and voice) rapidly'. The ITU refers to the major elements as 'end users (the big box), the regulatory framework (the big brother), and the business model (the big bid)', with technological convergence leading to 'one integrated network (the big pipe)' which will carry all kinds of communication. The impact on, and opportunities for, global society of such a 'big pipe' distributing information are immeasurable if it can be provided at high speeds and at relatively low cost.

As several technologies and media can be used to provide broadband services, three major policy implications persist (ITU 2006). First, distinguishing between the existing entertainment, media, broadcasting, narrowcasting, information technology, telecommunications and even geospatial industries is no longer be relevant. Telstra's former CEO, Sol Trujillo,[40] identified the impact of technological convergence and referred to Telstra as a 'media communications' company, an industry description which adequately encapsulates the converging technologies and industries. Second, competition can occur between networks, such as telephony, cable television and electricity; and media, such as copper, fibre optic, satellite, and terrestrial microwave (or a hybrid of these). Third, competition can occur in the provision of information (or content) which may require regulation for censorship or quality and space for government services and access. From a regulatory perspective, pre-existing institutional arrangements proved cumbersome once the 'big pipe' was activated. Internationally, any country which does not have access to this 'big pipe' is unlikely to be competitive in the digital economy, hence the importance of broadband policy globally.

The enabling technologies which countries have historically adopted tend to differ between OECD member states, and competition in the converging industries more often than not has been the result of earlier industry-specific policies of telecommunications infrastructure as a natural monopoly or a national preference for free-to-air or cable television. In Canada and Australia in particular, the level of penetration and culture of use of a variety of technologies such as mobile telephony, cable television and DSL have proven significant in determining the level of competition in a variety of broadband-related markets. What emerges from a longitudinal view of the adoption of new technologies is that broadband technologies cannot be viewed in isolation from the institutions in which communications policies have been mediated for decades. Indeed, new communications technologies represent critical junctures where institutions are forced to respond. The nature of this response, then, has ramifications for cross-national communications outcomes. Broadband

[40] At a National Press Club address in June 2006, Telstra CEO Sol Trujillo stated that 'Telstra is becoming a new kind of company – what I like to refer to as a media communications company. This notion of convergence is real and it is happening'.

exacerbates this problem in that institutions are not only forced to respond, but are often forced to merge. The path-dependent nature of institutions means that broadband outcomes today are not simply the result of recent policy successes or failures, but a long history of path-dependent decisions that begin with the approaches adopted to enable the spread of telegraph networks. As will be shown, in both Canada and Australia, the respective approaches adopted to enable telegraphic communications inform the available policy choices for communications technologies today. To not start at the beginning is to miss the importance of the co-evolution of technologies and institutions and an important explanation for the different communications outcomes in Canada and Australia which persist in the broadband era.

One working hypothesis is that Canada's decentralised approach to the deployment of communications technologies enables greater flexibility in deployment of services and faster penetration of new communications technologies than Australia's centralised approach. In addition, Canada is better placed to address the regional and local varieties of particularism associated with technological convergence in the communications industries as entrenched interests are also less centralised. Nonetheless, the nature of the different approaches and the policy choices made in the past restrict the available policy options in the present due largely to political reasons. Using the working hypothesis as a guide to explaining the different communications outcomes in Canada and Australia, the next chapter outlines the approach adopted to conduct the research.

Chapter 3: Research Design

> 'Canada and Australia have many similarities, which allow a ready comparison' (Statistics Canada 2003).

3.1 Structure of Research Approach

This chapter outlines the approach used to develop the working hypothesis presented in the previous chapter. The major issue to be examined is how different institutional patterns have impacted on policy and the future shape of converged communications industries: in effect, how institutional legacies shape communications policy. The thesis employs a qualitative methodology in its most-similar comparison of the communications sectors in Canada and Australia, and adopts a historical institutionalist approach. However, the overall design developed here draws upon several ideas and strategies in an attempt to unravel the complexities which reside at the nexus of government, business and communications technologies (Wilks & Wright 1987: 234). This chapter also explains the framework used to analyse and compare the political and industrial institutions in the Canadian and Australian communications sectors. To overcome what Liebermann (2001: 1034) refers to as one of the common shortcomings in historical institutional research design, this chapter provides 'a more explicit and self-conscious reporting of [the] strategies' used in this historical institutionalist explanation for the different communications technology outcomes in Canada and Australia.

3.2 Cross-National Variations: Why Australia and Canada?

> Institutions set the rules: 'routines, procedures, conventions, roles, strategies, organisational forms and technologies around which political activity is constructed' (March & Olsen 1989: 22).

Government and government policies in Canada and Australia have been compared by numerous researchers using a most-similar systems design (Alexander & Galligan 1992; Capling & Galligan 1992: xii; Bakvis 1981; Boothe 1996; Brusentsev 2002; Clemens & Cook 1999; Heaton 1934; Miller 1994). The similarities between the two countries limit the number of potential independent variables which may be considered to have caused a difference in a dependent variable. For the purposes of this research, the take-up or penetration of communications technologies represents the dependent variable, and the institutions which impact upon communications technologies represent the independent variable. The phenomenon to be explained is: Why has Canada outperformed and continues to outperform Australia in the speed of penetration of communications technologies?

Two overarching narratives are developed in the empirical analysis (conducted in Chapters 4, 5 and 6) as follows:

- Canada's decentralised institutional arrangements (political and industrial) lead to faster penetration than Australia's centralised institutional arrangements; and

- Institutional arrangements become, over time, policy regimes that reinforce industrial cultures which either encourage (decentralisation) or stifle (centralisation) the innovative deployment and use of communications technologies.

However, as a point of departure, it is necessary to address the logic of establishing causality in small-N comparative research. Comparative analyses require sound theoretical frameworks to be viable, so the chapter outlines the use of historical institutionalism as an analytical approach to understanding cross-national variations. It also outlines how the communications industries are conceptualised in Canada and Australia. The chapter examines concepts used in meso-level comparison and the effects of institutions and how these influence communications technology industries. Put simply, the thesis is not concerned with 'grand theory', but rather 'middle-range theory',[41] to explain why two otherwise-similar countries have such divergent results

[41] Merton (1968 cited in Mckenna 1997: 16) 'identified three categories of theory: grand theory, middle-range theory and narrow-range theory (practice theories). Grand theory is highly abstract and is broad in scope. Middle-range theory is more focused and is normally the end product of a research study. Narrow-range theory is even more specific and while also being based upon research findings, it guides specific actions in the achievement of desirable goals'.

in communications technology outcomes over time, regardless of whether the relevant communications industries were state- or market-controlled.

The thesis does not attempt, however, to explain institutions or institutional theory *per se*, but why communications technology outcomes in two countries have remained relatively stable over time. In the tradition of comparative politics, this thesis attempts to explain a 'real-world puzzle', and hence treats 'theories, approaches, and methods mainly as tools to help frame and explain' the empirical puzzle (George & Bennett 2004: 264). While further research may assist with theoretical developments, to date there has been very little direct comparative research into communications technology outcomes in Canada and Australia, especially over time. Existing research has focused on particular policies within a discrete sector such as pay-TV, broadcasting or telecommunications. In light of technological convergence, however, each of these formerly-discrete sectors is directly related to broadband technologies. What distinguishes this thesis from other research projects is the use of structured, focused comparison (in the discipline of political science), to address an issue of contemporary political importance.

Many comparative studies of Canada and Australia have touched on the two narratives which inform this study. For example, Alexander & Galligan (1992: 9) acknowledge the key differences in the federal systems of government – specifically Canada's decentralised system and Australia's 'centralist evolution' – but as a reaction to the challenges of nation-building. Similarly, other comparative studies have acknowledged the effects of Canadian decentralisation and Australian centralisation on policy innovation.[42] However, there has been little focus on how the nature of these institutional arrangements affects the interaction of government and business with communications technologies. Large-N case studies of communications technology penetration tend to explain penetration in terms of grand theories. For example,

[42] In comparing legal aid policies in Canada and Australia, Gray (in Alexander & Galligan 1992: 170-171) found that Australia's centralised policy approach prohibited state, regional and community innovation and operated in a 'closed decision-making process' which 'effectively precluded the possibility of significant [policy] innovations'. It was not until the Whitlam Government introduced 'a national legal aid system' in the early 1970s. In contrast, Canada's decentralised approach enabled Ontario to set up a legal aid program in the 1960s which was followed soon after by other provincial programs.

Wallsten (2001 cited in Warschauer 2003: 70-71) posited that competition (rather than privatisation or regulation) led to greater teledensity in his study of thirty developing nations. Nonetheless, competition (or a lack of competition) is an insufficient explanation for the different outcomes in Canada and Australia in direct comparison. Therefore, a middle-range theory which applies 'to more specific geographical, political, and historical contexts' is necessary to address the inadequacies offered by contemporary grand theories of communications technology penetration (Caramani 2008: 48).

Historical observations of communications technology outcomes in Canada and Australia indicate that Canada has repeatedly outperformed Australia in the adoption and take-up of communications technologies from the time of the telegraph until broadband Internet. Despite the liberalisation of the respective markets and (more recently) similar times to adopt new technologies, Canada has continued to outperform Australia in the take-up of new communications technologies. Understanding the communications technology outcomes (in this thesis, the dependent variables) observed over time in each country is perplexing. Therefore, the puzzle of the dependent variables (the historical adoption and take-up of communications technologies) which emerges from the available statistics and historical information is mapped in detail in Chapter 4. To explain causality in this puzzle, a structured, focused comparison provides a useful framework to generate new knowledge of communications policy which has been largely overlooked by the contemporary focus on competition alone.

There is contentious debate about whether market competition (free market) or public provision (government monopolies or multiple agencies) best facilitate the deployment of new communications technologies. In recent years, the OECD (2008b:12; see also 2009: 4) has acknowledged that 'governments should not prohibit municipalities or utilities from entering telecommunications markets'. Before the 2008 global financial crisis, any suggestion that government ownership may actually improve access to broadband services would have been sacrilegious. In more recent times, however, even industry leaders have called for Australia's NBN to be 100% government-owned (Hackett 2009). This changing view on the capacity of free market approaches to provide all the answers in the communications industries highlights a gap in the existing literature on how communications technologies might be governed effectively. Canada, then, appears to be doing something right which is not explained by contemporary economic theory. Comparative political research 'enables the development of hypotheses and generalisations' and 'new paradigms... to provide answers to even the most familiar questions about government and politics' (Alexander & Galligan 1992: 12). This chapter outlines how the hypotheses and generalisations will be developed in the present study.

To expand upon the explanation (the working hypothesis advanced in the introduction and the previous chapter) for the cross-national variations observed in communications technology outcomes in Canada and Australia over time, the working hypothesis may be re-stated (using the language of historical institutionalism) as follows:

> This thesis posits that political and industrial institutions are the explanatory (or independent) variable for the different communications technology outcomes (or dependent variable) observed in Canada and Australia over time. Institutions, then, are a major cause of the different outcomes. Moreover, path dependency stems from the constitutional foundations of these two different approaches, where, once policy choices are made, opportunities for institutional change tend to occur only at critical junctures provided by new technological innovations. Over time, institutions reinforce policy regimes which either help or hinder the deployment of new communications technologies.

Two most-similar countries are observed here with very different outcomes for communications technology penetration. Therefore, this study lends itself to the application of Mill's method of difference, which is outlined in the next section.

3.3 Scientific Method, Causality and Comparative Politics

3.3.1 Scientific Method and Causality

Determining causality in the social sciences proves challenging as it is difficult to observe causal relationships between variables through controlled experimentation. Nonetheless, in his definitive work *A System of Logic*, John Stuart Mill (1843 cited in George & Bennett 2004: 153; see also Lijphart 1971: 686-688; Nagel 1950) outlined the 'method of difference' as a method of experimental inquiry that can establish causality. Mill (Nagel 1950: 211) stated that 'singling out from among the circumstances which precede or follow a phenomenon those with which it is really connected... [can be achieved] by comparing instances in which the phenomenon does occur with instances in other respects similar in which it does not'.[43] Mill (Nagel 1950: 215-6) explained how the 'method of difference' can be used to establish causality:

> If an instance in which the phenomenon under investigation occurs and an instance in which it does not occur have every circumstance in common save one, that one occurring only in the former, the circumstance in which alone the two instances differ is the effect, or the cause, or an indispensable part of the cause, of the phenomenon.

To establish causality in cross-national variations in political science, controlled experiments are largely impossible. However, the comparative method offers a 'quasi-experimental' approach that enables researchers to attempt 'to draw conclusions on the basis of some stimulus being absent or present', particularly between cases (Caramani 2008: 65). A major problem in explaining causality in cross-national variations is the seemingly endless variables which make it difficult to isolate, sufficiently, the absence or presence of a discrete variable or set of variables which establish causality. According to Caramani (2008: 72-73), however, comparative research methods can draw upon Mill's logic to identify relationships between variables, and hence establish causality. Comparative studies based on the 'most-similar systems design' typically provide an appropriate framework for the application of Mill's method of difference, allowing causality to be ascribed to the independent or 'explanatory' variable. Effectively, the method of difference is a method of elimination, where differences are systematically excluded, suggesting that 'whatever cannot be eliminated is connected with the phenomenon' (Nagel 1950: 216) and therefore influential and perhaps causal to some degree.

Although 'quasi-experimental', many most-similar systems design studies have adopted the method of difference to establish causation (Ragin 1987: 38). For example, Skocpol (1979 cited in Ragin 1987: 38) adopted the approach in a longitudinal analysis of the different outcomes of the Russian revolutions of 1905 and 1917.

[43] Lijphart (1971: 688) states that Mill believed the method of difference could not be applied in political science (and Durkheim agreed with Mill) because 'sufficiently similar cases could not be found'. However, Lijphart states that these 'objections are founded on a too exacting scientific standard – what Sartori calls "over-conscious thinking"'.

Despite Skocpol's use of the approach, Ragin (1987: 38) argues that longitudinal cases alone 'do not come close to conforming to the demands of experimental design'. However, Caramani (2008: 72-73) suggests that in most similar systems designs, the 'logic of comparison' assumes that 'the cases have more circumstances in common (similar) than not', and therefore the research outcomes concentrate 'on the variation across the cases'. In most-similar comparative studies, the observed difference, often referred to as 'cross-system variation', is the 'basis for explanation' (Caramani 2008: 73). Such research designs are quasi-experimental in that they adopt Mill's method of difference in an attempt to locate 'variables that differ among similar systems' to account for the outcome or the dependent variable (Caramani 2008: 72).

Nonetheless, there are some criticisms of approaches which adopt Mill's method of difference in comparative research. For example, Ragin (1987: 34-52) does not point to the method of difference as a useful case-oriented research strategy, preferring to focus instead on Mill's 'method of agreement' and 'indirect method of difference'.[44] Ragin (1987: 39) is mostly silent on the method of difference in comparative research design except in the use of counterfactuals, or where an empirical case is contrasted with a theoretical case. This is likely due to a distinct lack of countries which are sufficiently similar to enable the direct application of the method of difference. Regardless, Ragin (1987: 39) suggests that the method of difference, when used as a theoretical method (that is, utilising counterfactuals), is 'not in the same class with such empirical methods as the method of agreement and the indirect method of difference'. However, an important bias in the works of Ragin (1987) and, in particular, King *et al.* (1994), is their focus on quantitative research as the measure upon which qualitative research should be assessed.[45]

Munck (in Brady & Collier 2004: 105-121) takes issue with the quantitative world-view and argues that 'qualitative analysts have their own well-developed tools' for

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[44] Mill's (Nagel 1950) methods of experimental enquiry were explained in terms of 'canons'. The method of agreement is thus: 'If two or more instances of the phenomenon under investigation have only one circumstance in common, the circumstance in which alone all the instances agree is the cause (or effect) of the given phenomenon' (Nagel 1950: 214); while the indirect method of difference refers to 'a method which attempts to approximate experimental design with nonexperimental data' (Ragin 1987: 38).

[45] Bartels (in Brady & Collier 2004: 69-74) refers to this bias as 'quantitative imperialism', where all forms of qualitative research are deemed inferior.

addressing many of the tasks outlined by King *et al.* (1994). Munck (in Brady & Collier 2004: 106) states that qualitative researchers can produce 'valid social scientific inference' and that 'analytic leverage [can be] produced by different types of intentional case selection'. Substantive explanations can be produced by 'formalized, Boolean-algebraic' studies using Ragin's (1987) Qualitative Comparative Analysis approach or by employing 'informal versions of the same approach' (Munck in Brady & Collier 2004: 110). In particular, Munck points to the frameworks used by Collier & Collier (1991) and Pierson (2000; see also 2004) which focus on critical junctures and path dependency (respectively) as an informal framework of this kind. Munck (in Brady & Collier 2004: 110) states:

> These approaches typically identify variables that place countries (or other cases) on different paths or trajectories of change. Such trajectories often involve causal processes that work themselves out in contrasting ways within different groups of cases.

Therefore, Munck (in Brady & Collier 2004: 116) argues that Mill's methods of experimental inquiry can be used jointly with critical junctures and path dependency to ascribe causality.

A major test for validity in comparative research design in case-study oriented research is case selection bias. King *et al.* (1994) state that selecting cases on the basis of similarities in the dependent variable (the outcome) presents a serious 'logical flaw' because the 'absence of the hypothesised causal variables' may actually be associated with a different dependent variable (in other cases). Selection on the basis of the independent (or explanatory) variables, however, does not introduce bias to the research design (King *et al.* in Brady & Collier 2004: 184). The present study passes this test. Nevertheless, establishing causality remains elusive for many social scientists (King *et al.* 1994: 75), given that any causal inference[46] can only make the best use of the available data (King *et al.* in Brady & Collier 2004: 185), which may readily lead to non-scientific explanations. Yet King *et al.* (in Brady & Collier 2004: 185) contend that 'uncertain inferences are every bit as scientific as more certain ones so long as they are

[46] Succinctly, 'causal inference' is the 'identification of the cause or causes of a phenomenon, by establishing covariation of cause and effect, a time-order relationship with the cause preceding the effect, and the elimination of plausible alternative causes' (Overview of key terms in the website supplement to Shaughnessy *et al.* 2000: 25).

accompanied by honest statements of the degree of uncertainty entailed in each conclusion'. To this end, the working hypothesis outlined earlier will be used to develop a model for viewing new communications technologies as critical junctures in institutional evolution and an institutional explanation for the different communications technology outcomes in Canada and Australia. The objectives of this research provide a useful conceptual framework for understanding the issues associated with infrastructure deployment and use in the Australian and Canadian communications industries. In particular, this research will be useful for future assessments of the NBN: the 'largest single infrastructure investment in Australia's history', which is currently under construction (Turnbull 2012; see also ALP 2012). The next section considers the relative issues and limitations of a comparative politics approach to the research at hand.

3.3.2 Comparative Politics: Similarities and Differences

According to Caramani (2008: 3), comparative politics is 'value-neutral' (that is, non-normative) and usually concerned with 'empirical questions' to analyse 'political phenomena as they appear in the "real world"'. Comparative politics focuses on the 'interactions within political systems', or, from an institutionalist perspective, 'institutions within political systems'. Canada and Australia provide uniquely similar case studies to employ the method of difference in a quasi-experimental, most similar systems design study. The assumption inherent in many comparisons of Canada and Australia is that the differences in demographic characteristics are minimal, leaving institutional arrangements as the major difference, or independent variable. For this reason, Alexander & Galligan (1992: 2) suggest that the similarities between Canada and Australia tend to 'favour an institutional rather than a behavioural approach'.

For some scholars, addressing 'real-world' problems (such as the present research) tends to produce 'narrow applied policy research of an essentially atheoretical nature which is... not a proper goal for academic scholarship' (George & Bennett 2004: 265). However, there is considerable debate over the usefulness of the 'highly general theories' favoured by political scientists (George & Bennet 2004: 265) and the emerging trend toward middle-range theories in comparative politics (Peters in

Caramani 2008: 48). For instance, existing theories of competition do not adequately explain the different communications technology outcomes in Canada and Australia. But how is middle-range theory developed in a comparative framework? First, a distinction must be drawn between 'thin analyses' provided by large-N case studies and 'thick analyses' provided by structured, focused, small-N comparisons. Second, the issues associated with applying the method of difference (outlined above) to a comparative politics approach must be taken into account. Third, some general guidelines to enable a theory to be specified adequately are outlined. This sub-section examines the literature on these three key issues for the comparative framework.

In the discussion of case selection bias above, the dilemma posed by the logical problems associated with inadequate case selection points to a common problem in comparative research: 'too many variables, too few countries' (Landman 2008: 30, see also Brady & Collier 2004: 251; Caramani 2008: 77; King *et al.* 1994: 119; Lijphart 1971: 685-691).[47] Much of the literature generated by international institutions such as the OECD and the World Bank provides cross-national comparisons using large-N case studies which are routinely cited by politicians, industry players and journalists as indicators of national progress. For example, Australia's performance in broadband speeds (AAP 2006c), penetration (Coonan 2007) and prices (Ferguson 2009) has been compared in relation to this body of literature. Large-N studies typically draw upon 'thin' analyses which 'depend not on detailed knowledge of cases, but rather on the inferential leverage[48] that derives from statistical tools' (Brady & Collier 2004: 310).

In addition to the limitations of large-N case studies and 'thin' analyses, the reports used to compare Australia's relative position in broadband outcomes tend to be 'cross-sectional', where the research 'focuses on multiple cases at one point in time' (Brady & Collier 2004: 282). Inferences drawn from such analyses tend to understate the impact

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[47] King *et al.* (1994: 19-122) point to the principle that the number of observations (or countries – see Landman 2003: 32) must exceed the number of variables. Further, increasing the number of observations can assist in identifying deviant cases (Landman 2003: 46; Brady & Collier 1994: 251) and in overcoming selection bias. For example, Porter's (1980 cited in King *et al.* 1994: 133-134; see also Brady & Collier 2004: 80) *Competitive Advantages of Nations* 'made it impossible to evaluate any individual causal effect... [of] the conditions he associated with success'.

[48] According to Brady & Collier (2004: 290), 'inferential leverage' refers to the 'capacity to make valid inferences, given a particular measurement model or causal model and a specific data set. Some methodological tools serve to increase inferential leverage'.

of the past on the present. In Australia's case, the historical snap-shots from large-N studies which indicate slow *take-up* of broadband services suggest the recent emergence of a 'broadband emergency' (Molloy 2008). Making such inferences about Australia's broadband situation from large-N comparative studies understates Australia's peculiar demographic features – in particular, a sparsely populated, geographically large country – and overlooks more reliable comparisons with similar countries. To complicate matters, many scholars (Barr 2000: 79; McCarthy cited in Freeman 198-:2; Frith 2009) insist that 'Australians have long shown a propensity to quickly adopt communications technologies'. At first glance, then, it appears plausible that Australia lagging the majority of OECD member states in broadband penetration is purely a contemporary problem. However, in light of the historical perspective, this explanation does not stand further scrutiny (see Holland 1986).

Small-N case studies, on the other hand, tend to focus on 'thick' analyses to draw upon a 'rich knowledge of cases' which, if 'utilised effectively... can greatly strengthen descriptive and causal inference' (Brady & Collier 2004: 309). Thick analysis, then, provides a major source of inferential leverage for qualitative researchers (Brady & Collier 2004: 248-249). Nonetheless, an indeterminate research design (where 'virtually nothing can be learned about the causal hypotheses', see King *et al.* 1994: 118) is to be avoided. As King *et al.* (1994: 120) assert that poor research design is a major problem in qualitative approaches to establishing causality:

> No amount of description, regardless of how thick and detailed; no method, regardless of how clever; and no researcher, regardless of how skilful, can extract much about any of the causal hypotheses with an indeterminate research design.

However, the debate over distinctions between qualitative, small-N and quantitative, large-N approaches to causality (compare, for example, Ragin 1987; King *et al.* 1994; and Brady & Collier 2004) is less of an issue for the research at hand. For example, it is very difficult to measure (at least statistically) differences in institutional frameworks and how these influence or restrict individual behaviour in small-N comparisons.[49] The

[49] See, for example, Castles (1998: 79) and the manner in which institutional variables are tabulated. In the large-N set, thin analysis is useful for the question at hand. However, the rating of Australia and Canada in this table is so similar as to provide little use in a direct comparison of the two countries, other to reinforce their political similarities.

assumption in institutional approaches to political science is clearly that institutions *do* shape individual behaviour and indeed, they 'matter' (Alexander & Galligan 1992; Clemens & Cook 1999; Hall & Taylor 1996; Hollingsworth 2000; Mansell 2006; March & Olsen 1989; North 1990; Peters 2005; Thelen 1999; West 2001). The question, then, is what data can be observed, and how can that data be measured?

There are two major types of observations which assist in enhancing inferential leverage in comparative political research: data-set observations and causal process observations (Brady & Collier 2004: 11-12). The former tend to be associated with the quantitative tradition, while the latter tend toward the qualitative tradition. George & Bennett (2004: 212) refer to the 'method of process-tracing' as a major technique to capture qualitative data on causal processes. Further, the technique enhances inferential leverage by providing a form of 'with-in case' analysis which is 'critical to the viability of small-N analysis' (George & Bennett 2004: 205). There are many forms of process-tracing, but essentially the approach attempts to verify 'causal stories' or historical narratives[50] which 'identify the intervening causal process – the causal chain and causal mechanism – between an independent variable (or variables) and the outcome of the dependent variable' (George & Bennett 2004: 206).[51] Process-tracing can also be used to identify 'more complex form[s] of causality... [which flow] from the *convergence* of several conditions, independent variables, or causal chains' (George & Bennett 2004: 158, emphasis in the original; see also Skocpol 1979).

Institutional approaches may also adopt process-tracing to overcome the problems associated with the application of Mill's method of difference to the social sciences (George & Bennett 2004: 212; see also Collier & Collier 1991). According to George & Bennett (2004: 213):

[50] Note the two overarching narratives adopted in this thesis.

[51] According to George & Bennett (2004: 147), 'causal mechanisms' refers to the 'microfoundations behind observed phenomena'. Process-tracing assists with the identification of causal mechanisms as it can 'empirically establish the posited intervening variables and implications which should be true in a case if a particular explanation of that case is true'. Further (citing Little 1998), they state that process-tracing should be combined with comparative study to 'distinguish causal from accidental accounts' of a phenomenon. However, approaches which focus explicitly on causal mechanisms tend to rely upon typological theories and other concepts which have developed as distinct methodological approaches outside of the institutionalist approach adopted in this study.

> The challenge in using process-tracing is to choose a variant of it that fits the nature of the causal process embedded in the phenomenon being investigated.

However, historical explanations which focus on institutional arrangements are not necessarily compatible with either statistical or typological approaches to process-tracing. Where a sequence of events informs causal processes by foreclosing 'certain paths in the development [which] steer the outcome in other directions', the concept of path dependency provides an approach 'for dealing with phenomena of this kind' (George & Bennett 2004: 212; Peters 2005: 72-86). Nonetheless, there is an argument that path dependency in institutional theory is tautological. Vergne & Durand (2010: 739) ask the question: 'if we define institutions as stable social patterns and identify path dependence with persistence, as is usually the case, then is it not tautological to speak of path-dependent institutions?' In addressing this problem, Vergne & Durand (2010: 739) distinguish between the 'process of path dependence (which... consists of contingency and self-reinforcement) and its outcome (a specific state of persistence known as lock-in)'. They go on to suggest that 'the usefulness of path dependence is bound to remain limited if it explains both persistence and its opposite (i.e. novelty)' (Vergne & Durand 2010: 739). In the research on Canada and Australia, path dependence is utilised to explain persistence of faster adoption and take-up rates of communications technologies in Canada compared with Australia. Therefore, path dependency's potential tautological problem identified by Vergne and Durand is not evident in this research project.

The issue with Mill's method of difference in comparative politics identified earlier can be overcome by using process-tracing for within-case analysis in small-N comparative studies. In particular, this approach, when combined with the method of structured, focused comparison,[52] enables historical experience to be studied 'in ways that... yield useful generic knowledge' (George & Bennett 2004: 67). Finally, a framework for establishing causal inference has been adapted from the guidelines set out by King *et al.* (1994) in *Designing Social Inquiry*. Three main guidelines for theory specification using qualitative research designs are relevant here. The researcher should: 1)

[52] George & Bennett (2004: 252) state that process-tracing can also strengthen inferences in most-similar systems designs which attempt 'to establish that the variation in the outcome was indeed due to the single independent variable that differed between the cases'. (Collier, Seawright & Munck in Brady & Collier 2004: 36-44)

Construct *plausible*[53] theories; 2) 'Build theories that are logically consistent'; and 3) 'Increase leverage by explaining more with less' (Brady & Collier 2004: 38). But what is meant by a theory in this instance? According to King *et al.* (1994: 19), in the social sciences a theory 'is a reasoned and precise speculation about the answer to a research question, including a statement about why the proposed answer is correct'. Although this thesis is concerned with middle-range theory (or on developing theory that applies to a 'specific geographical, political, and historical' context, see Caramani 2008: 48; see also Merton 1968 cited in Mckenna 1997: 16), the specifications remain relevant to the study at hand and will now be examined.

First, it is important to note that any social science theory (or explanation) relying on quasi-experimental methods can only provide 'scientific' speculation. According to Johnson & Reynolds (2005: 35), this type of 'scientific knowledge' in political science relies on induction, or 'the process of reasoning from specific observation to general principle or theory', where 'observation precedes theory'. The plausibility (rather than falsifiability) of an explanation is more appropriate as a goal for historical institutionalism (Thelen 1999: 372) and the approach is adopted here. Second, theories must be logically consistent, in that 'two or more parts of a theory [cannot] contradict one another' (Brady & Collier 2004: 38). While formal modelling using mathematical methods can be used to test internal consistency (see King *et al.* 1994: 105-107), such modelling is difficult to apply to this qualitative causal inference study. Nonetheless, accepted methodological approaches, particularly process mapping (discussed earlier in this chapter) are sufficient to facilitate internal consistency for the purposes of this study. Finally, increasing leverage draws upon the idea of parsimony ('limiting the number of explanatory variables', see King *et al.* 1994: 123; Brady & Collier 2004: 38). Parsimony can be achieved through research design and the use of thick analysis (also discussed earlier in this chapter). Having established the principles and approaches

[53] While some researchers may be attempting to construct falsifiable theories, this thesis adopts a quasi-experimental approach in an attempt to explain cross-national variation The principle of falsifiability means that the theory must be capable of being proved wrong (Brady & Collier 2004: 38). There are two main ways that this can be achieved: 'maximising observable implications' and by 'stating theories precisely'. The former means that a theory should be capable of being tested 'with more data and a greater variety of data' (King *et al.* 1994: 19). The latter relates to the precision with which a theory is stated (Popper 1968 cited in King *et al.* 1994: 19), or that 'theories should be stated clearly enough so that they could be wrong'. This is unlikely to be achieved in the present study, which aims to establish a plausible explanation for cross-national variation in the tradition of historical institutionalism (Thelen 1999: 372).

which inform the comparative method in political science, it should be recalled that historical institutionalism provides a recognised form of process-tracing which can strengthen causal inference in comparative studies. The discussion which follows in the next section focuses on historical institutionalism as a specific theoretical approach to addressing the research questions at hand.

3.4 Historical Institutionalism

3.4.1 An Overview of Historical Institutionalism

Institutions are the traditional focus of political scientists and 'remain... one of the pillars of the discipline of politics' (Rhodes in Marsh & Stoker 1995: 43; Peters 2005: 1). For many years, the institutional approach was the 'dominant tradition' of political scientists, largely focused on describing and analysing institutions (Rhodes in Marsh & Stoker 1995: 42). However, during the 1950s and 1960s, the increasing importance of behaviouralism in the social sciences tended to undermine the traditional institutional approach (Peters 2005: 1; Sanders in Marsh & Stoker 2010: 24; Lowndes in Marsh & Stoker 2010: 62). However, a 'counter-reformation' of institutionalism commenced in the 1980s which brought back the importance of institutions while introducing greater theoretical and methodological rigour (Peters 2005: 2). This 'new' approach returned to institutions as the focal point of politics and historical institutionalism emerged as one of the first approaches of what became known as the 'new institutionalism' (March & Olsen 1989).[54] In effect, the new institutionalists were reacting to the dominance of behavioural approaches to political science which had largely rendered institutions irrelevant as a focal point for research. Further, in the quest to make political science more 'scientific', statistical and quantitative approaches to the study of politics had emerged, particularly during the 1960s, to enhance the output of a discipline which had largely produced descriptive studies of political systems and institutions. Few political scientists would disagree that the 'behavioural revolution' inspired more rigorous research methods and in many cases the explicit application of scientific philosophy to the discipline. The quest for rigour has highlighted the

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differences between the quantitative and qualitative methodologies (some of which were outlined in the previous section) and the behaviouralist and institutionalist approaches, with each camp claiming superiority of scientific method over the other. Nonetheless, the 'new institutionalisms' have adopted a variety of analytical tools from each of the competing groups which introduce a level of scholarly rigour not found in the 'old' institutionalism. These tools facilitate a focus on institutional design and how far institutions can adapt.

The task at hand is well-suited to historical institutionalism as the approach provides many of the tools required to facilitate the application of Mill's method of difference to a structured, focused comparison using a most-similar systems design. The following sub-sections outline the theoretical concepts which underpin the historical institutionalist approach. As institutions are typically created to support collective decision-making, the rules which institutions reinforce can restrict future decisions. In this way, the legacies of the past can influence policy in the present; today's policy choices are often path dependent (Lecours 2005: 9). To understand how institutions create legacies or provide inertial forces which may restrict the penetration of communications technologies, this section reviews the literature on the application of the historical institutionalist approach. In particular, the concepts of path dependency and critical junctures are outlined in detail to facilitate the application of a recognised form of process tracing to Mill's method of difference.

3.4.2 Key Theoretical Concepts within Historical Institutionalism

Fundamentally, institutional theory posits that political behaviour is shaped and changed by institutions. While individuals are not considered 'automata responding to socialisation', institutions ensure that individuals must choose between competing institutional loyalties as they act. Individuals 'must pick and choose among influences and interpret the meaning of their institutional commitments' and therefore cannot act as the 'autonomous, utility-maximizing and fully rational individuals' suggested by behaviouralists (Peters 2005: 26). In the present study, the term 'institution' encapsulates the values, rules, routines and procedures (Peters 2005: 30; see also March & Olsen 1989) which influence behaviour through what March & Olsen (cited in

Peters 2005: 30) refer to as a 'logic of appropriateness'. Individuals still make conscious choices, but these are usually in line with the values, rules, routines and procedures of the dominant institutions. Alternatively, institutions may at least constrain or '"structurally suggest" individual interests' (Dowding & King 1995: 2). Typically, the variants of the new institutionalism suggest different answers to three fundamental questions: 1) What is an institution? 2) How are institutions formed? and 3) How do institutions change?

Conceptually, institutions have often been narrowly equated with organisations. However, Peters (2005: 32) argues that the terms are not necessarily synonymous. A constitution, for example, is an institution but it is clearly not an organisation. March & Olsen (cited in Peters 2005: 39) argue that an institution may also refer to the rules or routines which influence or constrain political behaviour. Nonetheless, a specific definition for the concept remains elusive with many institutionalists tending to focus on the functions (or limiting effects on individual behaviour) of institutions rather than a clear definition of institutions themselves (Peters 2005: 29-32). Importantly, the concept of an institution is much easier to define at the meso- or industry-level. Of particular interest to the present study are the institutions of the state which govern the communications industries in Canada and Australia. For instance, the overarching institutional arrangements in both countries start with the respective constitutions which set out the responsibilities of the various levels of government for communications technologies. Legislatures then establish the relevant laws which govern the industries, drawing on the expertise of a particular department or agency which supports policy implementation and administration. In both countries, independent commissions are responsible for regulating behaviour in the relevant industries in accordance with particular laws. At this meso-level, an institution is a formal mechanism for governing the communications industry, which may include particular organisations.

The institutions which govern the communications industries in Canada and Australia are *not* limited to the state. In many instances, formal industry and community organisations (referred to here as industrial institutions) may play a significant role in policy formulation, industry self-regulation, or lobbying government. Ryan *et al.* (2003:

10) distinguish 'the state' and its institutions as those funded by public revenue, but this distinction is not always clear-cut. For example, the state may provide funding to industry or community organisations to take on a particular role or function on behalf of the state. Over time, particular preferences for how these roles or functions are delegated by the state may become institutionalised. In this context, the term 'institutionalised' refers to approaches which are regarded as 'proper' or 'appropriate' for a given role or function. March & Olsen (1989) refer to approaches which over time become formally accepted by government, business and the community as the 'routines and procedures'. At the meso-level, these arrangements may be so ingrained as to become a part of a particular industry's 'culture'. Historical institutionalism provides a useful model to explain such arrangements. Indeed, new institutionalist approaches have 'become predominantly (although not necessarily) associated with the constitutive role of culturally legitimate models of organization and action (e.g. DiMaggio & & Powell 1983, 1991, Meyer & Rowan 1977)' (cited in Clemens & Cook 1999: 441).

Typically, institutional arguments are used to explain a lack of cross-national variation over time, such as uniqueness, specificity or diversity. Nonetheless, institutional arguments 'may also explain persistent differences, as when national industrial policies on comparable technical issues consistently diverge' (Clemens & Cook 1999: 441). The latter argument suggests a number of questions for comparison: 1) What are the institutional differences? 2) What influenced these differences? and 3) How are these differences 'culturally' legitimised? These questions will be addressed in the empirical chapters, but to answer these questions, it is important to understand the historical dimension; in effect, why were the relevant institutions formed?

An interesting feature of communications industries is that new technologies tend to influence the formation of institutions. For example, the telegraph existed *before* the Canadian and Australian constitutions. In each country, laws to govern the deployment of the telegraph were enacted before the technology was formally adopted. However, *institutions* designed to govern the telegraph 'industry' were introduced after the technology had been deployed – either experimentally or before governments established laws pertaining to the emerging industry. In many cases, existing institutional arrangements, particularly government departments and agencies, were changed to adapt to the governance requirements of the new technology. Over time, new institutions were formed to deal with governance issues raised by communications technologies or as the jurisdiction of the different levels of government changed (at federation, for example). Interestingly, the capabilities of each new communications technology tended to result in new institutions which effectively created the divergence of distinct industries along the lines of particular technologies. Often, this was the result of the capacity for nation-building (a policy objective peculiar to both countries), which the different technologies enabled.

Chapters 4 and 5 outline the trajectories of early communications technologies in Canada and Australia in detail to understand the institutional frameworks that coevolved with the different communications technologies. However, what is clear so far is that the institutional arrangements tend to be formed *after* the invention of new communications technologies, and then tend to remain relatively stable for long periods of time.[55] Historically, new technologies have brought about change in some of the institutional arrangements which govern the relevant industries. The institutional arrangements which govern communications technology industries, then, tend to be relatively stable until a new technology appears. Historical institutionalism provides some theoretical explanations for institutional stability and change over time. Nevertheless, Thelen (in Mahoney & Rueschemeyer 2003: 208) suggests that 'the importance assigned by many scholars to the role of institutions in structuring political life... [overlooks] the issue of how these institutions are themselves shaped and reconfigured over time'. In many ways, institutions represent the *status quo*, so when an institution (and therefore the *status quo*) changes, institutional approaches to understanding equilibrium appear to lose their relevance until a new *status quo* emerges.

[55] For example, the Postmaster General's Department in Australia remained the major institution governing the telegraph and telephone industries from 1901 until 1975. Similarly, the Canadian Radio-television and Telecommunications Commission (CRTC) traces its origins to the Canadian Radio Broadcasting Commission (CRBC), established in 1932. In the private sector, many companies which operate in both the Canadian and Australian communications industries trace their origins from the early days of the telegraph and the telephone, such as Bell Canada and Cable & Wireless.

Citing Douglass North (1981), Orren & Skowronek (1994), and Powell (1991: 183-200), Clemens & Cook (1999: 441) outline a theoretical problem for historical institutionalism: if 'institutional arguments maintain that variation and change are minimized, those same arguments are ill-suited to the explanation of change'. How institutions are viewed affects the logic of institutionalism, and it is therefore necessary to 'distinguish both the "virtual" aspects of institutions - the model, template, or schema - and the resources, interactions, and interpretive processes that make that pattern self-sustaining' (Cook & Clemens 1999: 441). Although historical institutionalism is much better at 'explaining the persistence of patterns' rather than explain 'how those pattern might change' (Peters 2005: 76-77), the logic of historical institutionalism outlined above provides greater rigour and precision to explaining institutional evolution.

3.5 Methodology and Evidence Collection

This section details the methodology and the methods of evidence collection. The methodological approach is designed to identify, qualitatively, the recurring patterns which occur in the interplay between governments, businesses, and communications technologies (Wilks & Wright 1987: 234). There are three main approaches. First, the thesis adopts a comparative sectoral or meso-level study. Second, using technological momentum as a framework, the thesis examines the policy trajectories in the Canadian and Australian communications sectors from the time of the telegraph until the broadband era. Third, the thesis draws upon the concepts of *ideas, interests* and *institutions*[56] and how these influence the manner in which governments *enable, coordinate* and *regulate* communications technologies as its units of focus. This approach is designed to capture, in narrative form, data to highlight the 'diversity stemming from deeply embedded institutional legacies which condition the choices available to political actors' in each country (Hopkin in Marsh & Stoker 2010: 302).

[56] Hall (cited in Lichbach & Zuckerman 1997: 176) states that: 'In broad terms at least, this division [of the political economy into ideas, interests and institutions] reflects the three primordial questions that animate the field... [Further,] this categorization is useful for illuminating some of the principal lines of inquiry and the issues [scholars] confront'. The three 'primordial questions' are (1) 'Whose interests are being served by any given set of economic arrangements and how do the latter distribute power and resources across social groups?' (2) 'Where do these conceptions come from and how do they become influential?' and (3) What institutional arrangements underpin the ideas and interests? (Hall cited in Lichbach & Zuckerman 1997: 175).

The focus on developing a plausible explanation is not uncommon in the historical institutional tradition using historical narratives. Indeed, for Büthe (2002: 482):

> [N]arratives [can be] written by scholars to present the results of their empirical analysis, providing information about actors, institutions, events, and relationships in "a single coherent story, albeit with subplots" (Stone 1987, 74) to provide empirical support for a theoretical argument. Insofar as they are independent of the information used to construct the model, these narratives can serve as data to test the model or as "evidence" to support the model's plausibility.

Büthe (2002: 482) distinguishes this approach from the case study approach (see for example Yin 2012):

> [H]istorical narratives differ from typical case studies in that they trace historical processes over long periods of time to test a theoretical argument with an important temporal dimension - which raises methodological problems not discussed in the case study literature.

The methods of data collection for the present study followed what Lieberman (2002: 1015) suggests is a typical approach developed by historical institutionalist (HI) scholars:

> HI scholars tend to begin their analysis with static, cross-sectional investigations of contemporary outcomes. More than anything, such analysis helps to motivate the empirical problem by identifying unexplained variance on the dependent variable. Either multivariate regression analysis or Mill's (1843/1961) methods of similarity and difference, or a combination of these approaches, is generally employed as the entry point into a research question. Both provide some basis for dispensing with rival hypotheses and help to determine if the institutional hypothesis is plausible.

Again, the focus is on developing a plausible (as opposed to falsifiable) explanation for an issue of contemporary importance.

The initial research design focused on interviews with industry elites in Canada. A recurring theme in the interviews was the importance of the past and how earlier technologies and earlier approaches to enabling, coordinating and regulating these technologies impacted upon broadband infrastructure and services. It was apparent that 'in-depth knowledge' of the two cases would be required to explain the different outcomes (Falleti 2006: 13). Three main chronologies were constructed: a chronology of electronic communication technologies, a chronology of both the Canadian and Australian communications industries. This was achieved by using what Skocpol (1995: 103) refers to as 'empirical rummaging' and drew attention to the recurring patterns of Australia lagging behind Canada in each instance. The previous chapter demonstrates the extent of these different communications outcomes in graphical form.

Consequently, this 'puzzle' led to the adoption of the historical institutionalist approach to explain the recurring patterns of difference.

The remaining sections outline the approaches used to collect evidence and construct the historical narratives in some detail.

3.5.1 Elite Interviews

Various OECD reports established the extent that Australia was lagging Canada in broadband penetration and provided the impetus for this research to explain the differences in broadband outcomes. The original intent of the research project was to explain the different rates of broadband penetration, and commenced with a two-week field trip to the Canadian Internet Policy and Public Interest Clinic (CIPPIC) at the University of Ottawa in April 2006. The fieldwork included a reconnaissance trip through Ontario, Québec, New Brunswick, Nova Scotia and Prince Edward Island. What was immediately apparent were the large number of payphones from a variety of telecommunications companies (at places such as remote service stations) and how the dominant carrier in each province was different. Physically being located in Canada assisted in gaining some familiarity with local customs and traditions (such as the extent of bilingualism in eastern Canada) and obtaining access to Canadian political science literature from local libraries. Discussions with staff at CIPPIC assisted in gaining knowledge of the relevant institutions, government departments, major industry players and other anecdotal views of broadband in Canada. A recurring theme was the importance of earlier communications policies and their influence on contemporary broadband policy.

In July 2007, another two-week field trip was undertaken in Canada (with local support from CIPPIC), specifically to conduct interviews with industry elites including policy makers, telecommunications company vice-presidents (regulatory), journalists and interest group leaders. The interview design was based on Johnson's & Reynolds' (2005: 271) suggestion that a semi-structured interview format is best for elite interviewing, as elites often resent the 'straightjacket' of standardised questioning. Industry elites were presented with a list of questions (see Appendix 2) before the interview, allowing scope for exploring areas of interest or expertise. Confirming Johnson's & Reynolds' (2005: 271) suggestion, each interviewee had a particular area of interest and tended not to follow the questions (See Appendix 3 for a list of Canadian and Australian interviewees).

It was particularly difficult to obtain interviews in Australia especially after broadband became a major election issue in the lead-up to the 2007 election. After the election, the establishment of NBN Co. remained a highly political issue. Public servants were unable or unwilling to participate in interviews without obtaining high-level permission (which did not materialise) and NBN Co. referred instead to official documents. Even some businesses were reluctant to participate: Optus, in particular, declined an interview. Unsurprisingly, regulators (in both countries) were reluctant to be interviewed due to the nature of their role as overseers, rather than policy-makers. Fortunately, access to primary historical documents and other secondary sources were readily accessible with the majority of interviews being conducted in Canada as the case was least familiar to the researcher.

One of the most beneficial results of conducting interviews with a wide range of industry experts was to gain an understanding of the extent of the varieties of particularism that exist in communications markets. Far from being a single technology with a single application, modern broadband services are available using various technologies, can be delivered in various ways, using a variety of pricing mechanisms, to suit a variety of users and a variety of geographical conditions. Indeed, the varieties of particularism highlighted the need to understand the various technologies in some detail. It is clear that to research communications policy it is desirable that researchers possess comprehensive technical knowledge (which can be difficult to obtain from documents alone). In this regard, the elite interviews proved invaluable. Moreover, the interviews provided the impetus for further 'empirical rummaging' (Skocpol 1995: 103) using the available official documents and recorded histories discussed in the following section.

3.5.2 Official Documents and Recorded Histories

Fortunately, the historical documents dating from the beginnings of the telegraph coincide with the telegraph's ability to preserve such documents. The usual academic conventions of drawing upon reliable primary sources such as government records, newspaper reports and other secondary sources were adopted to develop the three main historical narratives of the telecommunications (Chapter 4), broadcasting (Chapter 5) and broadband (Chapter 6) industries. One of the major difficulties was to weave a narrative that was self-conscious of technological convergence – something that many of the historical authors were less inclined to recognise during periods where industries were deliberately or inadvertently diverged.[57] Nonetheless, the purpose of the 'historical rummaging' was to identify, where possible, the *ideas* and *interests* which prevailed at the introduction of each of the major technologies, and subsequently the *institutions* which developed to *enable*, *coordinate* and *regulate* the various communications technologies.

Disagreement over research methods aside, an important element of the research design presented here is not to outline a falsifiable theory or to identify a grand strategy for effective development of communication policy, but to provide a plausible reason for Australia's relatively poor performance in communications technology penetration over time. Further, the research design attempts to outline a feasible approach to understanding the impact of institutions on communications industries in cross-national perspective. Indeed, plausibility is a worthy goal for any historical explanation, or as Büthe (2002: 490) suggests:

> [I]t may be that at the level of broad historical phenomena, where the temporal dimension is crucially important to any explanation, providing such support for the plausibility of the argument is the best we can hope for, at least from any *one* scholar.

Nevertheless, in devising a feasible approach using historical accounts, particularly secondary sources, Lustick (1996) warns of selection bias:

[57] Rather than being regarded as separate industries for technological reasons, many communications industries were diverged or converged to suit business interests or existing institutional arrangements. For example, the telephone and the telegraph industries in Canada were established as separate industries due to the agreement of the major telegraph and telephone firms. Similarly, in Australia, the regulatory bodies for broadcasting and telecommunications remained separate until the Australian Media and Communications Authority (ACMA) was established in 2005.

> [H]ow is the background historical narrative which is to serve as the empirical referent in the investigation to be chosen, discovered, or manufactured? Which sources are to be consulted, which used, which discarded?

Moreover, for Falleti (2006):

> Successful use of the [theory-guided process-tracing] method requires the researcher to tap into her sociological or political imagination in order to identify the theories relevant to the problems and puzzles she seeks to explain, and to be able to derive feasible causal mechanisms. Moreover, familiarity with the case or cases under study is crucial. Familiarity with the history, historiography, and politics of the cases of study makes it possible to avoid problems of selection bias (Lustick 1996) and to improve the validity and reliability of our proposed narratives (Vitalis 2006). This requirement, in turn, poses two other practical questions: Is fieldwork always necessary? How many cases can a single author study using the TGPT method?

From these authors it is clear that there are limitations to relying solely on historical documents to gather data for the research design adopted here. To a large extent, the elite interviews provided the initial impetus to explore the historical records and helped to collect and verify ideas, and to gain insider knowledge into the respective industries. Nonetheless, the ideas, interests and institutions which enable, coordinate and regulate communications technologies served as analytical 'guide-posts' for the selection of historical material.

The main purpose of collecting the historical evidence was to construct the historical narratives presented in the following three chapters. However, two over-arching narratives – 'mosaic' (Canada) and 'monolith' (Australia) emerged which explain the major variations in the independent variables (the political and industrial institutions) and these are presented in the following section.

3.6 Two Approaches to Connecting the Nation: Mosaic and Monolith

An interesting feature of both nations is that the starting point for government authority - the original intention of the respective constitutions - did not live up to the constitutional founders' expectations in the practice of day-to-day politics. While Canada's constitution attempted to place authority centrally with the federal government, Australia's constitution stressed the rights of the six former colonies (the states) in an attempt to ensure the decentralisation of political power. Nonetheless, in practice, Canada's political life is highly decentralised while Australia's is increasingly centralised as the federal government has taken more and more power away from the states (Parkinson & Anderson 2008: 95-113). In the respective telecommunications industries, however, the constitutional intentions to enhance or curb the powers of the federal executives were not played out in the allocation of responsibility for telecommunications to the federal government. Indeed, and despite its decentralised intent, Australia's constitution explicitly gave the federal government responsibility for telecommunications.

Canada's 'mosaic' developed amid a variety of competing interests in the fledgling telegraph industry and government attempts at nation-building which were often hindered by municipal and provincial interests. The provincial governments, therefore, were able to play a major role in enabling, coordinating and regulating telecommunications infrastructure and services and for the most part, politically, were expected to do so. Indeed, the federal government's constitutional role in telecommunications was to ensure interconnection *between* provinces, not within them. Further, the municipal governments played an important role in ensuring citizens' access to communications technologies. The political imperative was thus firmly entrenched at the municipal and provincial levels, with the federal government only later becoming involved to coordinate major infrastructure projects in the interest of nation-building. The close proximity to the entrepreneurial spirit of the telecommunications industry in the United States minimised the need for government provision of telecommunications services in the more populous areas of Canada and ensured that government did little to interfere with emerging communications markets on a national scale, and larger telecommunications corporations operated across the Canada-US border with relative ease. In the meantime, provincial interests led to the formation of numerous rural cooperatives which ensured the provision of communications services to their constituent members. Such diversity of interests and institutions remains a key feature of the Canadian telecommunications mosaic today (see Figure below).

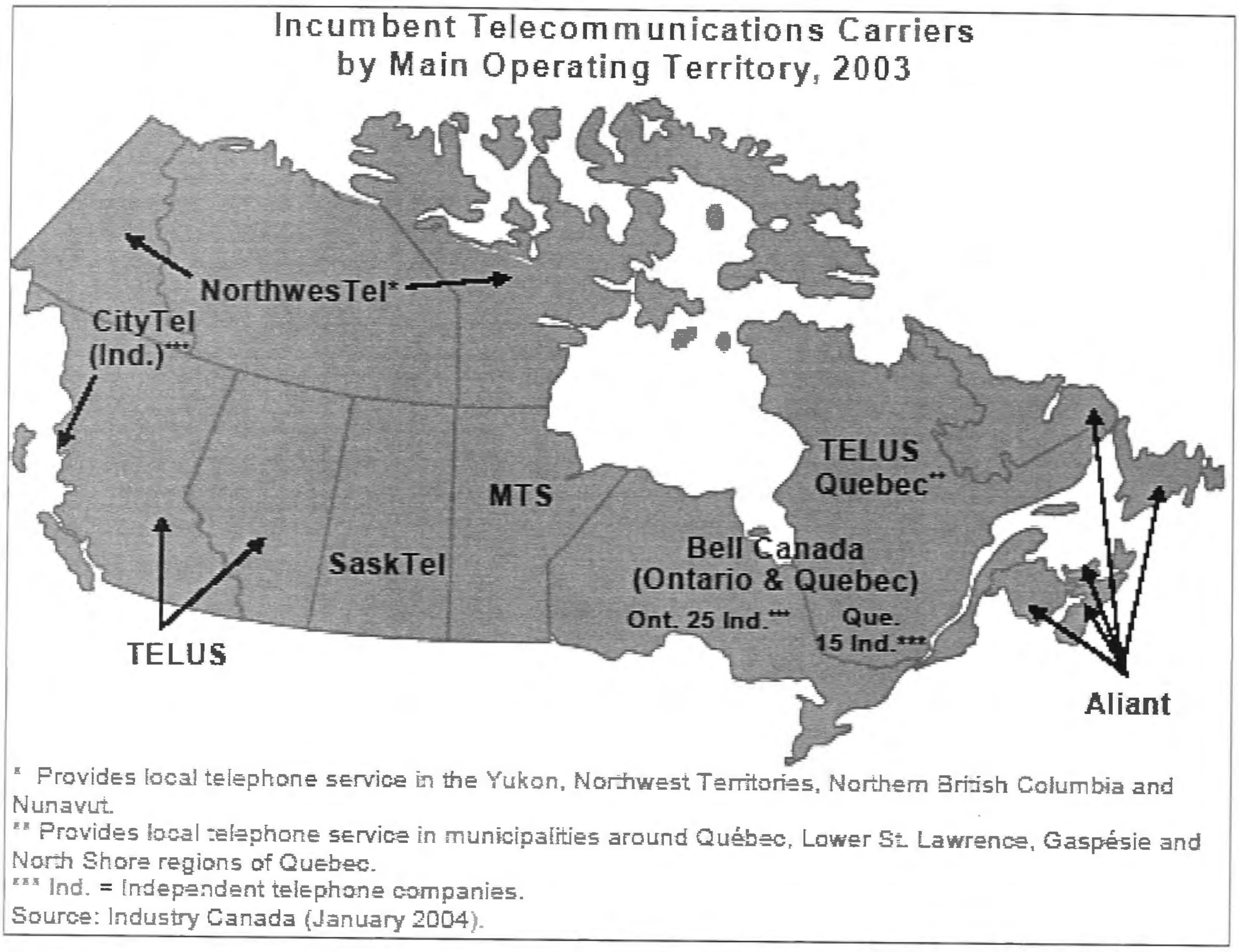

Figure 3.1: Canada's Persistent Mosaic: Incumbent Telecommunications Carriers in 2003[58]

Australia's telecommunications monolith, on the other hand, was remarkable in a political environment that was much more utilitarian than unified. Unsurprisingly, each of the separate colonies exhibited 'regional loyalties' which often resulted in a lack of standardisation, culminating in outcomes such as the 'confusion of different railway gauges' (Pike 1962: 115); a situation which still plagues Australia today. Further, the Australian colonies competed for services such as mail and shipping routes. In the early stages, new infrastructure projects might often commence as private ventures, only to be taken over by governments with access to finances which would 'ensure the progress of their colonies' (Pike 1962: 117). Yet the telegraph was different because it dealt with the sense of isolation: 'a distinctly Australian psychological phenomenon' (Clarke 2002: 119). Each of the superintendents of telegraphs in the eastern colonies communicated regularly and persuaded their governments to enable an intercolonial telegraph network and later an international link via the existing Java cable. In Henry Parkes' words, the inter-colonial telegraph network was the 'Australian scheme' which

[58] Industry Canada (2005: Figure 3.1-1)

eventually connected the colonies with Europe (Livingston 1996: 50). This early cooperation between the colonies would later see responsibility for telecommunications readily transferred to the Commonwealth upon federation, and, through extensive government ownership and control, ensure the politicisation of the telecommunications industry for well over a century.

3.6.1 Canada's Communications 'Mosaic'

Canada was quick to follow the United States in the adoption of the telegraph and the telephone. The telegraph, along with the railway, was significant in bringing together the former British colonies at Confederation in 1867 (Babe 1990: 7). The proximity of the United States (US) was a major challenge for nation-building, with the potential (and in some cases desirable) annexation of British Columbia by Washington State, and other forms of economic and cultural domination over the fledgling dominion posing persistent threats. Consequently, resisting the influence of the US featured prominently in the Canadian nation-building project (Reid 2008: 101; Neering 1990: 44). Canada was also post-Lockean but pre-Bentham in its political establishment.

To counter the influence of the US, particularly in the west, government-led deployment of communications technologies was utilised to spawn a Canadian nationalist culture, often referred to as 'technological nationalism' (Babe 1990: 6; Reid 2008: 99-101). Enabling the modern Canadian state required the deployment of a combination of communications and transportation technologies (Reid 2008: 101), particularly to overcome the vast distances between the eastern and western provinces. Once the rail and telegraph networks were established, Canada extended its economic and political structures to the western provinces and enabled both economic development and the forging of a national identity. The importance of the telecommunications and transportation industries in the Canadian economy has been an enduring feature: by the early 1970s the two largest firms in Canada were Bell Canada (telecommunications) and Canadian Pacific Ltd (railways) respectively (Chodos 1973: 10).

The confederation of the former colonies through the *British North America Act* (*BNA Act*) established the federal government's constitutional powers in relation to the telegraph. The *BNA Act* (now referred to as the *Constitution Act 1982*), section 92 (10) (a), gave provincial governments' constitutional responsibility for 'Local Works and Undertakings other than... Telegraphs... connecting the Province with any other or others of the Provinces, or extending beyond the Limits of the Province' (see Justice Canada 2009). This enabled provincial governments to coordinate the deployment of communications networks *within* the provinces, resulting in a variety of companies, institutions, and interest groups focused predominantly on intra-provincial issues. The federal government could only intervene in issues arising from the interconnection of the distinct provincial networks. Consequently, the structure of Canada's communications industries resulted in a 'mosaic' (Wilson 2000: 40) of networks, companies and institutions which continues to influence Canadian communications policy today.

A persistent feature of Canadian confederation is its dynamism: Newfoundland (now known as Newfoundland and Labrador) did not join Canada until 1949; new provinces and territories were formed out of the large Northwest Territories as late as 1999 (Nunavut); and attempts to establish the independence of Quebec as recently as 1995 (Rocher 2002), remain a challenge to national unity (Wood 2002: 326). Further, Canadian federalism is characterised by its highly decentralised political system (Simeon & Robinson 2004: 101), creating 'an ongoing source of tension' in federal-provincial relations (Bickerton & Gagnon 2004: 41; see also Bickerton *et al.* 2007: 29).[59] The decentralised nature of Canadian federalism is reflected in the communications industries which have emerged since the invention of the telegraph. According to Wilson (2000: 40):

> The principal features of the unique Canadian industry structure included:
>
> 1. A common carrier mosaic defined largely on the basis of provincial markets
>
> 2. A mixture of public and private ownership of common carriers

[59] See 'Appendix 2: Canada's Regions' for a map detailing how Canada's regions are labelled for the purposes of this study.

3. A tradition of active government intervention in the form of acquisitions and subsidies, at both the federal and provincial levels, to ensure infrastructure development

4. A system of mixed and often conflicting regulatory jurisdictions, resulting from the mosaic, that would make it difficult to plan, coordinate, and create effective policy at the national level

5. Bell Canada's presence as the dominant carrier within the telecommunications mosaic

6. The influence of American markets and American ownership of Canadian industry structure

The diverse range of interests in the Canadian telecommunications industry continues to the present day and, as will be shown later, has significantly influenced the structure of the communications industry in the broadband era.

3.6.2 Australia's Communications 'Monolith'

Australia was settled by Europeans during the height of the Enlightenment, where the state was viewed in Benthamite terms, idealistically at least, as 'a vast public utility, whose duty it [was] to provide the greatest happiness for the greatest number' (Hancock 1945: 61; see also Stokes 2004: 11 & Murray 2007). A vast social experiment consisting of 'an elite class fixed upon expansion, profit and the imperial dream; an underclass of convicts [and] emancipees [sic]...; the unfortunate and often resisting indigenes; [amid] a difficult and unyielding environment' (Genoni 2003), government in the colony emerged uneasily as a 'collective power at the service of individualistic "rights"' (Hancock 1961 cited in Gascoigne 2002: 66). Arthur Phillip, the first governor of New South Wales,[60] envisaged a settlement where grants of land encouraged free settlers to migrate to the fledgling colony, and self-sufficiency in basic foodstuffs would be achieved through the efforts of industrious, profit-motivated newcomers. However, the Imperial government did not provide adequate incentives for emigrants, and it was not until after Phillip left the colony (some five years later) that the first settlers arrived to find the colony dominated by convict labour and public enterprise (Fletcher 1967). Unlike the Canadian experience, Australia was settled along the coastline with little government incentive for settlers to move into the arid interior. For the most part, Australia's geography provided a disincentive to inhabit the inland; a vastly different approach to settlement compared to the North American experience.

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[60] Phillip is regarded as having been influenced by the ideas of the Enlightenment (Fletcher 1967; Bashir 2001)

In the early days, London Colonial Office policy focused on reducing the costs of government as much as possible by concentrating settlement and agriculture in the areas surrounding the initial site at Sydney, in the same manner of Europe's experience of settlement. Initially, there was no clear policy to support the 'sprawling pastoral industry' that emerged until, following the Bigge Commission in 1819, wool was acknowledged as a 'considerable article of export' (Gascoigne 2002: 82). Such sparse settlement was regarded by some as upsetting the 'apparatus of civilisation,' until it came to be recognised that 'Australia was far too large and too arid to be ever fully "improved" in the way of Europe' (Gascoigne 2002: 83). Nevertheless, emerging private interests in wool production brought about a greater sense of permanency to the settlement which, supported by Enlightenment concepts of 'progress' – both economic and social – enlivened the penal colony and spurred a burgeoning private-sector economy (Gascoigne 2002: 85).

Sparsely populated grazing communities provided little incentive for private enterprise to develop infrastructure. This meant that government, using convict labour, was expected to provide the necessary infrastructure to support graziers as they moved increasingly inland in search of more grazing land. Convict labour was also employed in the early pastoral industries; such work being regarded with some Enlightenment zeal as a reforming occupation to transform 'convicts into honest workmen' (Gascoigne 2002: 85). Distance from England, the use of convict labour, and the distribution of communities encouraged by the pastoral industries shaped Australia's demographic characteristics in ways that were very different from the influence of agriculture on the Canadian Prairies. In Australia, government, as the centre of 'collective power at the service of individualistic "rights,"' connected the interior to the ports. Moreover, reliance on government to develop railways was deemed by an American observer to be the result of 'local conditions rather than by a definite policy on the part of the people or the government' (Clark 1908: 401-402).

In examining colonial government policy to specifically exclude the private sector from owning and operating telegraph networks, it is useful to digress briefly to consider the rationale for government ownership of railways in Australia. In the nineteenth century, government ownership of railways was not a deliberate policy choice: the private sector was simply unable to sustain profitable railroad ventures in the midst of the high costs of obtaining finance from England, the high costs of freighting major inputs such as steel from overseas, and the distinct lack of demand from the sparsely-populated interior. Unlike their Canadian and United States' counterparts, the colonial governments in Australia did not have the power to issue land grants to private railroad companies,[61] and it was difficult to attract private English investors to infrastructure projects when mining and land interests in the colonies typically returned earnings of 20% to 50% of capital (Clark 1908: 401-403). Demand for railroads was not sufficient to provide adequate returns for private investors, but was important enough to encourage governments to meet that demand through public ownership (Clark 1908: 404).

A consequence of government ownership was that railway lines were built for political rather than commercial reasons 'at the call of private interests' (Clark 1908: 406-407). But what is clear is that there was no particular policy which forbade private ownership of railroads, and, where profitable, a few railways were still leased, owned, and/or operated by the private sector. Public ownership, then, was not so much a deliberate policy approach to deploying infrastructure, but a necessary consequence of early patterns of settlement, the lack of local engineering materials and expertise, and the ensuing economic conditions. If private enterprise had been successful in deploying a profitable railroad venture, there would have been little incentive for government to intervene. Nevertheless, government ownership of the telegraph, while influenced by the same conditions as the railway industry, was a deliberate policy of private sector exclusion from the industry.

Australia's communications industry remains largely a government-controlled 'monolith'. From its very beginnings, the Australian telecommunications industry was dominated by government, either in terms of retaining direct control of the communications network, or to eliminate competitors who might otherwise impact

[61] Free land grants ceased in NSW in 1831 (State Records NSW 2011), and Clark (1908: 403) argues that the Imperial Government's land policy 'was probably the decisive influence that turned Australia to government ownership' of railways. However, land grants were available in Western Australia, which tended to have more private sector participation in infrastructure projects prior to federation (Clark 1908: 405).

upon revenue-raising activities associated with the infrastructure. Australia was relatively isolated from other advanced economies, so there was little pressure to adopt new technologies in the early phases of each new communications technology. Occasionally, government control of communications technologies has been punctuated by attempts at privatisation and corporatisation. Invariably, however, government ownership has been an ongoing theme which continues to this day with the decision by the Australian government to deploy the National Broadband Network. Government policy has played a major role in the adoption, deployment and take-up of new communications technologies, albeit restricting privately-owned businesses to operating at the margins of the communications industries (typically as contractors to build government-owned facilities) or otherwise under strict government control. This feature has often resulted in standardisation at the expense of faster adoption of new technologies.

During the era of simple telegraph networks, the monolithic approach served Australia's communication needs well, and many instances of early innovation and a willingness to take risks occurred within a framework of government control. For instance, McGowan found little in the way of the required manufacturing technologies to provide the required insulators and had to develop his own capability to ensure the first telegraph lines were successful. Further, Australia's achievements in deploying telecommunications infrastructure include one of the earliest submarine cables in the world from Melbourne to Tasmania, and, most famously, the Overland Telegraph Line from Adelaide to Darwin which connected Australia to Britain via the Java submarine cable in 1872. However; over time and as communications technologies have become more complex, Australia's centrally-controlled monolith has not been able to deliver the variety of services enabled by modern communications systems.

Before 1901, the respective colonial governments were responsible for the telegraph within their own borders, yet cooperation was required to ensure interconnection between the colonies and with Britain, and this was achieved with relative ease: the colonies gave total telecommunications powers to the Commonwealth in section 51 of the Constitution. During a period of nation-building, when the economy remained relatively immature, central control brought to bear a coordinated effort to build significant infrastructure projects. Cooperation within the industry has been limited, however, as the private sector has always played a secondary role to government in the telecommunications industry, a role which continues despite an increasingly liberalised telecommunications market commencing in the late 1980s. This period is significant as it coincides with the emergence of the Internet, and as a consequence policies and technologies have tended to co-evolve in the Australian telecommunications industry.

3.7 Rationale for the Analysis Beginning with the Telegraph and Telephone

3.7.1 Why Start With the Telegraph?

The telegraph is the historical forerunner of broadband technologies and marks the beginning of human understanding of the relationship between power and information in advanced societies. Scholars such as Wilson (2000: 7) argue that 'the early history of the telegraph and telephone industries is extremely relevant to an understanding of contemporary telecommunications' and to understanding the industry structure, given that 'many of the firms established themselves during this period and continue to be the dominant players in the industry today'. Further, the Canadian communications scholar Harold Innis (cited in Soules 2007; see also Alexander & Galligan 1992: 20) suggested that: 'In order to understand any medium, we must attend not only to its physical characteristics, but also to the way in which it is employed and institutionalized'. The telegraph is an important starting point because many of the early institutions which continue to govern modern communications networks were formed during the telegraph era. In Canada and Australia, the respective constitutions provide explicitly for the governance of 'telegraph and other like services' (for example, in section 51(v) of the Australian Constitution) which has been extended over time to include telephony, including VoIP.

Canada's scholarly contribution to the understanding of communications technologies and society includes the work of Marshall McLuhan (cited in Babe 1990: 3-4) who suggested that 'pattern recognition' was an important tactic in understanding the influence of history on problem-solving, or how solutions to new problems are often framed by past experiences. McLuhan's approach was adopted by Babe (1990: 4) in his study of Canadian telecommunications history to emphasise 'the role of corporate and governmental power in implementing industrial devices [or 'technologies'] and processes and in structuring industries'. In addition, Wilson (2000: 7) argues that the dominant telegraph companies remain dominant telecommunications players today and many of the international institutions formed around the same time remain major players in the contemporary global communications industry. For example, the telegraph, following its invention by Samuel Morse in 1844, enabled trans-Atlantic communication with the successful deployment of a submarine cable laid by the paddle steamer, the *Great Eastern*, in 1867. By this time, numerous telegraph networks were well established throughout North America, and global efforts to promote international cooperation, particularly in deploying and standardising communications technologies, commenced in Paris in 1865 when the International Telegraph Convention established the International Telegraph Union (ITU).

The ITU continues to play a key role in coordinating the interconnection of national communications networks, including the allocation of spectrum (used for mobile telephony and wireless broadband applications) to nation-states. The idea of the telegraph as a common cross-national institutional legacy is often used to justify a behavioural, rather than an institutional, approach when explaining cross-national variation in communications technology outcomes. However, in a comparison of Canada and Australia, the behaviouralist approach is restricted in its application to domestic settings. Indeed, Alexander & Galligan (1992: 2-3) argue that comparative Canadian and Australian studies 'favour an institutional rather than a behavioural approach' because assumptions of institutional commonality, 'the usual starting point for political analysis', overlook the 'unexpected importance of contemporary concerns and domestic political traditions' which led to two different constitutional bases for developing communications policy. Indeed, in communications policy:

> 'Institutions matter': they influence norms, beliefs, and actions; therefore, they shape outcomes… 'Institutions are endogenous': their form and their functioning depend on the conditions under which they emerge and endure (Przeworski 2004: 527).

The telegraph is also an important starting point in that many of the ideas that enabled humans to begin the process of mastering time and space became a common feature of advanced societies at this time (Kern 2003: 1-2). New technological discoveries from the mid-nineteenth century led to the development of new communications devices and new industries to develop infrastructure, equipment, and content for these devices. While early signs of technological convergence were evident in many of the technological advances of the late nineteenth century, it would take almost a century of technological discoveries and manufacturing techniques to make the mass production of multifunction communications devices and infrastructure feasible. The advent of broadband technologies enabled multimedia devices to interconnect on a global scale at the end of the twentieth century, ushering in the era now commonly referred to as the information age. Nonetheless, historical legacies from earlier decisions restrict the available options for governments to develop policies that support technological development. Indeed, many of the regulatory concepts, institutions and companies from the early telegraph and telephone eras still influence the deployment and use of communications infrastructure today.[62]

3.7.2 Approaches to History and Technology

Two major studies inform the historical approach adopted in this thesis: Hughes (1993) and Nye (1992), both historians of technology, examined the influence of the cultural context in which electric power systems and the associated infrastructure and technologies evolved. These studies viewed technological adoption as 'a series of choices based only partly on technical possibilities' (Nye 1992: x) that were selectively adopted to address particular social or industrial problems. Hughes (1993: x) adopted the approach in comparative perspective and found that 'the interaction between region and technology was more notable than that between nation and technology. Influences at the national level, such as legislation, affected evolving technological

[62] The following concepts, institutions and companies hail from the early telegraph and telephone eras: The concept of the communication common carrier (Dorland 1996: 286); the Postmaster-General's Department (1901) (forerunner to Telecom Australia and later Telstra Corporation Ltd, see Telstra 2011a); the coordinating role of the International Telegraph Union (established in 1865 and became the International Telecommunication Union in 1934) (ITU 2011); the Australian (1901) and Canadian (1867) constitutions; and major global telecommunications industry players including AT&T (1876), Western Union (1851), Cable & Wireless Communications (1852), IBM (1889) and Bell Canada (1880).

systems, but local geographical factors, both natural and man-made, were more direct and discernible determinants of the shape of the systems. Stated differently, the factor endowments shaping electric power systems were more regional than national' (Hughes 1993: x).

Hughes (1993: x) also found that the history of technological systems extended beyond national borders. However, it is at this point that a distinction must be made between the influence of national and international institutions on the development of communications infrastructure. Despite 'globalisation', communications industries remain largely national in the deployment of infrastructure and associated devices. Indeed, most nation-states regard communications infrastructure as important to national security and national culture, and continue to limit the extent of foreign ownership and control of the means of communication, and protecting national cultural content, respectively. International institutions, on the other hand, tend to focus on developing or sharing 'best practice' information, the collection and dissemination of statistics, the establishment and maintenance of equipment standards, and establishing agreements on the use of radio spectrum, prices and tariffs, or cooperation in establishing cross-border communications networks. Within the nation-state, national industries have the most impact on connecting citizens in disparate locations and remain the main focus here.

A pattern which emerges from the history of 'telecommunications', defined here as electronic communication[63] between at least two geographically-isolated locations,[64] is that the separate industries developed 'around' particular devices. Technological convergence, or the tendency for communication to be 'integrated, meaning that all media— be they voice, audio, video, or data—are increasingly communicated over a single common network' (Lucky & Eisenberg 2006: 5), has only impacted upon the distinct device-based telecommunications industries (such as the telephone, computer, media, television, and radio 'industries' to name a few) in the last few decades as technological advances have improved the capabilities of devices and

[63] As in 'two-way' communication.
[64] This definition is explored in chapter 4 – the concept of 'broadband'.

infrastructure. Nonetheless, convergence is not new: broadband technologies have simply quickened the pace of technological convergence and exposed irrelevancies in the structures of contemporary 'communications' industries. The capabilities which broadband enables are nonetheless an important element of modern nation-building in both Canada[65] and Australia[66] and governments continue to play a key role in the deployment of infrastructure and the use of communications technologies.

It is near impossible to trace the development of the communications sectors in each country without referring to the actual technologies and how industry structures were influenced by the arrangement of businesses around particular devices. The chapters on the Canadian and Australian trajectories in the telecommunications, broadcasting and broadband 'industries', then, are necessarily arranged by the different technologies and how industries emerged around the particular devices which have, historically, enabled their use in general. Given the telegraph is the first means of electronic communication which enabled the general use of electronic communications technologies, it is a necessary starting point to understand how electronic communication, in its societal and institutional context, has evolved over time.

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[65] Canada's *Building Canada* plan refers to the federal government's investment in infrastructure, including broadband, in terms of nation-building. See Cannon (2007).

[66] Australian Prime Minister Kevin Rudd (2009) repeatedly referred to the National Broadband Network as an exercise in 'nation-building'.

Chapter 4: Telecommunications in Canada and Australia: Historical Trajectories

4.1 Introduction

This chapter maps the two distinct approaches to enabling, coordinating and regulating telecommunications technologies in Canada and Australia. Canada's archipelagic communities required a mosaic of different approaches by governments, businesses and cooperatives to achieve interconnectivity, whereas Australia's isolation led to the development of a government-controlled monolith focused on connectivity with Britain.[67] These two approaches inform the respective narratives of how telecommunications technologies were adopted in each country. The chapter highlights historical institutions and facilitates the analysis of the process sequencing of communications policy in Chapter 7. This chapter establishes the points of departure for the historical trajectories of communications technologies and the national policy priorities and institutions which, over time, have influenced the approaches adopted in each country to deploy broadband services in the twenty-first century. The institutions established during the telegraph era, in particular, have had a lasting impact on communications outcomes, and the general approaches adopted during this era, referred to here as policy regimes, persist in both countries.

Many of the policy choices made at the introduction of the telegraph represent points of departure which have subsequently informed the choices available to enable, coordinate and regulate later communications technologies. Indeed, institutional approaches designed to govern early communications technologies in each country changed relatively little in the broadband era, and the institutions outlined in this chapter will be shown later to be a significant explanatory variable for the variation in present-day broadband outcomes in Canada and Australia. This chapter develops a historical narrative to explain the ideas, interests and institutions as they relate to ways in which the respective telegraph and telephone industries were enabled, coordinated and regulated, up until the liberalisation of the telecommunications

[67] Wilson (2000) used the term 'mosaic' (see page 25) to refer to Canada's telecommunications industry and the term 'monolith' to refer to the American Telephone and Telegraph Company (AT&T) (see page 14).

markets in both countries in the early 1990s.[68] The chapter provides the background to explain the path dependent nature of the respective communications industries which will become apparent in the broadband era.

4.2 Institutional Origins of the Telecommunications Mosaic in Canada

4.2.1 Enabling, Coordinating and Regulating the Canadian Telegraph Industry

In the period immediately preceding Confederation, various privately-owned local telegraph networks were established in British North America.[69] Typically, business elites developed proposals to establish local telegraph networks and an act of the local colonial legislative assembly enabled the establishment of a telegraph company and its charter to deploy a telegraph line. The first telegraph system in British North America was established in 1846[70] by an act of the legislative assembly of the Province of Canada[71] which gave the private owners the power to operate and maintain the system. Initially, provisions in the enabling legislation which established regional telegraph monopolies required little intervention from governments. The telegraph provided an important infrastructure and it was necessary for governments to protect the investment of shareholders; this approach was more efficient than purely government-funded deployment. The initial outlay required to construct telegraph networks was significant: protecting the investors was a logical step in enabling private investment in infrastructure.

Canada's 'bottom-up' approach to the incubation of telegraph networks was coordinated by governments, typically on a 'first-come, first-served' basis.

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[68] This period approximately coincides with the advent of the Internet in both countries. Further, Integrated Services Digital Network (ISDN) was a precursor to broadband, and in the late 1980s, ISDN promised a 'single socket in every home, school classroom, office and factory, as well as in public places... [into which] could be plugged our phones, fax machines, TV sets and computers. With these devices we would be able to receive and send information in any form instantly, including High Definition Television (HDTV)' (Telstra 2011a). ISDN was not capable of providing these services at the time, 'but new developments in broadband technology [would] enable this to occur' (Telstra 2011a). Both Canada (see Bolter & Kelsey 1990: 300) and Australia (see Telstra 2011b) commenced the deployment of ISDN networks in the late 1980s and early 1990s, making this an appropriate end point for the 'telecommunications industry' and the beginning of the 'broadband era'.

[69] The term 'Canada' referred only to the Province of Canada until confederation in 1867. Up until that time, the term 'British North America' refers to what is now known as 'Canada'.

[70] The Toronto, Hamilton, Niagara and St. Catharines Electromagnetic Telegraph Company.

[71] The Province of Canada consisted of both modern Quebec and Ontario and came into being following Britain's defeat of the French in the Seven Years' War.

Consequently, early attempts to regulate the industry were designed to limit the physical expansion of the network in accordance with the terms of the original charter. Firms were not to expand their networks unless permission was granted by the 'Commissioners of Public Works or their Officers' (Canada 1848: 1745). Telegraph infrastructure was usually constructed along public roads and over waterways, and government regulation was largely focused on ensuring that the infrastructure did not impede public use of roads or waterways.[72] However, direct government control over the construction and use of telegraph networks was not a policy priority, and prominent businessmen played leading roles in establishing networks in each province, often receiving monopoly rights for several decades.[73] Generally, restricting competition ensured the private companies would remain viable within the area established by the originating act of incorporation.

The first large-scale telegraph company in Canada was the Montreal Telegraph Company which was established by Montreal businessmen and the Montreal Board of Trade in 1847 (Wilson 2000: 26).[74] The company's network extended to New York, marking the first 'international' connection for Canada (Huurdeman 2003: 66). Interconnection of telegraph networks in British North America and the United States became commonplace. As a consequence, the Montreal Telegraph Company later joined the cartel known as the North American Telegraph Association. This cartel saw six North American firms collaborating in regional monopolies and interconnecting with other cartel members, thus reducing their vulnerability to competition (Wilson 2000: 26). Competition in the Canadian telegraph industry, although short-lived, emerged in 1868 when the Dominion Telegraph Company was formed by a group of private investors. However, the company was shut out of the North American cartel

[72] One industry expert stated that the major role for government in this era was to 'clear the rights of way' for infrastructure deployment.

[73] For example, the Newfoundland Electric Telegraph Company, founded by Frederick Gisborne, an English engineer, was granted monopoly rights to Newfoundland's telegraph services for thirty years (Huurdeman 2003: 130; Prowse 1895). See also the New York, Newfoundland and London Electric Telegraph Company, which was given 'the sole and exclusive right to build, make occupy, take or work any line of telegraphs... during a period of fifty years' (Huurdeman 2003: 131). Further, in 1880, Western Union encouraged the Canadian government to establish the Great North Western Telegraph Company by an act of the parliament with a 99 year contract for 'exclusive interchange of business' with Western Union (which owned 51% of the shares) (Huurdeman 2003: 105).

[74] The Montreal Telegraph Company absorbed numerous local telegraph networks and quickly became a dominant actor in the Canadian telegraph industry. See, for example, Collections Canada (1848-1856) and Huurdeman (2003: 66).

and was forced to form an alliance with the Atlantic and Pacific Telegraph company in the US to enable cross-border communication. US railroad tycoon Jay Gould later gained control of Atlantic and Pacific Telegraph by forcing the company to merge with Western Union. He then attempted to gain control of the Canadian telegraph industry by competing fiercely with the Montreal Telegraph Company and had largely succeeded by 1881. According to Babe (1990: 8), 'virtually all of the Canadian industry had tumbled into US hands, only hesitantly to re-emerge under Canadian ownership with the inception of Canadian Pacific Telegraphs a few years later'.

Babe (1995: 185) argues that regulatory decisions made by Canadians in the early years of the telegraph were really 'made within the context of US influence'. Major features of the telegraph industry during this period included 'American ownership and control, government subsidy, exclusive franchises, and restrictive trade practices'. The Montreal Telegraph Company, for instance, had secured 'exclusive rights to construct lines along railroad rights-of-way', thus enabling the Company to devastate its competitors by 'reducing prices along competitive routes and cross-subsidizing losses through revenues earned on monopolized ones'. Nonetheless, government intervention did occur from time to time, either to construct telegraph lines and then gift them to the Canadian Pacific Telegraph Company, or when the Canadian National Telegraph Company was established as a crown corporation (Babe 1995: 187). The numerous, diverse approaches throughout Canada meant there was no truly 'national' telegraph monopoly for extended periods, although periods of duopoly would exist until competition from the telephone industry encouraged the Canadian National and Canadian Pacific Telegraph companies 'to cooperate rather than compete'.

During the late nineteenth and early twentieth centuries, government policy amid growing pressure from citizens focused on the coordination of national transport and communications networks. As part of growing nationalism, Canadian railway, canal and telegraph systems[75] were to be incorporated and amalgamated in a drive for

[75] In the late 1890s, a Standing Committee on Railways, Canals and Telegraph Lines established by the House of Commons presented numerous reports to the House dealing with various bills to incorporate and amalgamate Canada's railways, canals and telegraph lines (Collections Canada 1896).

control by the federal government which continued from 1896 until 1995.[76] Initially, drivers for the coordination of these systems included ongoing rebellions which troubled Canada for many years (see, for example, Collections Canada 1885), with the government only acquiring 'such lines as were required by public policy' (Copp Clark Company 1892: 195). Public control of telegraph networks commenced when British Columbia leased part of the Collins Overland Telegraph (which crossed the province) from Western Union, until later, when, upon joining the confederation, British Columbia purchased the lines outright (Olsin 1999: 147-151). What followed was a complex series of telegraph line lease agreements between the major companies (Collections Canada 1867-1875; 1902-1907; 1906-1954; 1921-1928; 1921-1944) which tended to reflect geographically discrete markets.

Telegraph competition tended to mirror railway competition, with telegraph firms gaining rights of way along particular railways.[77] Yet signs of a growing nationalisation agenda became apparent in 1883 when the federal government took over some of the Montreal Telegraph lines (Collections Canada 1867-1875).[78] By the early twentieth century, many private telegraph companies struggled to remain financially viable, and the Canadian government purchased many of the existing telegraph networks and combined them into the All-Canadian Government Telegraph Company, operated in connection with the Canadian Post Office Department.[79] The nationalisation of all the railways and the railway telegraph networks,[80] despite some opposition from shareholders, occurred over a period of years as most of the privately-owned railways

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[76] When Canadian National Railways was privatised.

[77] By 1882, Western Union, through Great North Western, had leased the lines of the Montreal and Dominion companies and had established the first large-scale network in Canada (Huurdeman 2003: 105). However, Western Union's domination was short-lived. The Canadian Pacific Railway (CPR), built on a promise made to British Columbia for joining the confederation, started establishing its own telegraph line along the railway to facilitate the coordination of rail traffic. By 1889, the CPR telegraph provided public telegraph services in competition with Great Western, on a network that ran from Halifax, Nova Scotia in the east; to Victoria, British Columbia, in the west; and extended south to Seattle and beyond to southern California (see Churcher 2008; Collections Canada 1846-1953; Collections Canada 1867-1875; Huurdeman 2003: 105).

[78] In 1876 a Select Committee of the House of Commons had advocated a national telegraph system and appointed Gisborne, founder of some of the earlier telegraph companies, as the Superintendent of Telegraph and Signal Services in 1879.

[79] This company extended the network into Yukon using, in large part, the poles constructed for the Collins Overland Telegraph in 1865, but it did not have a complete monopoly position in the Canadian market.

[80] CN Telegraphs, as the associated telegraph company became known, finalised the nationalisation agenda when it purchased the Montreal Telegraph Company in 1955 (Collections Canada 1867-1875; Collections Canada 1846-1953).

faced bankruptcy.[81] By 1923, all major telegraph companies had been purchased by the federal government (except Montreal Telegraph) (Collections Canada 1906-1954; Collections Canada 1921-1928). By 1955, Canadian National (CN) Telegraphs had purchased most of the major networks in the provinces, including those owned by Western Union and the Anglo-American Telegraph and the Dominion Telegraph Companies. CN Telegraph's role was to operate communication facilities for both railway and commercial purposes (Collections Canada 1921-1944; 1846-1957). By this time the telegraph mosaic effectively ended. However, the telegraph was no longer the dominant communications technology and the mosaic had re-emerged in the telephone industry.

The rich mosaic of the Canadian telegraph industry unfolded amid a dynamic series of mergers and acquisitions, nationalisation and so on, resulting in a range of business and government monopoly providers, all with an underlying local pragmatism to connect communities via the network. This underlying local pragmatism remains a key feature of the Canadian communications industries today. However, and despite the federal government's desire to use communications technologies as an instrument of nation-building, the early technological limitations of the telegraph necessitated local operations, and for the most part, following confederation, telegraph networks were administered by the provinces. The provinces were thus able to collect an annual tax from large telegraph operators, deemed to be *intra vires*[82] of the provincial legislatures.[83] Once telegraphic communications extended beyond provincial borders, however, there was a clear role for the federal government to enable interconnectivity across the provinces, supported by section 92 (10) of the Canadian Constitution.

During the telegraph era, the federal government faced two major policy problems. First, the developing communications 'mosaic' was not unique to electronic communications. Numerous provincial and trans-national (that is, with the US) newspapers competed fiercely for customers. The monopoly position ascribed to the

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[81] The federal government purchased the ailing railway companies (except Canadian Pacific Railways) which came under majority government ownership under the auspices of Canadian National Railways.

[82] *Intra vires*: 'within the powers of'.

[83] See Great North-West Telegraph Co. versus Fortier. 12 Quebec. K.B. 405.

dominant telegraph companies enabled the domination of both the carriage, and, with regard to news information, the content, of messages. Most telegraph operators performed the dual role of telegraph operators and news correspondents, thereby controlling the content of messages sent to newspapers. Second, the nationalisation of railways (and consequently the nationalisation of telegraph systems) resulted in two major players in the telegraph industry: the government-owned CN Telegraphs and the privately-owned CPR Telegraph. Arrangements between the telegraph companies and news media organisations had proliferated from the 1890s, but by 1907, CP Telegraphs had increased prices for its news services, and the newly formed Western Associated Press, through the Board of Railway Commissioners for Canada, challenged CP Telegraph's prices. As a result of this challenge, CP Telegraphs no longer gathered and selected news, leading to the segregation of the news media and telegraph industries.

The deliberate divergence of the telecommunications[84] and news media industries occurred officially when the Board of Railway Commissioners for Canada established the concept of the *communications common carrier* in 1910. Up until the last Canadian telegraph message was sent in 1967, telegraph companies were obliged to carry any message provided the lawful fee for carriage was paid by the content provider. The telegraph remained a major means of communication for over a century, despite the introduction of competing technologies such as the telephone. A major difference between messages sent by telegraph and telephone was that the telegraph provided a permanent communications record as part of the process.[85] Yet enduring features of the modern communications industries present in Canada today stem from this first form of electronic communication. The original institutions established to enable, coordinate and regulate telegraph services, in particular the constitution and the concept of the common carrier, set the scene for later industries emerging from new communications technologies into the present era.

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[84] Note, too, that wireless telegraphy was deliberately diverged from the wired telegraphy industry, not because of the capabilities of the technology, but because of the interests behind the particular technologies and the institutions established *before* the deployment of the newer technology. Wireless telegraphy will be addressed in the next chapter on the broadcasting industry.

[85] A characteristic which enabled Western Union's telegraph business to remain viable until at least the introduction of the teletype service by American Telephone and Telegraph Company (AT&T) in the 1930s.

Box 4.1: Issues with Early Telephone Systems

Given the limitations of the technology, telephone networks were rolled out as localised operations until advances in battery and wiring technology enabled long distance telephony (Casson 1922: 222). Consequently, the telephone was not a replacement technology for the telegraph as a result of its early technological limitations. The technological limitations related specifically to the different requirements of the telephone and the telegraph for message transmission. For instance, telegraph transmissions were sent and received by telegraph officials, and several subscribers could be placed on the same line with specific instructions for the operation of the network. During the infancy of the telephone, however, the orderly transmission of messages was difficult to achieve because communication occurred between ordinary citizens who relied on the network to order the communications process. Moreover, telegraph lines used for telephone conversations meant that other subscribers could hear conversations conducted on the same line, necessitating a different type of conduit.

The telephone provided early advantages over the telegraph for communicating over short distances (Preece & Maier 1889: 444). Where there was insufficient demand to justify the establishment of a telegraph station, telephones were less expensive. Further, there was no need to train telegraph operators to facilitate telephone conversations. Deploying telephone lines typically became the responsibility of the subscriber, resulting in ad hoc line arrangements between various locations. Consequently, the fledgling telephone industry focused on manufacturing telephone devices, rather than providing the full-service operation offered by telegraph companies. This situation did not change until public switching became commonplace (which enabled any two subscribers on a network to contact each other). For many years, switching was conducted manually (by human telephone operators) until automatic switching technologies became available some time later. Human involvement in the telephone network presented its own challenges for the industry: before switching technologies, complaints about telephone operators directing calls to 'preferred' businesses were commonplace.

Early telephone networks were restricted to the wealthy due to the cost of establishing a separate line between each two points of communication. The invention of the telephone exchange in the late 1870s overcame this early limitation and the telephone gained wider appeal, though it would not be commonplace in households until at least the 1970s in both countries.

4.2.2 Deliberate Divergence and the Canadian Telephone Industry

The telephone was patented by Alexander Graham Bell in 1876 and Canada's first commercial telephone system commenced operations in 1877 (see BCE 2011).[86] Despite Bell's invention of the telephone and ownership of the patent originating in Canada, within 'four years of the first telephone conversation, control over both the patent and a Canada-wide charter' was in US hands (Babe 1990: 8). Initially, the Montreal and Dominion Telegraph companies provided telephone devices (but not services) free-of-charge to major customers, resulting in fierce competition between the firms. However, because Canada did not recognise the foreign Bell patent, there were no legislated monopolies in the early telephone industry. Consequently, the introduction of the telephone led to the duplication of telephone networks, which did

[86] Alexander Graham Bell's father, Melville Bell, along with Reverend Thomas Henderson, operated a small Canadian telephone business by leasing handsets to customers, using lines constructed at the customer's expense.

not interconnect, and deployment of the new device was largely unregulated. Both the Dominion and Montreal Telegraph companies were distributing Edison devices and the lack of coordination of the networks resulted in the proliferation of privately-made and inefficient iron-wiring systems, often strung simply from trees.

Numerous small and rural telephone companies proliferated across Canada during the early years of the telephone.[87] Provincial governments, keen to promote the use of the new technology, provided subsidies which were payable upon construction of telephone networks; this no doubt played a major part in the growth of these smaller, local networks. For the most part, the telephone could be seen to fill gaps in the market where it was uneconomical to provide a telegraph station, hence the number of rural telephone networks established throughout the provinces. Many of these smaller networks, particularly in Canada's east, were subsumed by Bell Canada's network following its establishment by federal charter in 1880.[88] Nonetheless, Bell Canada did not become a truly national monopoly player due in large part to the influence of the US industry,[89] and the use of Bell devices in both Canada and the US would have a significant impact on the future of the Canadian industry. In particular, Western Union, with Thomas Edison a leading player, had attempted to thwart Bell's ownership of the telephone patent in the US, but when a court decision ruled that Bell was the legal owner of the patent, an agreement between Western Union and Bell was reached where Western Union agreed (see Casson 1922: 83):

> 1. To admit that Bell was the original inventor.
> 2. To admit that his patents were valid.
> 3. To retire from the telephone business.
>
> The Bell Company, in return for this surrender, agreed –
>
> 1. To buy the Western Union telephone system [Edison's device].
> 2. To pay the Western Union a royalty of twenty per cent on all telephone rentals.
> 3. To keep out of the telegraph business.

[87] For example, in Prince Edward Island alone (the smallest of the provinces), there were over 50 telephone companies by the 1930s. Further, many businesses (such as mining companies) established telephone connections between different locations of their business operations (Higgins 2008).

[88] Bell Canada was regulated federally, except for its requirement to abide by the rules for deploying infrastructure established by municipal councils. To retain the Bell patent in Canada, Bell Canada was required to maintain an office and to manufacture its equipment in Canada, but nationalist sentiment resulted in the Bell Canada patent later being voided by the federal government anyway.

[89] There were also numerous provincially-regulated monopoly providers which restricted Bell Canada's national monopoly provision. Nonetheless, many of the local and provincial services would later become interconnected under Bell Canada's leadership.

This agreement meant that the telegraph and telephone industries were effectively diverged – not by technology, but by agreement between the major industry players. National Bell[90] in the US took over the regionally-based Western Union telephone networks in addition to its own. Eventually, the American Telephone and Telegraph Company (AT&T) purchased the patent for the Bell telephone system and maintained a monopoly until the end of the 1800s.[91] AT&T dominated the North American market until the patent expired, at which time competition arose from smaller, entrepreneurial firms. To maintain its competitive position, president of AT&T, Theodore Vail, who had envisioned a 'grand telephonic system' and included Canada in AT&T's charter (Casson 1922: 173), encouraged ongoing innovation through research and development to maintain AT&T's dominance. Once long distance telephony became practicable, Vail's strategy of 'one system, one management, universal service' (Franklin Institute 2009) enabled the company to retain its market dominance by deploying telephone lines which interconnected many of the existing regional American Bell networks throughout North America.

While not a deliberate public policy, the 'bottom-up' incubation of various telephone networks met local demands in the short term, and encouraged developments for greater interconnection of the local networks as the technology improved. This process was effective: by 1910, Canada ranked second in the world for teledensity with 3.8 subscribers per 100 people, behind the US with 8 (Huurdeman p. 230). By 1940, Canada ranked third in the world for teledensity with 12.8 subscribers per 100 people, behind the US and Sweden with 16.6 and 14.3 respectively (Huurdeman 2003: 233). While regional monopolies existed, the large companies did not serve many areas where rural and smaller providers existed. During the drive for nationalisation of the major Canadian industries in later years, many of these smaller firms were purchased by provincial governments and municipally-owned electricity companies (Collections Canada 1900-1966 R606-13-7-E). Historical records indicate that there were

[90] National Bell of Boston was the name of the company established by Alexander Graham Bell in the US. The company later changed its name to American Bell Company. Theodore Vail, as Chief Operating Officer of American Bell, began establishing a series of companies known as Bell System companies. These included the purchase of Western Electric, enabling the Bell System to offer local services, long distance toll services, and to manufacture equipment. Here, the names National Bell and American Bell refer to the early US companies, whereas Bell System refers to either the collective of Bell companies or the 'Bell system' of devices.

[91] AT&T started as a wholly-owned subsidiary of American Bell in 1885. In 1899, AT&T purchased the assets of American Bell and became the parent company of the Bell System.

complaints about Bell Canada's prices when it took over the Heckston Rural Telephone Company (Collections Canada 1913-1919 R164-14-8-E); but equally, customers requested service from Bell Canada in areas where smaller companies maintained a local monopoly (see for example Metcalfe Telephone Ltd in Collections Canada 1962-1973 R164-70-7-E). Further, Bell Canada did not adequately maintain all of the networks it acquired, with many being purchased by provincial governments (in response to citizen-led movements – see Bell Canada 2009) and some provincial operators as late as the 1970s (Higgins 2008).

Nevertheless, many of Canada's major telecommunications industry players were established around the beginning of the twentieth century. For example, Northern Electric[92] was founded by Bell System companies in 1895 and became a major manufacturer of Bell system equipment (Huurdeman 2003: 181). The company still exists as Nortel Networks, a major global provider of communications networks and equipment. Indeed, many Bell System companies established during the early decades of the twentieth-century remain major industry players. For example, the International Telephone and Telegraph Company (IT&T and later ITT), established by Bell Systems in Cuba in 1920, became Alcatel-Lucent in 1987, incorporating the French company CGR, Bell Labs, and Alcatel and Lucent Technologies (all offspring of AT&T). Using the approach adopted by AT&T (Collections Canada 1906-1975 R3674-0-1-E) to interconnect smaller networks, Bell Canada established a dominant position which remains to this day. However, and despite Bell Canada's market dominance, in 1987 there were still 81 providers in the Canadian telephone industry, although 16 providers accounted for 98% (including Bell Canada with 55%) of the industry's revenues (Babe 1990: 29).

Out of necessity, a great deal of cooperation existed[93] among the numerous Canadian firms, and inter-firm coordination had a long history. In 1921, the Telephone Association of Canada (TAC) was formed by the seven major telephone companies to:

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[92] Northern Electric was an offshoot of Western Electric and included a Montreal-based wire and cable factory, known as the Imperial Wire & Cable Company, before becoming part of Northern Electric.

[93] As most local monopoly providers, otherwise known as incumbent local exchange carriers (ILECs), were regulated provincially, Bell Canada, as a federally incorporated company, had to cooperate to enable all companies in the

protect telephone investment; to establish uniformity of construction, maintenance, operation and accounting; to disseminate useful information; to cultivate cordial relations and to do all things necessary to systematize, unify and render efficient telephone service in the Dominion of Canada.

TAC investigated the establishment of the Trans-Canada Telephone System and brokered agreements between its members to share the costs of establishing the network (Bonneville 1932: 228-243). Known colloquially as the Copper Highway, the Trans-Canada Telephone System was completed in 1932, with cooperation between the major industry players an important element of its success. TAC's study for the Trans-Canada system was conducted by Bell Canada, and a great deal of information was shared between TAC's members, resulting in standardised procedures for maintenance and testing of the system, based on Bell's own procedures. The extensive mosaic of networks required government intervention 'to integrate national telephone service[s]' (see Babe 2009). TAC would become Telecom Canada in 1975 and then the Stentor Alliance in 1992, and in addition to managing and monitoring the interprovincial network and revenue sharing, the organisation provided a platform for the major providers to lobby government (Wilson 2000:37).

Technological convergence between the telecommunications and broadcasting industries became apparent at this time with the introduction of satellite communications (via Telesat), thus setting the scene for the communications industry which emerged towards the end of the twentieth century. Nevertheless, Canada's communications 'mosaic', overlaid by regional monopoly providers, remained stable until the introduction of competition in the early 1990s. During the 1970s, pressure to enable competition in the telecommunications industry surfaced and the regulatory structure which exists in the broadband era (discussed in Chapter 6) emerged. Early moves towards competition were predicated on the common carrier concept, but there was little clear policy guidance from the federal government. However, in 1976, the passing of the *Canadian Radio-television and Telecommunications Commission Act* (CRTC Act) saw the role of the Board of Transport Commissioners transferred to the

alliance to make the Trans-Canada Telephone System (as the system managed by TAC was known from 1932-1975) function effectively. Much of the formal cooperation between the major Canadian telecommunications providers ended with the dissolution of the Stentor Alliance in 1999 (see Babe 2011) under continued pressure from the Competition Bureau and various industry players (see Competition Bureau Canada 1996a, 1996b, 1996c).

then Canadian Radio and Television Commission, bringing together the regulation of the telecommunications and the broadcasting industries, albeit in two distinct functional areas. Amid global and local pressure for competitive telecommunications services, the CRTC finally allowed long distance telephone competition in 1992, and extended competition to local services in 1997. During this period, the introduction of the *Telecommunications Act 1993* provided the first clear policy guidance for the regulator in many years. The *Telecommunications Act* clearly stated that 'telecommunications performs an essential role in the maintenance of Canada's identity and sovereignty', and set out the following *policy objectives*:

> (a) to facilitate the orderly development throughout Canada of a telecommunications system that serves to safeguard, enrich and strengthen the social and economic fabric of Canada and its regions;
>
> (b) to render reliable and affordable telecommunications services of high quality accessible to Canadians in both urban and rural areas in all regions of Canada;
>
> (c) to enhance the efficiency and competitiveness, at the national and international levels, of Canadian telecommunications;
>
> (d) to promote the ownership and control of Canadian carriers by Canadians;
>
> (e) to promote the use of Canadian transmission facilities for telecommunications within Canada and between Canada and points outside Canada;
>
> (f) to foster increased reliance on market forces for the provision of telecommunications services and to ensure that regulation, where required, is efficient and effective;
>
> (g) to stimulate research and development in Canada in the field of telecommunications and to encourage innovation in the provision of telecommunications services;
>
> (h) to respond to the economic and social requirements of users of telecommunications services; and
>
> (i) to contribute to the protection of the privacy of persons.

The Act further established a clear definition of the term 'telecommunications' as 'the emission, transmission or reception of intelligence by any wire, cable, radio, optical or other electromagnetic system, or by any similar technical system'. Interestingly, the CRTC's *Report on New Media* left Internet content and services largely unregulated, except for 'high-speed access rates between cable or telephone companies, and Internet Service providers' (Media Awareness 2009). Nonetheless, the Stentor arrangements came to an end under pressure from the Competition Bureau Canada (1996) as a general policy of competition and deregulation took hold during the latter part of the twentieth century. By the 1990s, with the emergence of publicly-available access to the Internet, the term telephone industry was obsolete, and there were 'three dominant axes of power within Canadian telecommunications: carriers, the federal government, and major user groups' (Winseck 1995). Nevertheless, over more than a century of competition, the cooperative mosaic of private interests and government ownership was largely intact at the beginning of the broadband era in Canada.

4.3 Institutional Origins of the Government Monolith in Australia

4.3.1 Enabling, Coordinating and Regulating the Government Telegraph in Australia

Serendipitously, it was a Canadian who transferred telegraph technology to Australia in 1853.[94] Samuel McGowan,[95] an experienced entrepreneur who had witnessed the burgeoning private telegraph companies in North America, had plans for his own telegraph company in Victoria (see Moyal 1984: 16-17). When McGowan arrived in Victoria with several sets of telegraph equipment and a copy of the *Canadian Telegraph Act*, he set about demonstrating the new technology to find interested backers for his company. Despite an initial lack of interest, the Victorian Government soon called for tenders to establish an experimental telegraph line between Melbourne and Williamstown, but insisted that ownership would remain with the government. McGowan had been warned that 'any independent approach [to deploying the telegraph] would meet "the utmost resistance."' Technology transfer occurred, but not policy transfer. Nonetheless, McGowan was awarded the construction contract with the understanding that he would become the 'general superintendent of the new [public] electric telegraph of Victoria' (Moyal 1984: 17-18, see also Museum Victoria 2011/1887). Private businesses operated as construction contractors, but owning and operating telegraph lines was the sole domain of government (Hunter 2000: 44-50).

[94] Coghlan (1900: 711) and the Burke Shire Council (2011) claim that the first telegraph in Australia appeared in NSW in 1851.

[95] McGowan was born in Ireland and was educated in Kingston, Ontario. He studied under Morse but also worked with the earliest telegraph companies in Canada, including the Toronto and Buffalo Electro-Magnetic Telegraph Company, the Montreal Telegraph Company, and the New York, Albany and Buffalo Telegraph Company (see Gittens 1974 and Museum Victoria 2011/1887). McGowan had studied under Morse and was a competent telegrapher and had worked on the construction and operation of these telegraph lines.

The other Australian colonies, with the exception of Western Australia, opted for Victoria's public ownership model: they, too, resisted private attempts to own and operate telegraph lines. For instance, Charles Todd, who would later lead the construction of the Overland Telegraph Line (OTL), was recommended by the London Colonial Office as the superintendent for South Australia's telegraph system. On the same day that Todd arrived in Adelaide in 1855, a private telegraph line funded and constructed by James McGeorge (Moyal 1984 and ABS 1900) commenced operations. McGeorge had been refused assistance by both the South Australian government and the local chamber of commerce but went ahead with his network anyway. This created problems for Todd as McGeorge's line had captured the market, causing 'the immediate revenue' from the government's duplicate line to be 'infinitesimal' (ABS 1900: 101). McGeorge's line was subsequently purchased by the South Australian Government and dismantled in 1856 to prevent further competition (ABS 1900: 101; Moyal 1984: 20), effectively bringing to an end private sector ownership and operation of telegraph lines in South Australia, too.

Public ownership of telegraphic infrastructure was adopted by New South Wales, Queensland and Tasmania, with construction being undertaken by Canadian[96] or local private companies under government contracts. Coupled with colonial hopes 'of mutual goodwill and of rapidly increasing prosperity,' a variety of American and British telegraphic devices were adopted to interlink the colonies in a relatively standardised fashion, with demand driven by the commercial benefits of faster communications encouraging continued government expenditure on the deployment of more telegraph lines (Moyal 1984: 23-24). As with railways, only in Western Australia did the private sector play an early part in building, owning and operating the infrastructure until such time as the Western Australian government, under pressure from residents, saw the value in the new medium and the commercial operators were bought out. Like McGowan, the entrepreneur who enabled the establishment of the privately-owned network in Western Australia became the first superintendent of telegraph in the colony (Moyal 1984: 28). In effect, colonial governments captured the expertise of the

96 W.H. Butcher, one of the Canadian contractors, would later accept the position of superintendent of telegraph with the Tasmanian Government.

original telegraphic entrepreneurs who, possibly reluctantly, substituted the status of a government position for the potential profits of private enterprise (Moyal 1984: 28).

Colonial unanimity on the public ownership of telegraph networks had its advantages. In contrast with the development of the colonies' railway and electricity networks, colonial governments had, although with some rivalry, cooperated to enable interconnectivity of the separate colonial telegraph networks, and by 1857 postal and telegraph matters featured regularly in intercolonial consultations and appeared as news items in newspapers (Livingstone 1996: 27-29). As competing shipping technologies and faster international shipping routes were adopted, the hubs for mail arriving in Australia shifted among the major cities and New Zealand, affecting the speed and priority of the transmission of news arriving from overseas to the regions (Livingston 1996: 31-33). As telegraph networks developed, so too did regional newspapers (Morrison 2005: 141). The delivery of mail and news across colonial borders required greater cooperation, leading to increasing calls to establish a customs union, in the form of federation, in the second half of the nineteenth century.[97] Cooperation was necessary, as newspapers and businesses called for 'major reforms' in the intercolonial telegraph service: problems of delays, particularly at intercolonial connection points, led to the development of additional and more direct telegraph wires between major population centres (Livingston 1996: 55).

The capabilities of early telegraph technologies restricted the extent of interconnectivity that could be achieved, especially across large expanses of ocean. With the successful deployment of the transatlantic cable in 1866, however, it was recognised that it would only be a matter of years before Australia would be connected with Britain. By 1869, Tasmania was connected to the mainland telegraph network via the first successful submarine cable in Australia, and in 1872 the construction of the OTL enabled communication between Adelaide and Darwin. Subsequently, the OTL linked to the Singapore-Java submarine cable,[98] connecting

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[97] See Livingstone (1996) for further details. Although cooperation was an important feature of intercolonial telegraphic communications, intercolonial competition ensured that 'cooperation' was achieved only through vigorous debate and politicking.

[98] The Singapore-Java cable was established by the British Australian Telegraph Company, an early predecessor to the British Cable & Wireless Group. The Cable & Wireless Group was predominantly owned and controlled by Sir John Pender and the Pender family until the Group was nationalised by the British Government in 1947, despite

Australia to the existing international telegraph network (ASTHC 2000a:529). Government (despite some intercolonial rivalry[99]) had achieved what is considered to be one of the greatest civil engineering feats in Australian history, if not the nineteenth century, leaving little room for a commercial communications industry to develop.

Government ownership of telegraph networks was the norm throughout Britain and Europe. In 1869, the government-owned British Post Office took ownership of the formerly private telegraph networks and amalgamated the telegraph and post offices in Britain, and over time, the Australian colonies followed the British example. To a large extent, the co-location of telegraph offices with post offices facilitated greater intercolonial cooperation (Livingston 1996: 5). In Australia, government ownership of both the telegraph and postal systems, and the move by the colonies to administer posts and telegraphs under individual departments of posts and telegraphs, made the transition of posts and telegraphs to the jurisdiction of the new federal government relatively easy. At the time of federation, the new Commonwealth Government readily[100] assumed the constitutional power to legislate in relation to telecommunications (Putnis 2002). The inclusion of '[p]ostal, telegraphic, telephonic, and other like services' in section 51 (v) of the *Australian Constitution* was significant for the future development of national policy and the assumption of legislative and regulatory functions relating to telecommunications, and later, broadcasting services.

The significance of the term 'other like services' in the Constitution would become apparent when Marconi's invention of the wireless telegraph simultaneously enabled the development of radio broadcasting – an early indicator of the technological convergence which has continued into the present. Yet wireless telegraphy was not

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Cable & Wireless' petitions. The assets of the Company were subsequently integrated with those of the British Post Office.

[99] For example, the Overland Telegraph Line (OTL) was not the only attempt to connect to Darwin in preparation for the international link. The Queensland Government had attempted to secure the connection to the overseas link with their own telegraph line around the Gulf of Carpentaria, but this venture failed when the South Australian Government agreed to cover some of the costs of construction for the British Australian Telegraph Company. Further, some historians argue that South Australia denied Queensland 'permission to run the cable through South Australian territory' (see http://australia.gov.au/about-australia/australian-story/overland-telegraph for more information).

[100] Although Moyal (1984: 88-9) outlines the reluctance of some of the Colonial Postmasters-General to lose their positions of power, and some of the political difficulties associated with filling the position of Federal Postmaster-General, there was no significant challenge to the federal government's power to manage the national telecommunications network.

regarded the same urgency as wired telegraphy, and the government wavered in its response to the new medium before responsibility for wireless telegraph was transferred to the Department of the Navy in 1915.[101] Nonetheless, there was little incentive for the private sector[102] to compete with the government-owned monopoly on both the hard-wired and wireless technologies. Indeed, these technologies would be treated very differently (in terms of their prescribed functions) until the advent of radio and hence the broadcasting industry. For the most part, federal telecommunications policy focused on setting rates and moving, gradually, towards standard fees and charges across the states. With very little private sector involvement in the industry (beyond construction contractors), federal telecommunications policy focused almost exclusively on delivering services to citizens while attempting to keep costs under control – the Postmaster-General's Department would continue to operate in this manner until 1975.

One feature of government ownership was that telecommunications was a persistent political issue. Before federation, it was accepted 'by colonial Governments, [and] acknowledged at the Intercolonial Conference of 1873, that in a vast country telecommunications was and should, if necessary, be maintained in the Colonies "at some pecuniary loss"' (Moyal 1984: 33-34). Rather than being dictated by market forces of supply and demand, telecommunications outcomes were most often determined by political, rather than economic, needs. Indeed, as Colonial Governments had monopolised the telegraph network, there was an expectation that these government-funded services would meet the demand, even if it meant running the services at a loss. After federation, this trend continued. For example, in the lead-up to the 1910 Royal Commission into Postal, Telegraph and Telephone Services (AT&T 1913: 64), the Member for Maranoa, James Page, commented:

> [N]ot a mile of new telegraph line, except in connexion with new rail ways, has been erected in that State since Federation was inaugurated... Notwithstanding the public complaints, and my efforts, I cannot get the

[101] See the *Year Book* series by the Australian Bureau of Statistics from 1907 up until 1917, when the section on wireless telegraphy was discontinued due to the First World War. For many years, wireless telegraphy was regarded as primarily a matter for shipping, in particular the Navy, and not as an alternative means for general communication. The *Wireless Telegraphy Act came* into effect in 1905 but the significance of wireless technology beyond telegraphy would not be fully realised until radio launched the broadcasting industry in the 1920s. This discussion is continued in chapter 5.

[102] That is, beyond the monopoly position in wireless technology that was eventually negotiated with Amalgamated Wireless (Australasia) Ltd (see chapter 5).

> Department to move, and so desperate are my constituents becoming that some of them talk of voting against me because nothing is done for them. I ask the Postmaster-General to give us fair treatment.

After two years of investigation, the Royal Commission found that sufficient funds to maintain the telecommunications network were withheld by the Treasurer to achieve other political aims in federal-state relations. According to the Royal Commission, 'the system of management [was] faulty, in that it permitted the Treasurer to assume financial control of services for whose efficiency he was not responsible' (AT&T 1913: 44-45). Federation added another layer of control by bringing together the Colonial telegraph networks under the control of the Postmaster General's Department. This, in turn, brought together the various interests at play in telecommunications, leading to a large number of complaints about telecommunications services. The Royal Commission (1910: 187, para 1071) reported:

> [T]hat the number and magnitude of the complaints received indicate the existence of strong dissatisfaction among the public with the Postal, Telephone and Telegraph services. Your Commissioners are of the opinion that the bulk of complaints were entirely justifiable, and are convinced that to obtain an efficient service it is essential that improved methods of Management, Finance, and Organization be promptly adopted.

Meanwhile, 'official jealousy' concerning appointments, political pressure undermining the authority of the deputy postmasters-general, the unwillingness of the Permanent Head of the Department to leave the central headquarters and a culture of reporting rather than taking action created a 'distinct weakness in the system of control'. Given that the Minister 'permit[ted] political pressure to influence him in reviewing actions' taken by his deputies, the apparent attempt at avoiding 'over-centralization' was thwarted by politics (ABS 1910: Vol. IV, 17). A decade earlier, the NSW Statistician (Coghlan 1900: 713) had claimed enthusiastically:

> In no country in the world has the development of telegraphic communication been so rapid as in Australasia, and in none has it been taken advantage of by the public to anything like the same extent.

Yet at the height of the telegraph era, Australia's enthusiastic response to telecommunications technologies was not reflected in the outcomes achieved by the centrally-controlled monolith.

4.3.2 Unplanned Convergence and Telephone Services in Australia

The first telephone system in Australia commenced operations in 1878,[103] just two years after the telephone was patented by Alexander Graham Bell. However, the first system was restricted to point-to-point communication until the first telephone exchange commenced operations in Melbourne in 1880. American businessmen Masters and Draper (see Moyal 1984:75) established the exchange as a private firm, the Melbourne Telephone Exchange Company Limited, and patented their own design. At first, the Victorian Government seems to have displayed very little interest in the new technology, even though the Melbourne exchange began operations some two years before London opened its own exchange (Mellor 1974). Indeed, a culture of opposition to private sector interests in telecommunications is apparent at the time, especially from the Chamber of Commerce in Melbourne, which led to the Victorian Government forcibly taking over the exchange. Davison (1978: 26) claims that the government takeover was largely a result of pressure from the Chamber of Commerce due to subscriber complaints about the exchange's efficiency. While the number of subscribers almost doubled following the takeover (Hunter 2000: 8), consumer charges for telephone services were cheaper under government ownership (Davison 1978: 26). Regardless, at that time in the colonies, government policy was clearly focused on protecting existing domestic primary industries (Adams 1869: Sala 1885: 10; see also Davison 1979: 24), not enabling new tertiary industries.

Moyal (1984: 71-78) points out that, unlike earlier problems associated with the lack of local manufacturing capabilities for telegraphic equipment, local invention and innovation was 'most fertile' in the early days of the telephone in Australia. Effectively, the new technology energised various Australians who were interested in experimenting with the new communications devices (see also Telecom Australia 1980). Henry Sutton (see McCallum 1976), for example, invented 20 different telephones but failed to take out patents on his designs, and some 16 of his designs

[103] There is some disagreement over which telephone line was first: On 2 January 1878, McLean Bros & Rigg (see Museum Victoria 2011) in Elizabeth St in Melbourne connecting with their Spencer Street Depot, or the system established by Robison Brothers, connecting their Flinders Street Office to their South Melbourne works in 1879 (see Moyal 1984: 73).

were later patented overseas. Moyal (1984: 78) suggests that a 'contemporary tendency to ignore indigenous inventiveness' existed during this period. The proprietors of the Melbourne Telephone Exchange, Masters and Draper, used their own patented design to establish their business in Melbourne. Despite Master's and Draper's success, other Australian inventors, such as J.E. Edwards (see Moyal 1984:72-73, for example), had patented several designs and later operated a 'flourishing' Melbourne telephone business until 1885. Edwards was mentioned by the Victorian Postmaster-General during the proposed government takeover of the Melbourne Telephone Exchange Company as:

> the first; but he seems to have been more of a practical electrician than a commercial man. He was not so active as the company have been in pressing this - as it was then - new invention on the public notice, and he did not increase the business to any large extent, while they have gone ahead. I have no doubt beyond their expectations.

It is interesting that the Masters and Draper design, the first telephone exchange in the country, was not adopted elsewhere. Similarly, Edwards' achievements as the original pioneer of telephone exchanges did not go unnoticed by Derham, then Postmaster-General of Victoria. However, when it came to establishing exchanges in Brisbane and later Sydney (Telstra 2011c), overseas equipment was adopted with no consideration for what had been established locally. Further, E.C. Cracknell (see Affleck & Rutledge 1969), superintendent of telegraphs in NSW, prevented a telephone line being connected between the General Post Office in Sydney with the Royal Exchange. Businessmen at the Royal Exchange decided to build their own telephone exchange to connect to Sydney's docks and this proved to be successful until the exchange burnt down. By this time, Cracknell had decided to open an exchange at the Sydney Post Office so the private venture, along with Australia's local telephone manufacturing industry, ended abruptly.

According to McLean (1984: 1-2), by 1901 'there were fewer than 33,000 telephone instruments in use among a population of 3.8 million – less than one for each 100 people'. At federation, the *Post and Telegraph Act* of 1901 gave the Postmaster-General the power to regulate the cost of telephone calls and there were various attempts to standardise fees across the country. Annual fees or 'flat rates' soon gave way to a 'toll' or 'measured rate' system to remove discrimination 'against subscribers who made little use of the phone' and, allegedly, to discourage 'the practice of subscribers granting non-subscribers use of their telephones without payment' (McLean 1984: 4). According to McLean (1984: 18), to change post and telegraph charges required a change in legislation, whereas telephone charges could be changed by the department. This meant that 'telephone charges rarely featured in parliamentary discussion'.

The convergence of posts, telegraphs and telephones in the colonies established a precedent that was readily incorporated into the Australian constitution at federation in 1901. Moreover, almost fifty years of colonial cooperation in posts and telegraphs enabled the telecommunications industry to be assumed by federal government under its constitutional responsibilities for 'postal, telegraphic, telephonic, and other like services' (Livingston 1996: 4-5). Further, both world wars served to increase the preponderance of government monopoly provision as defence powers and telecommunications powers reinforced each other. As such, it would be unreasonable to expect that the amalgamation of the various services would be a seamless process. Nevertheless, the government monolith continued to have problems well into the 1920s, where periods 'of unsatisfied demand for telephones' existed. McLean (1984: 2) suggests that this was either because of 'shortages of materials, or government directives' or simply because 'the spread of telephones [w]as a process of diffusion towards some level of market saturation'. Regardless, persistent issues such as the Postmaster-General's pricing policies and conditions 'clearly reflect[ed] government policy and were intended to favour particular groups – and not just farmers' (McLean 1984: 42). By this time, telecommunications was firmly entrenched as a political tool – what is referred to here as a 'policy lever' – to be 'pulled' whenever government needed to secure votes.

The global economic crises of the 1970s triggered significant social policy changes under the Whitlam Government.[104] Responsibility for postal and telecommunications services, which had been amalgamated under the control of PMG from 1901 until 1975, was separated into two statutory monopolies: the Australian Postal Commission

[104] The Whitlam Government was the first Labor government since 1949.

(trading as Australia Post), and the Australian Telecommunications Commission (trading as Telecom Australia).[105] Domestic telecommunications remained under the regulation of Telecom Australia, which retained responsibility for equipment, infrastructure and administration of telecommunications services. Telecommunications policy focused on the concept of the 'universal service obligation' which was a key component of the Australian telecommunications framework for many years (DCITA 1997). Nonetheless, the new governance arrangements for telecommunications provided a more 'business-like' approach to service delivery and somewhat shielded Telecom from the political concerns that often plagued PMG (Moyal 1984: 299, 312). By 1980, Telecom had teledensity in Australia at a level of almost one telephone for every two Australians (McLean 1984: 1-2). Nonetheless, Telecom was plagued by 'a distinctly unfavourable image compounded by extravagance, inefficiency and high cost to the consumer coupled with large profits for itself' (Moyal 1984: 309).

During the 1980s, global trends perpetuated a move away from public ownership of telecommunications infrastructure (in most of the highly-industrialised countries) toward market-based solutions designed to reduce the cost of providing government services (Martyn 2003: 327).[106] Up until this time, monopoly provision of telecommunications services had been supported by assumptions pertaining to 'natural monopolies'. However, a Committee of Inquiry into Telecommunications Services in Australia was appointed in 1981 to investigate, among other things, 'the extent to which the private sector could be more widely involved... in the provision of telecommunications services' and the relevant issues surrounding a move to a competitive market system (Commonwealth of Australia 1982: 1). Early moves towards a market-based telecommunications sector began with Telecom's 'keeping you in touch with tomorrow' external borrowings as a way to fund capital expenditure (Moyal 1984: 309-311). Politics, however, was never far away and a dispute with trade

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[105] International telecommunications services were provided by the Overseas Telecommunications Commission (OTC), which was also a statutory monopoly (see Martyn 2003: 328).

[106] See Raiche (1997): 'The Uruguay Round of the General Agreement on Trade And Tariffs (GATT) negotiations, which included trade in services, meant liberalisation of telecommunications regimes was truly on the international agenda'.

unions in 1978, initially over new equipment[107] that resulted in job losses, caused political problems for the government.

Bob Hawke (cited in Moyal 1984: 323), then President of the Australian Council of Trade Unions (ACTU), claimed that the government, in refusing to let Telecom management negotiate with the unions, 'was facing a Luddite position, that if it went ahead and introduced the new equipment in disregard of the wishes of its employees the danger of sabotage was real'. According to Moyal (1984: 315-335), much of the debate over the introduction of new telecommunications technologies was linked to issues about the responsibility for public entities to provide employment. With rising unemployment coinciding with Telecom's increasing profits, social justice issues affected by technological change outweighed consumer demands for the provision of improved telecommunications technologies. Disputes with unions about wages and the introduction of new technologies did not go away, and the politics of telecommunications soon became more intense as Telecom attempted to capture new technologies such as cable television and videotex (Moyal 1984: 379). As the capabilities of telecommunications technologies extended beyond the telephone, Telecom increasingly encroached on the private sector, in particular Kerry Packer's Publishing and Broadcasting Ltd, and political pressure to move to a market-based telecommunications sector increased.

The Davidson report[108] recommended the introduction of a competitive telecommunications market, with Telecom Australia reconfigured as a government-owned incorporated company, with responsibility for equipment regulation and manufacture transferred to separate entities. In effect, Davidson was introducing a 'user-pays' principle into the provision of telecommunications services that did not fit comfortably with the ideas of universal service established years before. While the Fraser Government set about implementing Davidson's recommendation, but in 'measured stages', the embeddedness of telecommunications in the Australian political psyche enabled the Hawke Government to go to the polls in 1983 with a commitment to retain the ATC (Telecom) as the national carrier (Moyal 1984: 383). This decision was short-lived, however, and the Hawke Government enacted the

[107] In particular, the Ericsson ARE 11 local switching system (see Moyal 1984: 323).
[108] The Report of the Committee of Inquiry into telecommunications Services in Australia (1982).

Telecommunications Act 1989 and corporatised the ATC as part of a series of Australian telecommunications reforms. Competition in value-added services was introduced, and the Australian Telecommunications Authority (AUSTEL) was established as a regulatory agency designed to 'protect consumers and ensure fair competition' (Martyn 2003: 325).

The next two stages of telecommunications reform occurred with the introduction of the *Telecommunications Act 1991* by the Hawke Government followed by the Howard Government's *Telecommunications Act 1997*. The first act saw the introduction of Optus and Vodaphone[109] as major competitors to the newly formed, 100% government-owned Telstra Corporation Limited. Under the supervision of AUSTEL, Telstra was to provide access rights to retail competitors who resold basic carriage services provided by Telstra (Martyn 2003: 325). Coinciding with the introduction of competition was the establishment of the Telecommunications Industry Ombudsman as a self-regulatory body designed to resolve consumer complaints (Stuhmcke 1998: 808). The second act amended the *Trade Practices Act 1974* to reduce the barriers for new industry entrants and by 2003, 'more than 60 holders of carrier licences in Australia and around 130 providers of telephony carriage services' were competing with Telstra. Further, the Australian Government had commenced a phased privatisation of Telstra by selling its shares via the Australian Stock Exchange (Taylor 2003: 325; see also O'Leary 2003).

In the 2006, the Howard Government completed the privatisation of Telstra, thus ending over 150 years of government control of telecommunications services. Nonetheless, the government's refusal to reduce Telstra's market dominance before the sale had numerous implications (see Koutsoukis 2005). The telecommunications market was far from mature and it was unlikely that competition would thrive while Telstra remained unchanged. However, some semblance of competition existed in the mobile telephony sector as the new technology was initially seen as complementary and therefore largely ignored by government. Yet Telstra still controlled the backhaul infrastructure and the landline market, even though the ageing copper network was fast approaching the end of its useful life, and in attempting to extend its return on

[109] Vodaphone competed in the provision of mobile telephone services only (O'Leary 2003).

investment, Telstra was regularly accused of engaging in anti-competitive behaviour (see Bustos 1999). Legislation crafted in 2005 to prevent Telstra from engaging in anti-competitive behaviour did not produce the desired effect, and by 2008 the chairman of the ACCC admitted that the legislation had proven to be ineffective (Hendry 2008). The politics of the Australian telecommunications did not end with privatisation, and consumers continued to expect government to influence the price and quality of telecommunications services. While the structure and the major players had changed, federal politics, empowered by section 51(v) of the *Australian Constitution*, projected the industry along the same trajectory it had been launched upon more than 150 years beforehand.

4.4 Comparative Institutional Analysis: Ideas, Interests & Institutions

Ideas[110] about how telecommunications technologies could be put to best use in Canada and Australia emerged from local conditions within an overarching framework of nation-building. For Canada, the process of connecting the disparate communities into a single nation-state was confined by the reluctance of these communities to have their political autonomy, or indeed, their wealth, controlled by a central government. At the time of confederation, political decentralisation in Canada was less a deliberate strategy to govern the new dominion, and more a reality of dealing with pre-existing social, political and economic disparity. The introduction of the telegraph occurred a few years before confederation, so the telegraph proved to be a timely tool for nation-building. Australia, on the other hand, was considerably less developed than Canada, and the arrival of the telegraph predated federation by more than forty years.

Government control in Australia led to a distinct lack of industrial development. In effect, the colonial institutions were merged into the Postmaster General's Department (PMG), which for a period of 74 years had exclusive control of the industry. Private sector involvement, as had occurred during the colonial telegraph era, was largely focused on contracting with the PMG for construction and other tasks which remained under the direct control of the department. Hence, the central idea in

[110] In this context, 'ideas' are viewed as possible courses of action or strategies to deal with policy problems (see Glossary).

Australian telecommunications was that government would provide equality of service in terms of pricing and access to communications technologies (ABS 2001b). The constitutional powers were used to their full extent by the federal government. Consequently, the government itself became the major interest group, aside from providing for the communications needs of businesses and the community, with communications policy a persistent political issue controlled by government. Regulation, then, was a relatively simple matter for the PMG, although the task of providing postal and electronic communications services became unwieldy by 1975 (ABS 2001b).

The Australian PMG's control of both the telecommunications and the broadcasting industries was problematic for the advancement of new technologies without private sector involvement (ABS 2001b). Maintaining central control led to an institutional framework that was largely punitive in nature to ensure government control was not usurped by industry players. Indeed, the punitive nature of regulation in the Australian communications industries has been acknowledged by numerous industry players as remaining a key feature of the regulatory environment today, and in some cases stifling the ability of industry to operate in an environment of technological convergence (Warren 2006; Communications Alliance 2006; Crawford & Lumby 2011). The remainder of this section necessarily focuses more on Canada as government control in Australia led to a clear absence of institutional development. Indeed, Canada's communications industries were dynamic in that new institutions were created to deal with the myriad issues brought about by the mosaic. Control by the PMG during the majority of the telegraph and telephone era in Australia meant that the story of this era is the story of the PMG. Although certainly important in historical context, for the purposes of this thesis the absence of new ideas, interests and institutions during this period in comparison to the dynamism of the Canadian industry demonstrates the powerful influence of Australia's monolith in maintaining the *status quo*.

Canada's diversity stems from the influence of numerous empires following the discovery of the Americas. Canada was settled by British and French companies and was heavily influenced by efforts to win the Seven Years' War and later by the entrepreneurial spirit of the United States. Whereas Australia, as a penal colony, was initially a government-controlled prison and was reliant on supplies from Britain for its very survival until local agricultural efforts started to produce sufficient food. New arrivals and the emerging pastoral and mining industries soon changed the character of the new settlements in Australia, yet there remained an expectation that government, not businesses, would provide important infrastructure, including telegraph services. Australia's isolation and small population was a major factor in the reliance upon government to establish infrastructure. For instance, Canada's population in 1814 (following the 1812 war with the US) was approximately 430,000 (Statistics Canada 2009b) people compared to Australia's 14,000 (ABS 2008b) in the same year. However, by the time of federation, Australia's population was 3,773,801 (ABS 2001a), whereas Canada's population was 5,371,051 (Statistics Canada 1901), largely reducing the logic that may have supported government provision in lieu of a substantial market in earlier times. Nonetheless, federation did not present an opportunity to change the *status quo* of government ownership and control in the Australian telecommunications industry.

On the other hand, Canada's constitution did not give the federal government exclusive powers over telecommunications except where interconnection occurred between provincial networks. This was largely a result of the political power the provinces retained and the distinct lack of consensus in forming a federal government. For example, in the lead-up to confederation, anti-confederation sentiment was such that the major political followings, rather than Conservative versus Liberal, became Confederate versus Anti-Confederate, particularly in The Maritimes (Beck 1968: 9). Indeed, former premier of Nova Scotia and leader of the Anti-Confederation League, Joseph Howe, tried to prevent Nova Scotia from joining the Confederation and later attempted to have it secede: but the British refused (Francis, Jones & Smith 2009: 263). Although intense in the lead-up to confederation, the Anti-Confederation movement in the east floundered once Howe was persuaded by John A. Macdonald, Canada's first Prime Minister, to join his cabinet. Howe and others soon 'back-flipped' and worked to weaken opposition to Confederation[111] by pressuring Macdonald to fund construction of the Intercontinental Railway from Rivière-du-Loup in Quebec, through New Brunswick to connect with existing railway lines to Halifax and Saint John.[112] Consequently, the anti-Confederation movement collapsed (Francis, Jones & Smith 2009: 263).

Nevertheless, any notion of a settled confederation was short-lived. Territorial resistance from the Hudson's Bay Company, including attempts to thwart a planned Canadian telegraph line westwards through the Company's territory,[113] required the Canadian government to pursue an aggressive policy to remove the Company as an obstacle to expansion (see Babe 2000: 333; then Innis 1923: 38-44). After acquiring Rupert's Land (effectively 'all territory whose rivers flowed into Hudson Bay') from the Hudson's Bay Company (via the British Government), the Canadian Parliament appointed a colonial government but had not consulted with the local Métis people, leading to the Métis Resistance of 1869-1870 (Francis, Jones & Smith 2009: 265), otherwise referred to as the Red River Rebellion (MacDougall & Howe 1870). This led to political compromise with the Métis people to bring the Red River settlement into Canada, resulting in the establishment of the province of Manitoba.[114] As the Métis people were mostly French-speaking, both English and French became the official languages and both French and English schools were established in the province. The Northwest Territories were also acquired and later British Columbia joined the Confederation, on the promise of railways. Natural Resources Canada (2009) refers to Canada's gradual expansion into the north and west as 'territorial evolution', and in large part this evolution explains the extent of decentralisation which still exists in Canada today.

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[111] It must be noted that Dallison (2006: 110) argues that the Fenian Crisis of 1866, especially the Battle of Ridgeway, played a large part in The Maritimes joining confederation, mostly for defence purposes.

[112] One industry expert suggested that the Macdonald Government established a culture of cooperation between the federal and provincial governments that continues to characterise the relationship between the two levels of government today.

[113] See also Barr (1999) for mention of the Hudson's Bay Company's attempt to build its own transcontinental telegraph network around the same time as the Collins Overland Telegraph, indicating the extent of 'decentralisation' in the context presented here.

[114] The North-Western Territory, also part of the Hudson's Bay Company transfer, became the Northwest Territories the month before Manitoba was created.

As Canada expanded westwards, so too the provinces expanded and by 1880, with the British transfer of title to the Arctic archipelago to Canada, the greater part of the actual territory of British North America (with the exception of Newfoundland) was within the jurisdiction of the Macdonald federal government. Francis, Jones & Smith (2009: 276) attribute much of this expansion to '[f]ear of American encroachment..., internal economic pressures such as the need for more land for agricultural development... the necessity of east-west trade, and... [the] railway building program'. Yet Maxwell (1941: 589-590) argues that by the 1880s, the impact of the federal government's vigorous policies of prairie settlement, railway construction and protection designed to develop the economy and 'weld the political unit together' had been:

> ...singularly slight and the prosperity so confidently anticipated in 1867 had not materialized. Canada was "a land of emigration helping to people the frontier and cities of the United States." In these circumstances it was inevitable that regional discontent should arise and find its expression through the provincial governments.

Maxwell (1941: 589-590) goes on to argue that, in the face of provincial discontent, and despite the intentions of the 'fathers of confederation', the federal government's power was challenged under the auspices of the provinces' powers to make laws for 'property and civil rights in the province'. Effectively, the power of the federal government was 'whittled away by provincial pertinacity, by force of events, and by court decisions' and subsequently, provincial powers were expanded (Maxwell 1941: 590). Driven by a 'genuine and deep-rooted agitation for "provincial rights"', the 'provincial revolt' had been largely successful by the turn of the twentieth century (Maxwell 1941: 590-591). At the same time, the wheat boom brought new settlers to the Prairie Region (creating two new provinces - see Appendix 4) and economic success enabled expansion of the railway and the industrialisation of the Central Region (see also Appendix 4).

In the midst of economic growth and the increased powers of the provinces, the impact on the telegraph industry of decentralisation (as a form of political compromise) to enable territorial expansion was to see a variety of approaches used to build and fund the infrastructure to facilitate that expansion. In addition to payments for work performed, contracted companies were provided with land and royalties from land along which roads, telegraph lines, and later railways, were constructed. The pressures of financing this infrastructure were exacerbated by the promises made, particularly to British Columbia, for the telegraph, and in particular the railway, to join the province, logistically, to the Central Region (see Appendix 4). Amid such pressure, it is not surprising that the political power of the provincial governments was pervasive in influencing outcomes specific to the particular provinces' needs. Not only had the federal government's need to compromise led to the constitutional decentralisation of responsibility for intra-provincial telegraph connectivity, but it enabled a variety of arrangements for deploying the telegraph, including a combination of government and business approaches, and government-business partnerships.

It is also clear that local arrangements and delivering connectivity, as part of the nation-building promise, were more important than any particular principle of policy delivery. Where private interests were able to maintain a sufficient telegraph service, provincial legislatures enacted legislated monopolies to protect these telegraph networks from competition. However, the presence of US corporations (such as Western Union) in the Canadian market no doubt ensured that opportunities for state ownership were limited. Indeed, private ownership of telecommunications networks in Canada and the United States was unusual by global standards, as state ownership was the global norm (Pike & Winseck 2004: 645). Nonetheless, where private returns were insufficient or maintenance costs too high, it was not unusual for governments to become involved. For example, British Columbia had leased the ailing Western Union telegraph network (which was part of the Collins Overland Telegraph venture - beaten by the Atlantic cable) 'in perpetuity' until British Columbia joined the confederation and the federal government took over the lease; repaired, rebuilt and expanded the network (no doubt as part of its promise to provide infrastructure to the new province), and eventually purchased the network from Western Union in 1880 (Neering 1990: 214). Yet there was no single national monopoly provider or an attempt to establish a single national network to provide universal service – the approach was pragmatically focused on infrastructure provision as part of the nation-building project, rather than achieving any rigorous form of standardisation.

An important idea in the development of Canada's telegraph industry is referred to here as decentralisation. However, as Dubois & Fattore (2009) indicate in their categorisation of the definitions and emphases in various uses of the term, the concept requires some explanation in the context of this thesis. In the case of governments enabling the deployment of the telegraph, initial deployments were the result of colonial legislatures forming chartered companies. As this early period of the telegraph pre-dates confederation, central control was reserved by the powers of the respective colony. Upon confederation, however, these powers were never taken over by the federal government. The federal government was able to and *did* assist the deployment of telegraph networks as part of its nation-building agenda, but this did not prevent the newly established provinces from continuing to develop their own networks (within the boundaries of the province) in whatever fashion they chose.

In this instance, 'formal authority, as "the right to decide" and real authority as "the effective control over decisions"' were never purely the domain of either the federal or the provincial governments (Aghion & Tirole 1997 cited in Dubois & Fattore 2009: 709). As decentralisation was not a pre-existing condition *before* confederation, decentralisation in this instance does not concern the devolution or the transference of authority from the federal to the provincial governments, but the layering of another level of government over pre-existing authorities. Canada's telegraph industry developed amid a type of 'silent decentralisation' where the importance of policy areas increased over time, without any active decentralisation agenda by the central authority (Dubois & Fattore 2009: 719). The dynamics of this type of decentralisation are not necessarily peculiar to federalism. As Breton (2000: 3) points out (in his use of broadcasting and telecommunications powers in Canada to distinguish between the externalities of decentralisation versus federalism), decentralisation may occur where 'interjurisdictional spillovers' result in the use of complementary powers.[115] Relevantly, the differences between decentralisation and federalism are important for the current study in distinguishing the approaches adopted by the two federal jurisdictions under investigation.

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[115] According to Breton (2000: 3), '[t]wo powers are complementary whenever making use of one power calls for the utilization of the other'.

Further, the discontinuous and disjointed nature of Canadian settlement[116] produced what Wiseman (2007: 122, citing Harris 1982: 466) referred to as 'a series of cultural "islands" [known as] "the Canadian Archipelago"'. According to McVey (2004: 39), small and medium-sized towns, 'scattered in pockets from east to west... rather than in a continuous belt' played an important part in the settlement process and in supporting regional economies. This process 'created and reinforced core-periphery or heartland-hinterland relationships' (McVey 2004: 39 citing McCann & Smith 1991), creating the conflict which 'has been clearly linked by many analysts to regionalization in Canada' (Bakvis 1981: 45). Regrettably, for the present study, there is little agreement on how such regionalisation can or should be characterised (see Francis 2001; also Appendix 4). Nonetheless, the intricate differences in regional political cultures, however described, provide a political background which was peculiarly supportive of a decentralised industry structure. From the federal government's perspective, the 'idea' was to be pragmatic in connecting the provinces via rail or at least telegraph using whatever approach was the most feasible in the given circumstances. Pursuing a particular approach to *how* the infrastructure should be deployed was not a major consideration.

Nation-building in Canada required engagement with a variety of private interests, especially within the railway, telegraph and newspaper industries; industries which provided important political tools for the nation-building project by enabling federal interaction with provinces and towns. Amid the federal government's desire to connect the western provinces with the east, the major interests being served by the deployment of telegraph networks included the press and the railways. News arriving from Europe came via Newfoundland to the US via the Maritimes, so arrangements between telegraph companies and newspapers ensured US newspapers could beat their competitors to the latest headline story, and Canadian companies could use funding provided by US newspaper interests to expand their networks, hence increasing their own competitiveness. Private interests, in expanding railways and telegraph networks and providing news faster than ever before, were viewed as acting

[116] In comparison to the 'systematic east-to-west settlement of the United States' (Francis 2001: 570-571). Importantly, Harold Innis's 'staples thesis' informs this understanding of Canadian settlement, which, in turn, influenced his work as a communications scholar. Ultimately, Innis's work was to be very influential on Marshall McLuhan's work (see Library and Archives Canada 2008 for an overview).

within the public interest, at least insofar as businesses were funding nation-building infrastructure and building a sense of connectedness without the entire cost being borne by governments.

Nonetheless, telegraph companies promising to connect with the United States, and later Europe, sought government guarantees, loans, grants, subsidies, freedom from import duties and, most importantly, protection from competition; and governments often obliged.[117] Initially, numerous telegraph companies in the Province of Canada[118] took advantage of the generous provisions for rights-of-way for telegraph lines included in the *Electric Telegraph Companies Incorporation Act of 1852*, and the industry followed 'the pattern of many fledgling industries: companies were started to serve small areas and, as districts began to overlap, amalgamations occurred' (Montgomery 1984: 25).[119] Elsewhere, local companies established by acts of the relevant general assembly, such as the *Act for the Incorporation of a Company to build a Line of Electric Telegraph from Truro to Pictou of 1850* (Nova Scotia 1850: 70-77), would influence the statutory arrangements for future companies. For example, provision was made, in a later act to establish the Nova Scotia Electric Telegraph Company (Nova Scotia 1850: 187-191), to connect with the Truro to Pictou company lines by either purchasing the lines or merging the two companies.

Several features of the *Nova Scotia Electric Telegraph Company Act of 1850* encapsulate how a variety of interests, in addition to shareholders, were captured in a single piece of legislation. The 'governor' (that is, the government) was ensured preferential use of the lines for messages relating to the public service. Further, if the telegraph service failed for a period of more than 20 days, the government could, with appropriate compensation, regain control of the lines. However, one of the most interesting features of the act gave significant power to the citizens of Nova Scotia. The act specifically states that:

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[117] Precise details of government policy instruments are provided in the various acts of incorporation. See, for example, the Transatlantic Telegraph Company (Select Standing Committee on Railroads, Canals and Telegraph Lines 1856: 47) and the Atlantic Telegraph Company (Briggs & Maverick 1858: 48).

[118] As the Central Region (see Appendix 2) was known before confederation.

[119] See, for example, the Newcastle Telegraph Company and the Bathurst Telegraph Company, both of New Brunswick, which receive no later mention in the accessible historical documents (Glendenning 2000).

> the inhabitants of any town, village or hamlet in the province... wish[ing] to be connected by telegraph with the company's lines... shall have the right to raise the amount of money required to build such connecting line (Nova Scotia 1851: 188-189).

Upon certain conditions, such 'inhabitants' had the option to become shareholders in the company.

In the early stages of the Canadian telegraph era, the mosaic to support bottom-up incubation from local interests developed as governments incorporated various telegraph companies. However, where the risks were much greater, such as where the investment required to establish international or interprovincial connections was substantial, governments tended to be more generous in providing incentives to investors. At the same time, governments reserved the use of telegraph lines for messages which were deemed to be in the public interest; and, where the telegraph lines had been built by government initially, the particular government could regain control of the lines if companies were unable to provide the required service. It is unsurprising, then, that where governments' interests were at stake, such as in enabling international or important interprovincial communications, the incentives provided for the private sector were greater. Nonetheless, there was no preference for any particular approach to coordinating the telegraph in the early stages of its deployment, other than pragmatism.

Later, even when American interests dominated the Canadian telegraph industry, there was no obvious shift towards government ownership of telegraph lines, nor was such a shift necessarily deemed to be in the public interest.[120] Not necessarily because, provided telegraphic services were provided at reasonable prices and at the expected quality, there was little reason to curtail monopoly providers. Nevertheless, as Babe (1990: 16) attests, governments' role was one of a:

> historical and continuing function of structuring industries - by bestowing or withdrawing exclusive privileges; by empowering, condoning, or

[120] See Wiman (1881) for a detailed apologia of the proposed union of Canadian telegraph networks into a private monopoly. It provides a clear view of corporate opposition to government ownership and intervention, the close relationship between key shareholders, governments, and other telegraph companies, as well as a defence of Jay Gould's involvement as a major shareholder. It also addresses those opposing the scheme at the time, including the press and the public.

> inhibiting restrictive and predatory business practices; and by simply but ineluctably establishing the "rules of the game."

Given that the power of the provinces was of such capacity as to influence 'national' policy before confederation, the tradition of the mosaic was established in these early times: there was not one set of 'rules of the game', but many rules, to many games, and played out across the fledgling nation-state of Canada.

In modern terms, 'policy goals are established through laws... [and] regulatory agencies implement the laws through rulemaking' (CSTB 2002: 297). Nonetheless, the concept of a regulatory agency was very much in its infancy during the early years of the telegraph. In the United States, the Interstate Commerce Commission (ICC) had been established as a result of public outcry over the monopoly powers of the railroad companies, and in particular, the 'robber barons', which included the owner of Western Union, Jay Gould (Josephson 2010: 306-307; see also Wilson 2000: 28). Until that time, and for the most part, regulatory functions were carried out by the relevant legislature in the form of a charter or enabling act, as was the case in the initial deployment of the telegraph throughout British North America. Confederation, however, added an extra dimension of complexity to the regulatory mix, and in many ways the US Interstate Commerce Commission as a quasi-independent regulatory agency provided an early model for regulating competition in a federal system.

In terms of political institutions with responsibility for telegraphs, provincial arrangements such as the Select Standing Committee on Railroads, Canals and Telegraph Lines (1856: see in particular, p. 36) established by the Legislative Assembly of the Province of Canada considered and amended bills to incorporate telegraph companies. Further issues would arise with the deployment of the telephone in the last quarter of the nineteenth century (addressed in a later section). Nonetheless, it was not until 1904 that a separate regulatory agency, the Board of Railway Commissioners, was given the role of regulating both the telegraph and telephone industries. Telegraph lines were an important part of the railways, as Babe (1990: 42) argues:

> The telegraph... was of immense importance in railway-building... [and] after construction was completed, the telegraph remained essential for dispatching trains along the single-line tracks then predominant in North

America… The railways, meanwhile, aided the monopolization of the telegraph industry by selling exclusive rights to construct telegraph line along railroad right-of-way. Such concessions proved especially useful to Montreal Telegraph Company, beginning in 1869.

Yet when the Board of Railway Commissioners commenced in 1904, it had very little impact on the telegraph industry while it, at first, struggled for resources (McGuire 2004: Chapter 1). But by 1907 (see Babe 1990: 58), years of anti-competitive practices, particularly by Canadian Pacific Telegraphs' domination of the press service and its practice of forcing newspapers to subscribe to both the news and transmission services bundled under one price. Canadian Pacific's domination of both content and carriage was such that it served to weaken Great North Western Telegraphs (which would later be taken over by government as it faced bankruptcy) but forced smaller newspapers to affiliate with local and US-based telegraph companies when rates were doubled. Canadian Pacific continued to charge different rates and even cut-off services to newspapers reporting unfavourably on the company. In 1908, the Board of Railway Commissioners was granted jurisdiction 'over pricing practices of telegraph companies' and in 1910 ruled that 'Canadian Pacific Telegraphs' press rates were unduly discriminatory' and therefore unlawful: and 'the era of the communications common carrier began' (Babe 1990: 58-59).

The concept of the communications common carrier became an institution that was to ensure the continued divergence of the communications industries, even though this was not driven by any 'inherent technological imperative' (see Babe in Dorland 1996: 285-286). Further, the information and communications industries would become traditionally regarded as three distinct sectors: publishing, telecommunications, and broadcasting. Along with the 'rules of the game' established prior to confederation, and subsequently reinforced by provincial political practice in relation to section 92 (10) (a) of the *BNA Act*, the Canadian mosaic, despite attempts by various companies to monopolise their respective industry, would persist to the present day.

In the early days of regulating the telephone industry, there was very little regulatory structure to enable intervention by the federal government (CRTC 2005). When it did regulate, the federal government tended to respond to public pressure concerning the pricing of telephone services. For example, the federal charter which established Bell

Canada in 1880 was amended in 1893, requiring the company to seek permission from the Governor-in-Council before increasing prices. Monopoly provision of telephone services was independently regulated by the Board of Railway Commissioners, commencing in 1906, through the approval of 'telephone service rates, ordering the interconnection of telephone systems and installing lines along highways and other public places' (CRTC 2008a). The regulatory structure for basic telephone services remained relatively stable until 1993, with, for the most part, regional monopolies providing basic telephone services throughout Canada. The federal government's policy focus was on regulated monopoly provision to enable 'high quality, reliable telephone service to Canadians in all parts of the country at reasonable rates' (CRTC 2005).

As many of the early telephone (and indeed, telegraph) companies had commenced operations before the regulatory structure (or in the case of telegraph, the Constitution) was imposed, it is little wonder that regional, rather than national, monopolies developed. What is surprising is that these regional monopolies persisted for the better part of eight decades. Nonetheless, Theodore Vail's model of connecting regional monopolies through a national company enabled the interconnection of these regional monopolies – an approach referred to by the CRTC as regulatory bargaining where extension of a company's operations was enabled by government in exchange for submission to government regulation (CRTC 2005). The government benefited by achieving policy goals through the efficiencies generated by the monopoly provider's economies of scale, while the monopoly provider benefited from the absence of competition. Vail's US model for connecting regional monopolies functioned quite differently in Canada, with Bell Canada establishing a monopoly in the east (except in the Maritimes, where the Bell network was sold to private interests), and, for the most part, neglecting the west. Provincial governments responded in 1907 and 1908 with Alberta, Saskatchewan and Manitoba purchasing Bell Canada's assets. Moreover, at the peak of telephone industry diversity, some 850 independent operators provided telephone services to areas underserved by (or even to compete with) Bell Canada (CRTC 2005).

Debates about public versus private ownership, particularly at the municipal level, focused on social rather than commercial goals. Dissatisfaction with telephone services through private monopoly provision, especially in rural and remote communities, led to municipal governments responding to public demand for the provision of services 'to the whole population - both urban and rural - at a reasonable price' (Love 2005: 67). Resentment of eastern, private ownership of utilities in the newly formed western provinces required 'practical solutions to practical problems' (Love 2005: 6-69), resulting in municipalities (and later provincial governments) adopting a 'policy of assisting the people to manage their own affairs and of trusting the people', reflecting the different interests of big businesses and municipal governments (Martin 1921 cited in Love 2005: 67-68). 'Civic populism' arose as a 'nation-wide protest movement "against inadequate service by arbitrary, self-serving monopolies from which a small elite grew conspicuously rich"' (Armstrong & Nelles 1986 cited in Love 2005: 71). '[L]ocal control, or municipal freedom as it was sometimes called, and public ownership' gained significant public support for provincial and municipal governments to enable alternatives to privately-owned monopolies (Love 2005: 71).

Formed in 1901, the Union of Canadian Municipalities (predecessor of the Federation of Canadian Municipalities) 'was formed largely to remind utility companies they could not simply assume municipal consent for tearing up public infrastructure without consideration: municipal rights-of-way had to be negotiated' (FCM 2009). Telephone services were the first agenda item for the Union's lobbying activities. Municipalities fell within the jurisdiction of the provinces, and the provinces had the constitutional power to pursue intra-provincial policy goals: only at the point where the intra-provincial networks interconnected with other provinces was the federal government's jurisdiction clear. The Union of Canadian Municipalities was significant in preventing the concentration of power in the federal and provincial governments and aimed to 'eradicate... the granting of charters by federal and provincial governments that declared certain private companies to be "works for the general advantage of Canada"' (Love 2005: 71). Municipal public ownership of utilities, including telephone services, enabled local control of important infrastructure and essential services.

From the late 1890s until 1906, attempts by municipalities to own or grant franchises to local private companies to operate municipal telephone networks were not always successful. Indeed, the lack of a clear regulatory structure resulted in what the CRTC (2005) described as 'a number of rather tumultuous years of direct regulation by the Governor in Council'. Bell Canada often re-instated its monopoly status through the courts, with sympathetic judges and politicians supporting the company's position (Love 2005: 74). In 1905, a Select Committee of parliament heard evidence of 'excessive rates charged for unsatisfactory service, inadequate connections to small urban centers and rural districts, defective equipment, conflicts between municipal councils and the Bell corporation over civic rights-of-way' (Love 2005: 76), but failed to offer recommendations to the government. This was seen as a victory to Bell Canada, but numerous interests formed in opposition to Bell's monopoly and set the tone for the future of the Canadian telephone industry.[121]

The *Railway Act 1906* introduced a clear regulatory structure which empowered the Board of Railway Commissioners for Canada 'to regulate all telephone tolls, contracts and agreements of [federally-chartered] companies' (CRTC 2005). The federal government declined to nationalise Bell Canada, choosing an independent regulatory commission instead. Nonetheless, in the west, civic elections included questions such as 'Shall this municipality own and operate its own telephones?' and if a two-thirds majority supported the initiative, the federal government guaranteed the bonds used to finance the network (Love 2005: 82). Love (2005: 84) suggests that in Alberta and Manitoba, provincial ownership was placed on the policy agenda by politicians, whereas public support for public ownership of the telephone system in Saskatchewan forced the province's government to act. Obviously, telephone services were high on the policy agendas of the federal, provincial and municipal governments during the early twentieth century. The result was a deepening of the telecommunications 'mosaic' which persists to this day, with Bell Canada enjoying a privileged position with the federal government against a backdrop of regional opposition to the company's regulated monopoly.

[121] For example, the Canadian Independent Telephone Association (CITA) which formed in 1905 to unite independent telephone companies against Bell Canada and the federal government. This organisation still functions today with a membership of '39 independent telephone companies... [which] serve rural and sparsely settled regions' of Canada (CITA 2006).

There were no 'express policy objectives' outlined in the regulatory role ascribed to the Board of Railway Commissioners, but three principles can be discerned from the substantive provisions of the *Railway Act*: (1) the principle of universal service through the regulatory bargain, (2) the principle requiring telephone companies to treat customers 'in a fair and non-discriminatory manner', and (3) the principle of network connectivity, where any 'municipally, provincially, or federally-regulated company' could apply to the Board for relief where an interconnectivity agreement with a federally-regulated company could not be reached (CRTC 2005). Consequently, rate of return regulation was adopted where rates 'were set both with regard to their affordability for consumers and businesses and with regard to generating a sufficient return for the monopoly to enable it to continue investing in the plant and equipment necessary to provide a ubiquitous and high quality service' (CRTC 2005). Internal cross-subsidies were provided by long distance and other 'discretionary' services to alleviate the cost of providing services to high-cost areas.

Minor amendments aside,[122] the regulation of the Canadian telephone industry remained largely unchanged for several decades. However, a key feature of the industry was its dynamism: a feature that was clearly absent in Australia. Initially, government ownership and control of the Australian telegraph network was not a predetermined policy, but an outcome of the conditions faced by colonial governments resulting from geopolitical circumstances. It was simply too expensive or too risky for private interests to invest in telegraph infrastructure projects, yet the prosperity of the colonies required better communications facilities, so government assumed the role of provider in the absence of commercial activity. Nonetheless, governments did not actively seek partnerships with private interests, and actively discouraged or even thwarted attempts by businesses to develop a telecommunications market. Government ownership of telegraph networks was not unusual in Europe. Indeed, telecommunications markets only existed in the US and Canada and outside nation-states, a 'free' space that enabled John Pender's international submarine cable telegraph empire to flourish. In light of international

[122] Slight modifications were made to the *Railway Act* in 1919, and the Board of Railway Commissioners became the Board of Transport Commissioners with responsibility for regulating telecommunications 'common carriers' in 1938.

trends, and with the success of the OTL as evidence of the effectiveness of government enterprise, the Australian Government obtained complete control of the national telecommunications network. The downside of government control in Australia, until this very day, is that telecommunications remains a great 'policy lever' that can be 'pulled' whenever federal politics demands – states and local councils have no jurisdiction to respond to their constituents on matters concerning communications.

Technology has been noted by the OECD to be somewhat alien to the Australian way of life. For instance, in 1986, an OECD Science and Technology review team stated: 'we were struck by what seems to be a widespread Australian view of technology as in some sense external to national life' (OECD, 1986, p. 13). This view can be explained to a large extent by Australia's history of economic development. However, it is interesting to note, by way of contrast, that establishment of the first European settlement was a direct result of support given to a scientific project proposed by the British Royal Society. Captain Cook was sent to the Pacific to observe the transit of Venus and search for the southern continent. In response to a report from the botanist on board, the British government settled New South Wales with convicts 18 years later" (Nelson 1993: 349).

The differences between the Canadian and Australian approaches to managing telegraph networks and the choices made during this early period represent the points of departure for the trajectories of the respective communications industries. Indeed, to understand the differences in communications outcomes in Canada and Australia today, establishing the points of departure in this early period is a crucial first step in this thesis. Importantly, government control of both telegraph and post in Australia was distinct from the Canadian model. In Canada, the postal systems of the provinces were amalgamated at confederation and placed, constitutionally, under federal government control, while telegraph networks remained largely in private hands and within the jurisdiction of the provincial governments (within provincial borders). This meant that, long after the telephone had begun to replace the telegraph in Canada, Australian post offices continued to operate telegraph services. Indeed, as shown in Figure 2.3, the penetration of the telegraph was more than double that of Canada's until well into the 1950s.

4.5 Implications for Future Technologies

The competing ideas in Canada and Australia in enabling the telegraph and the telephone led to the establishment of institutions which have had a lasting impact on the available choices in communications policy. This section summarises the key institutions in each country to facilitate the evaluation in Chapter 7. In particular, this section establishes the starting point for the path dependencies observed in later approaches to deploying new communications technologies.

Of particular importance in Canada's deployment of the telegraph was the continuance of provincial jurisdiction over telegraph and telephone networks *within* the provinces after confederation. In both countries, the deployment of the telegraph pre-dated the establishment of a federal political system. Upon confederation, however, the residual powers of the provinces in Canada included telecommunications networks *within* the provinces. In Australia, section 51(v) specifically grants the federal government with the power to legislate for *all* telecommunications networks. This major difference in the constitutional, and hence, institutional, frameworks, effectively incorporates the manner in which the original telegraph networks were enabled. Provincial governments in Canada enabled provincial companies to establish local networks which would later be interconnected by a variety of provincial and municipal, and later, federal government ventures alongside a variety of small and large private firms. Once these private interests were entrenched, it would have been particularly difficult for the federal government to take away the provincial powers that had enabled the telegraph in the first place.

In Australia, the opposite was the case. As privately-owned networks were *not* enabled, there were few political incentives for the states to retain control over the telecommunications networks. Indeed, inter-colonial cooperation by the time of federation was so well-established that it was almost natural for the new federal government to take over the role of coordinating the various colonial networks. Further, the cost of maintaining the telecommunications network was such that, at the time of federation, the Postmaster General's Department represented some 90% of the Commonwealth's total administrative staff (IPA 2006). With the majority of private involvement in the telecommunications industry in Australia related to wireless services, equipment manufacture and submarine cables; on the mainland, the government took complete control of the wires (Given 2004: 177) as private interests were not involved in profit-making from the mainland infrastructure. An interesting outcome in telecommunications is that Canada's centralised constitution (designed to facilitate nation-building) (Dion 1998) left responsibility for the existing telecommunications networks with the provinces, whereas Australia, with its decentralised constitution (designed to protect the rights of the states), placed total control of telecommunications with the federal government.

What is clear is that the initial approaches to deploying the telegraph were adopted in the respective constitutions. Nonetheless, the constitutions were not necessarily the starting point for the mosaic versus monolith trajectories. Decisions taken at the time of enabling and coordinating the telegraph informed these major institutions: the constitutions effectively formalised pre-existing practices, giving legal force to the existing 'rules of the game'. It is interesting that Canada's *Constitution* was formulated *before* the invention of the telephone whereas Australia's *Constitution* was designed *after* its invention. Unlike the telegraph, the telephone industry in Australia commenced with entrepreneurial businesses but was soon taken over by government and the *Constitution* which came into force in 1901 resulted in the deliberate convergence of the telegraph and telephone 'industries'. In Canada, however, it was not the government but private interests that established the 'rules of the game' by deliberately diverging the telegraph and telephone industries. The importance of these starting points becomes evident as the manner in which each new technology is enabled, coordinated and regulated follows the pattern established at the time of the telegraph, hence the importance of these early institutions.

While the constitutions reflect the established 'rules of the game' (what might also be referred to as *industrial cultures*), the powers granted by the respective constitutions clearly reinforce the 'mosaic' versus 'monolith' trajectories which continue into the present. However, Canada's telecommunications industry adopted the common carrier concept as a major institution, and, unlike Australia, posts and telegraphs were functionally separated - both constitutionally and industrially. Although the Australian government operated the telecommunications network on the basis of the common carrier concept, the government maintained control of the network and could prioritise its own traffic at any time. The differences here are important because, as observed in Figure 2.3 (see Chapter 2), Australia maintained telegraph offices at post offices, therefore penetration of the telegraph continued to increase long after the telephone was in general use. Further, competition in the provision of content in Australia (via the newspaper industry, which would later form the basis of the news media industry), was not matched by competition in the carriage of content. This deepened the extent of the monolith whereas Canada's carriage and content industries were actively regulated by the common carrier concept as an institution, rather than simply a procedure followed by government employees in operating a government-owned network.

The ramifications of these different institutional approaches for the deployment of future technologies cannot be understated. For Canada, telecommunications was not bundled into one industry structure and the telegraph was not tied to post offices. Whether this non-standardised approach is better than Australia's approach is arguable. However, what is clear from the communications outcomes mapped out in Chapter 2 is that Canada outperformed Australia in providing faster access to and greater penetration of new telecommunications technologies. As the penetration of a new technology (the telephone), increased, Canadian governments were not committed to an older technology (the telegraph) because of its co-location with post offices. Australia's 'monolith' had the effect of tying several communications technologies (post, telegraph and telephone) to one major institution (PMG), leaving little room for deviation from established methods of deployment.

The resilience of government control in Australia cannot be overstated: for 74 years PMG remained one of the largest areas of government expenditure, then Telecom and later Telstra remained one of the largest employers in the country. Despite the privatisation of Telstra, within a matter of a few short years the National Broadband Network was launched as the single biggest public investment in infrastructure in Australia's history. For Canada, no one carrier was able to dominate on a national basis, and although anti-competitive behaviour and other regulatory issues are far from absent, during the 1990s (discussed further in Chapter 6), re-convergence was on the agenda, introducing competition between the cable companies (discussed in Chapter 5) and the traditional telecommunications carriers in the broadband era. The next two chapters address broadcasting and broadband respectively and demonstrate how the institutional beginnings of electronic communications technologies in Canada and Australia continue to enable, coordinate and regulate new technologies on the bases of the 'mosaic' and the 'monolith' (respectively).

Chapter 5: Broadcasting in Canada and Australia: Historical Trajectories

5.1 Introduction

The advent of broadcasting technologies in the developed world enabled instantaneous, one-way communication on a grand scale. By the mid-1920s, broadcasting technologies were effectively operationalised, and the Canadian and Australian governments began investigating the use of mass communication as a means of nation-building,[123] particularly in the dissemination of 'common or at least mutually compatible perceptions and attitudes' deemed to represent the national identity (Deutsch & Foltz 2010: 57). Nonetheless, the broadcasting industry had its origins in the last years of the nineteenth century, beginning primarily with Marconi's innovations and the development of wireless telegraphy.[124] The technological capability that spawned the first of the broadcasting industries, the radio, was in the early stages considered exclusively as a derivative of the wireless telegraph (Babe 1995: 192). Globally, governments ensured that potential applications of wireless technologies were restricted to the functions of wireless telegraphy and telephony, and in the interests of existing telegraph and telephone industry players, radio as we know it today was 'delayed for another time and another age' (Regli 1997: 42).

Nevertheless, the military quickly grasped the usefulness of wireless technologies and national navies and the global shipping industry were the main users of wireless communication for at least two decades (see Goodland 2009: 51-55). With the exception of the United States, government control of radio infrastructure, services or content avoided many of the problems associated with coordinating the numerous transactions required to enable commercial provision of radio services. Enabling a market for radio services and content presents three coordination problems for

[123] Vance (cited in Infrastructure Canada 2006) and Putnis (2002) state that 'nation-building' historically meant creating the 'national identity,' in addition to 'building infrastructure,' in Canada and Australia.

[124] Czitrom (1982: 63) argues that Marconi was the 'crucial innovator in wireless, not as its inventor'. However, Marconi's role in the proliferation of wireless telegraphy throughout the world and indeed in Canada and Australia was pivotal.

governments that make it difficult for the radio industry to deliver a profitable commercial activity:

1) **Reception and monitoring the consumption of content:** Airwaves are public goods, and the quality of broadcast content does not diminish as the number of receiver sets increases. Monitoring consumption of airwaves is difficult and can result in the 'free rider' problem. This leads to the underproduction of content as it is difficult to realise commercial value from consumers of broadcast content.
2) **Transmission and coordinating the use of radio spectrum:** Radio spectrum is a common-property good as most receiver sets are incapable of distinguishing between different content providers on the same frequency. Content providers 'who are capable of transmitting can collectively overuse a frequency, leading to depletion, congestion, or inefficiency'. This is typically referred to as the 'problem of the commons'.
3) **Realising value by coordinating equipment 'development, production and use':** The 'apparatus used for transmitting and receiving signals' in a market-based system are typically 'private property protected by patent rights'. As many receiver set components are developed independently, the 'diverse individuals and companies with exclusive rights to different components necessarily must cooperate to achieve this value' (Leblebici *et al.* 1991: 334-335).

The role of government in either a market-based or a government-controlled broadcasting industry, then, is to ensure 'a stable cycle of exchanges between broadcasters and listeners' (Leblebici *et al.* 1991: 335, see OECD 1993: 69-81 for a detailed economic analysis of the broadcasting industry). Nonetheless, the First World War restricted opportunities for experimentation with radio outside the military as governments in both countries focused almost exclusively on the war effort.

During the 1930s, Canada and Australia adopted mixed-market approaches to the broadcasting industry through both commercial and government provision of broadcasting services and content. Once radio became available throughout both countries, the device enabled a process of blurring 'the boundaries between the private domestic sphere and public, commercial, and political life' and listening to the radio became a major cultural pastime (Douglas 2004: 9). Governments in Canada and Australia took advantage of this cultural pastime to contribute to the nation-building effort, not so much through the development of infrastructure, but by developing and protecting cultural content and, in particular, by using broadcast media to convey nationalist or patriotic ideals. Consequently, in both countries, broadcasting infrastructure enabled the creation and maintenance of a national identity, particularly through government-run broadcasting organisations such as the Canadian Broadcasting Corporation (CBC)[125] and the Australian Broadcasting Commission (ABC).[126] Indeed, Canada's broadcasting legislation[127] and the ABC's charter both cite the 'maintenance' of and 'contribut[ion]' to a sense of national identity as major purposes for the respective organisations' existence. This aspect of nation-building was an important driver of enabling and regulating the broadcasting industries in both countries. However, as will be shown, the approaches adopted in each country tended to replicate the industry structures established by the early telecommunications industries.

[125] Now commonly referred to as CBC/Radio-Canada.
[126] Now known as the Australian Broadcasting Corporation.
[127] *Broadcasting Act 1991*, c. 11, Section 3.

Box 5.1: Brief Comparison of Broadcasting and Telecommunications Capabilities

The broadcasting industry differed from the telecommunications industry in that, rather than enabling two-way communication between two points, broadcasting technologies enabled one-way communication from one point to many points. Content was delivered either via cable networks or radio waves to receiving devices such as radios and televisions. Contemporarily, the term "broadcasting" continues to refer to audio-visual content delivered to radios and televisions. Initially, the infrastructure required to deliver broadcasting services was well beyond the means of typical citizens. So too was the cost of producing appropriate material for delivery to mass audiences. Governments, then, played an active role in *enabling, coordinating* and *regulating* the construction of and access to the delivery means (the infrastructure) and also the content allowed to be delivered via means generally accessible by ordinary members of the public.

Telecommunications infrastructure was also regulated by government, but as the content typically consisted of private messages between discrete parties (criminal activity aside), it was rarely in the public interest to regulate this private content. As a result of public accessibility to broadcasting services, however, governments played an active role in regulating content, whether for moral, social or political appropriateness. Despite the availability of global content via the Internet today, which remains largely unregulated by governments, regulation of broadcasting infrastructure and content continues into the present.

An interesting feature of broadcasting and telecommunications industries is that, despite the different capabilities of transmitting and receiving devices, the same infrastructure can be used to deliver the various forms of content. For example, wireless technology can deliver telegraph and telephone messages in addition to radio and television content. Microwave towers and satellites provide this same capability, as do the various means of connecting to the Internet today. Therefore, while the devices used to transmit and receive one-to-one and one-to-many messages are traditionally different (but increasingly less so), the infrastructure used to deliver these messages was (and is) often the same. The divergence of the telecommunications and the broadcasting industries, then, has for the most part been a deliberately crafted industry framework, rather than a boundary created by technologically-different capabilities. This demarcation of the traditional broadcasting and telecommunications industries, despite the similarities in delivery methods, has important ramifications for the broadband era.

5.2 Institutional Origins of the Broadcasting Mosaic in Canada

5.2.1 Enabling, Coordinating and Regulating the Canadian Radio Industry

Some important early experiments with wireless telegraphy and wireless telephony – two technologies that enabled the broadcasting industry – were conducted in Canada or involved Canadians. Wireless pioneers and entrepreneurs such as Marconi, Fessenden and De Forest claimed various world-first achievements in wireless communication, often amid a great deal of hype and conjecture, and brought these new technologies quickly to the Canadian market.[128] Following Britain's example, the

[128] The first transatlantic radiotelegraph message was sent from Cornwell, England and received by Marconi at St Johns, Newfoundland in 1901 (CRTC 2008a), although some (see Belrose 1995) suggest that Marconi mistook atmospheric interference for Morse code. Further, Reginald Fessenden, a Canadian, is believed to be the first person to successfully transmit the human voice using via wireless. However, Fessenden, did not receive support from the Canadian Government as Marconi, an Italian, had secured an agreement to be the sole provider of 'wireless services (then considered to be a ship-to-shore service only)' in Canada (Murray 2005: 1-2;

Canadian Parliament passed the *Wireless Telegraphy Act 1905*, authorising the Department of Marine and Fisheries 'to issue licences for radiotelegraph stations, including experimental licences' (Armstrong 2010: 22).[129] By 1907, the DeForest Wireless Telegraph System had extended 'the potential for low cost long range telegraphy' and operated land-based communication services throughout Central Canada with a range of about 800km (Collections Canada 1905).[130] While some wireless competition existed in Canada for a short period of time, by 1912 the DeForest companies collapsed as a result of fraudulent investment-related activities by company directors[131] and Marconi's companies took over the remnants of the DeForest group, establishing a dominant position in North America (Schwoch 1990: 14). Nonetheless, earlier monopoly arrangements with the 'hard-wired' telegraph companies (especially in Newfoundland) and transatlantic cable companies were brought to bear, restricting Marconi's deployment of wireless telegraphy, particularly on land (Appleton 2010). Regardless, Marconi was able to obtain a monopoly with ship-to-shore services, and by 1912 voice transmissions by radio were practicable, prompting an update to the 1905 act (Armstrong 2010: 22).

In 1913, the *Wireless Act*[132] was expanded to include radiotelephone transmissions (mostly conducted by amateur operators),[133] and gave the federal government authority for 'all aspects of radio'. Nevertheless, the First World War saw the suspension of some ninety-five amateur licences as wireless transmissions posed a security threat. Government supervision of the airwaves was limited, however, and 'many amateur radio operators continued to operate, knowing the chances of their detection, particularly in rural areas, was unlikely' (Armstrong 2010: 23). Following the First World War, the first experimental radio station (funded by the Department of the

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see also Belrose 1995; Seitz 1999: 1). Despite Fessenden's achievements, he is yet to be formally acknowledged in the *Dictionary of Canadian Biography (from personal correspondence with the publishers,* Fessenden will finally be acknowledged in the forthcoming volume 16, see also Godfrey & Spencer 2000: 437).

[129] Britain authorised the Post Office to perform this role.

[130] An advertisement in the *Montreal Gazette* (1906a: 4) urged potential investors not to hesitate in purchasing shares in the company. Further, Collections Canada (1905) suggests that the Dominion DeForest Wireless Telegraph Company was operational on land in 1905, and advertisements in the *Montreal Gazette* (1906b: 12; 1906c: 15) lists prices for wireless telegraph services in Quebec, Montreal and Ottawa. However, Schwoch (1990: 14) states that: 'almost all the DeForest companies were capitalized for much more than they ever returned in revenue or tangible assets'.

[131] See Fayant (1907) for details.

[132] From this point known as the *Radiotelegraph Act 1913*.

[133] Commonly referred to as 'ham radio' operators.

Navy Service and owned by the Marconi Wireless Telegraphy Company of Canada) commenced operations in Montreal. Regardless, it would be some time before the use of Marconi's technology in broadcasting would become an important part of nation-building in Canada, particularly through the establishment of public and commercial radio stations. As late as 1922 (when licensing for private commercial broadcasting was introduced), Canadian radio stations were still considered to be experimental.

As wireless communication frees transmission from terrestrial constraints, monopolies of provision were difficult to achieve through infrastructure restrictions alone, requiring a different regulatory structure than the telegraph and telephone industries. Nonetheless, for a short time Marconi's international empire maintained a monopoly on the provision of radiotelegraphy services by deploying radio operators as a necessary part of using the company's equipment. These operators were able to prevent messages being sent and received by non-Marconi equipment operators, and despite the struggle for reliable transmissions and with world-wide patent challenges (as Morse and Bell before him), most of the benefits of innovation accrued to the patent holder. Marconi companies world-wide remain in existence today, with many becoming part of the defence industry through acquisition by firms such as British Aerospace. Although the name Marconi has been reduced to a brand name within the Swedish company Ericsson (2006), the Marconi companies influenced the establishment of the broadcasting industries in most developed nations during the twentieth century.

The use of radio devices or transmitters and receivers, unlike the telephone and the telegraph, were coordinated by requiring both radio stations *and* listeners to purchase licences. During the 1920s, CN Railways installed radio equipment on trains and later operated radio stations, known as CN Radio, along with a handful of universities, churches, the Manitoba government and some private organisations (CRTC 2008a; CCF 2008). There was little government intervention and little growth in the radio industry. However, when radio stations operated by the Bible Students Association publicly attacked the federal government, the government responded and revoked the stations' licences. Parliamentary debate over 'censoring religious opinion and limiting freedom of speech' led to calls to establish a Royal Commission to consider options for

Canadian broadcasting to: (1) establish one or more networks which would receive a federal subsidy, (2) establish a network of stations supported by provincial governments, or (3) establish government-owned and operated stations (CCF 2008).

The Royal Commission, led by Sir John Aird, was particularly concerned about American radio stations transmitting along Canada's southern border, and ultimately American domination of Canadian broadcasting content. The Commission recommended the establishment of 'a national public radio system to be called the Canadian Radio Broadcasting Company' in 1929, but the Great Depression and a change of government slowed progress. Radio provided a cheap form of entertainment during the Depression, and the Canadian Radio League 'began lobbying for support for public broadcasting among influential groups such as the Canadian Club, the Canadian Legion, labour unions, business associations, agricultural groups, corporations, the legal system and highly influential individuals' (CCF 2008). The *Canadian Broadcasting Act 1932* implemented many of the Aird Report's recommendations and the Canadian Radio Broadcasting Commission (CRBC) was established to regulate all Canadian radio stations *and* to deliver information and entertainment to all regions of Canada via radio. The CRBC received grants from the federal government and it began purchasing the CN Radio stations and recruiting its staff, as well as leasing private stations and recruiting private stations to provide CRBC content, which was Canadian-produced.

Later, the federal government refused to provide further funding and the CRBC turned to advertising to generate revenue. Political debate during the 1930s focused on CRBC's content, deemed to be overly-conservative, amid calls for public broadcasting to 'be a social force for enlightenment and nationalism rather than pure entertainment' (CCF 2008). A change of government ended the CRBC and a new entity, the Canadian Broadcasting Corporation (CBC), was established. Regulation of broadcasting became the responsibility of the CBC, but licensing and the allocation of frequencies (allocated internationally by the ITU) became the responsibility of the Department of Transport. The debates over the CRBC exhibited all the characteristics of the decentralised Canadian communications 'mosaic', with multiple interests influencing the development of policy thus preventing a single, preferred solution. For example, although the Aird Report recommended a national public broadcaster, some members of the Royal Commission argued for provincial control of the radio stations. Further, in the debates leading up to the establishment of the CBC in 1936, the Minister for Transport wanted private stations to report to him directly, and not to the CBC, in the delivery of national content.

With the introduction of the *Broadcasting Act 1958*, the Board of Broadcast Governors was established to take over CBC's regulatory role, leaving the CBC to focus on broadcasting. During the 1970s, Canada's regulatory framework increasingly adapted to address the issue of technological convergence. In particular, the Canadian Radio and Television Commission replaced the Board of Broadcast Governors in 1968 and was subsequently renamed the Canadian Radio-television and Telecommunications Commission in 1976. This change would be significant in establishing a specialist regulator for the regulation of both content and carriage, providing an institutional framework that was readily adaptable to the effects of disruptive broadband technologies in the 21st century. Nonetheless, maintaining a sense of national identity was a persistent issue and the regulation of content became a major concern for governments in the 1970s, leading to policies often referred to as cultural protectionism by other countries (see Browne 1998). A percentage of Canadian content, referred to as 'Cancon', was required in all broadcasting services and this was strongly supported by the CBC. Indeed, as late as 1994, a radio station was shut down for violating the requirements to provide at least 30% Cancon. To determine whether a production was Canadian or not, a system known as MAPL was adopted: each production required at least two categories of music, artist, producer, and lyrics (MAPL) to be Canadian in order to meet the Cancon requirements (see CRTC 2009).

In addition to the Cancon requirements, section 16 of the Charter of Rights and Freedoms in the *Constitution Act 1982* declared Canada (and the province of New Brunswick) to be officially bilingual. The move toward official bilingualism commenced with the adoption of the statutory Bill of Rights in 1960. In 1969, a Royal Commission on Bilingualism and Biculturalism (commenced in 1963) recommended that English and French be declared official languages of Canada. The provision of bilingual content remains a major concern for the industry, particularly in the western provinces, as part of the broader Canadian nation-building project. The nation-building imperative and the dominant role of the CBC in providing national content as part of establishing a Canadian national identity are summarised neatly by Stewart & Hull (1994: 4):

> The private stations were tied to the CBC individually by affiliation agreements and collectively by the regulations which the CBC Board of Governors enunciated for the whole system. In those days, it was considered inappropriate to talk of the public and private stations as being in competition with each other. Their roles were seen not as competitive but as complementary in a single system in which the CBC was the driving force.

Nonetheless, the 'single system' was more of a strategic arrangement rather than a restrictive organisational hierarchy. While national content remained a driving force in the radio industry until well into the post-World War Two era,[134] private radio stations, 'under the umbrella of their industry association, the Canadian Association of Broadcasters (CAB)', began to impact upon the 'single national system' (Stewart & Hull 1994: 5). Much like the telecommunications industry, the history of the Canadian radio industry is a rich mosaic of public and private interests intersecting at the various levels of government, making it difficult to implement a single, coherent national policy solution.

Since the end of the Second World War, when FM radio first became available, Canada has been at the forefront of radio technology. The provision of Cancon via radio has been an ongoing issue due to Canada's proximity to the United States, and has been a source of litigation during the North American Free Trade Agreement (NAFTA) in Canadian courts and also in the World Trade Organisation (WTO) in relation to trade with European countries. This problem is often referred to as the 'Canadian Dilemma' or the 'Culture/Trade Quandary' (Browne 1998). However, Canada has continued to deploy new radio technologies, such as digital radio, with many radio stations now broadcasting simultaneously in AM/FM and Digital Radio Broadcasting (DRB) as the system is known (CAB 2009). The allocation of radio spectrum is coordinated by Industry Canada, the successor of the Department of Transport. DRM not only provides compact disc-quality audio content, for with DRM receivers, listeners can also receive multimedia content such as text, pictures, data and videos. DRM presents a

[134] As late as 2006, the CRTC reviewed radio content regulations and, despite an increasing focus on consumer choice in communications policy, continued to include quotas for cultural content (such as French language programs) for radio stations (see CAB 2006).

surprising addition to the dilemma of technological convergence, although the devices used to receive DRM signals and the existence of numerous FM and AM radio stations, means that there are still remnants of the traditional 'radio' industry.[135]

A major hindrance to the adoption of digital radio by consumers is the distinct lack of digital radio devices on the market. This is possibly due to the risk involved in producing devices which may become obsolete very quickly as computer-mediated communication and broadcasting receivers converge. Nonetheless, the introduction of digital radio provides a substantial efficiency benefit because digital radio broadcasting requires significantly less spectrum to air the same number of analogue radio stations. This creates what is often referred to as a 'digital dividend'[136] which frees up spectrum for use for television broadcasting and significantly, wireless broadband applications. The major unresolved issue brought about by the move to digital radio is the most appropriate way to reallocate the 'digital dividend' spectrum. The competing interests of the traditional broadcasters, telecommunications carriers and community communications networks are some of the most difficult issues to resolve in the current era of increasing technological convergence. Nonetheless, the mosaic persists in Canada's radio industry.

5.2.2 Enabling, Coordinating and Regulating the Canadian Television Industry

Newspaper and radio businesses conducted the earliest Canadian experiments in television broadcasting. Beginning in 1884, the Montreal-based *La Presse* is still one of the most widely-read and influential French-language newspapers in Canada (Fleming 1991: 106).[137] La Presse conducted experiments with mechanical television in 1926 through the French Canadian radio station CKAC, in Montreal. The first television broadcast by La Presse occurred in 1931 but it was not until 1947 that the large-scale

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[135] In 2007, Industry Canada promoted experimentation in digital radio broadcasting in the belief that it 'would be beneficial to Canadian broadcasters and to the Canadian public'. Further, Industry Canada gave a commitment to 'work with the public and private broadcasting industry to develop the required technical regulations in order to accommodate hybrid digital radio on a more permanent basis' if 'these experiments prove[d] successful' (CRTC 2007).

[136] The term, however, is also used as an antonym for the 'digital divide' by many civil society organisations. This use of the term 'digital dividend' relates to the social benefits, whereas the usage here relates to the additional spectrum freed up by switching from analogue to digital technologies.

[137] La Presse continues to remain abreast of new communications technologies to this day and was an early mover to develop a significant online presence (see Cyberpresse 2009)

adoption of television became possible. In that year, CBC presented a 15-year plan for the development of Canadian television along similar lines to radio broadcasting. Radio had developed with the CBC as the national 'single system' of broadcasting, with privately-owned stations meeting local content needs and interconnecting with CBC through a '"partnership" between public and private elements' (Stewart & Hull 1994: 5). The CBC launched Canadian television in 1952 and the following year the first private television station opened. Television became available quickly and by 1955, television services were accessible by 66% of the Canadian population.

As with radio, the ever-present threat of cultural domination from the US influenced the development of the Canadian television industry. The policy of a 'single system' remained relatively unchallenged by successive federal governments during the 1940s and 1950s. This reinforced the dominant role of the CBC as both regulator and national content provider. The 'basic principle of public service broadcasting' was at the core of television policy, focusing particularly on broadcasting content (Stewart & Hull 1994: 4). National content was dominated by the CBC 'as the sole operator of the high-power transmitters and of national radio networks and as the regulator of all aspects of the system including the privately-owned stations'. Private stations would play a supplementary role, providing CBC content where the CBC 'did not have "owned and operated" stations'. Competition between the public broadcaster and private stations was generally considered 'inappropriate' (Stewart & Hull 1994: 4), however, as with radio, the 'single system' was rarely (if ever) a coherent monolith.

In 1957, when the Fowler Commission[138] recommended that responsibility for regulating broadcasting be removed from the CBC, private interests in the television industry were starting to impact upon the 'single system' approach. In particular, the Canadian Association of Broadcasters (CAB) gained ground with federal politicians, resulting in the removal of the CBC's regulatory role. Indeed, the 'CAB claimed that the CBC Board regulated the system in the interests of the CBC and in effect denied the private stations natural justice' (Stewart & Hull 1994: 6). While the CBC had the power

[138] In response to the adoption of television, a second Royal Commission on Broadcasting was established in 1955, chaired by Robert Fowler.

to ensure CBC content (in French and English) was provided by *all* television stations, the government lacked the funds to provide content across the country, and in addition to issuing licences to seven of its own stations (in six cities), licences were issues to private stations in 35 other cities (CCF 2007). Nevertheless, the Fowler Commission recommended that future broadcasting legislation should prohibit foreign direct or indirect acquisition of over 20% interest in broadcasting companies: technological nationalism prevailed.

Broadcasting was a major issue at the 1957 federal election and the Progressive Conservatives came to power on a promise to change the Canadian broadcasting system (Stewart & Hull 1994: 6). Calls for the privatisation of the CBC did not eventuate yet, by 1958, the CBC's microwave network was the longest television network in the world. At the same time, the Board of Broadcast Governors (BBG) took over the regulation of the CBC and private broadcasters - creating a two-board system (the BBG *and* the CBC) which Fowler had warned against – and the use of the name recommended by Fowler for the new regulatory body enabled politicians to claim that Fowler's recommendations had been implemented (Stewart & Hall 1994: 6). Fowler had stated that Canada had 'a single system in which both public and private stations [were] all integral parts and which [was to be] regulated and controlled by a single public board, representing the public interest and responsible to Parliament' (cited in Hall & Stewart 1994: 7; see also Armstrong 2010: 35). According to Hall & Stewart (1994: 6), the creation of the two-board system resulted in an approach of 'trial and error' in addressing important questions about the role of the CBC and private stations, the educational function of broadcasting, and federal-provincial relations in the industry.

The BBG established regulations designed to promote Canadian talent by broadcasting stations, and, as with radio, this influenced the development of the television industry. However, the CBC's dominant position was challenged by private interests in 1960 when the BBG called for applications for private broadcasters to establish television networks. This led to the development of second television stations in major cities. At around the same time, the CBC developed a shortwave network to provide services to the remote northern regions of Canada. In 1962, the interests of private television networks were formalised with the creation of the Television Bureau of Canada (TVB) as the industry association for commercial television broadcasters (Collections Canada 1963-1995, R8967-0-2-E). At the same time as the transatlantic telephone system commenced operations, the Canadian Television Network (CTV) was launched and the CBC submitted recommendations for satellite telecommunications in Canada. However, the industries remained diverged, in practice, because the provision of Canadian broadcasting content via television and radio was considered separate from telecommunications. Although satellite transmission would enable both broadcasting and telecommunications content, broadcasting content (mass media) remained largely controlled whereas telecommunications content (individual communications) rested on the principle of the common carrier.

Following public outcry for a choice of content other than that provided by the CBC, the BBG conducted hearings throughout Canada for 'second' television stations in major cities. A number of new stations were granted licences, but one of the unsuccessful applicants, Spence Caldwell, set about connecting the 'second' stations via a network which he intended to control. In reaction to Caldwell's approach, the Independent Television Organization (ITO) was established and it gained television rights for many US programs. However, Caldwell managed to convince enough of the 'second' stations to join his network to broadcast by securing the television football rights. His network became known as the Canadian Television Network (CTN) which led to competition for US program rights between the ITO and CTN. Later, CTN changed its name to CTV but its broadcasting services where concentrated in the major cities. Not all member stations of CTV were happy with the network arrangements and eventually purchased the network as a 'cooperative', where each owner controlled only one vote. The extent of cooperation in the industry was evident years later when the Canadian Radio-television Commission[139] requested CTV to expand its content services into smaller communities. In reaction to the regulator, the smaller community stations promptly banded together to resist content domination by 'external' competitors (CCF 2007). According to Rutherford (1985: 83), the legacies of radio content requirements continued to impact upon the early television industry, but the period up until the mid-

[139] The Canadian Radio-television Commission was formed in 1968 but did not become the Canadian Radio-television and Telecommunications Commission (CRTC) until 1976.

1960s was marked by a great deal of innovation and experimentation. Indeed, the Canadian communications mosaic deepened.

The regulatory direction of the Canadian television industry was not clearly laid out by the federal government until 1964 when Fowler was asked to convene a new committee on broadcasting.[140] The Fowler Committee called upon the government 'to identify its expectations for the broadcasting system as well as set specific objectives for both the public and private broadcasting sectors in Canada' (CRTC 2008a). The Committee also recommended replacing the BBG with a new regulatory and licensing agency and this transpired with the *Broadcasting Act 1968* and the formation of the Canadian Radio-television Commission. The Act also 'confirmed the CBC's mandate as a national broadcaster, strengthened restrictions on foreign ownership, required the predominant use of Canadian creators and talent, and reaffirmed the vision of the broadcasting system as a means of strengthening Canada's cultural, social and economic structures' (CRTC website).

In 1966, colour television was introduced and throughout the latter part of the 1960s a series of white papers on broadcasting and use of satellites was published. The government's broadcasting policy focused on the control of communications technologies: 'Canadians should maintain control over new electronic communications technologies in order to preserve and strengthen Canada's social and economic structures' (CRTC website). In public hearings, the CRTC had 'berated... private stations for not showing "real" Canadian content during prime-time' (CCF 2007), and in 1970, introduced Canadian content regulations requiring all stations to provide 60% overall Canadian content. Soon after, calls for third television stations in major cities led to the licensing of CanWest, a private station which operated in Winnipeg, Manitoba, and Global Communications Ltd in Toronto. Each network expanded throughout Canada during the 1980s but by 1989 CanWest had acquired 100% of the failing Global network. CanWest Global was formed and the network achieved cross-country coverage through a series of mergers and establishing new television stations.

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140 Robert Fowler was 're-hired' by the Canadian Government in 1964 to establish the Fowler Committee on Broadcasting was formed to report on the impact of the *Broadcasting Act 1958* on the broadcasting industry (Armstrong 2010:)

Before the CBC dominated television networks, television services were provided by antennas picking up US television stations and delivering the content locally via coaxial cable services to the television set. The abbreviation often used for cable television today, CATV, originally stood for community antenna television, where large antennas were built to receive the television signal which was then distributed to the community.[141] US television stations could be received via CATV and this became a major driver of deployment of CATV systems. According to Armstrong (2010: 38), CATV commenced in London, Ontario in 1952 but growth was slow and cable television subscriptions were not monitored by the Dominion Bureau of Statistics (now Statistics Canada) until 1967. By 1970, however, the CATV penetration rate in Canada was 17% compared to 6.3% in the US in 1969 (Armstrong 2010: 38) and by the beginning of the 21st century, over 80% of Canadian households subscribed to CATV services (Canadian Media Research 2006). Armstrong summarises the impact of CATV on Canadian broadcasting policy succinctly:

> [T]he rise of cable television and the issues that this raised, questions about Canadian identity and the appropriate role of Canadian content requirements, and the report of the Fowler Committee all contributed to political pressures for revised legislation that resulted in the Broadcasting Act of 1968.

The *Broadcasting Act* of 1968 fixed many of the problems which were avoided in the 1958 legislation and established the CRTC as an independent, specialist regulator. The act reaffirmed the 'essential role [of broadcasting] in the maintenance and enhancement of Canadian sovereignty and identity' and 'defined the role of the CRTC as one of putting into effect the broadcasting policy of Canada' (Armstrong 2010: 41). The CRTC's jurisdiction over cable was confirmed in 1978 after disputes over the definition of broadcasting resulted in two Supreme Court decisions (Armstrong 2010: 43). However, pay television would later be excluded from the definition of broadcasting as it was not available for 'direct reception by the public'. In the meantime, a major policy issue for the CRTC in addition to ensuring the provision of Canadian content was the economic impact of advertising revenues on the industry. As many subscribers to CATV accessed US content, this also had the impact of reducing the effectiveness of Canadian television advertising. To compensate, cable providers

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[141] Armstrong (2010: 38) refers to this as master antenna television, or MATV.

were required to substitute Canadian advertising content when airing certain US programs (see Armstrong 2010: 45).[142]

The development of satellite technologies, beginning with the successful launch of the Anik satellite in 1972, provided alternative technologies for the distribution of television content. Satellite enabled the first live television broadcast to the remote northern regions of Canada and remains a major means of service delivery in the area. By 2006, 98% of the population had access to over-the-air (OTA) services, yet only 12% of Canadians used the service for television reception (CBC/Radio Canada 2006). Coaxial cable remains the most popular method of delivering television content, although an increase in direct-to-home (DTH) satellite services has seen a decline in the number of CATV subscribers since the early 2000s (Canadian Media Research 2006). The deployment of cable television infrastructure resulting from the high penetration of the technology would later pave the way for broadband services and facilitate the convergence of the broadcasting and telecommunications industries. Nevertheless, cable television, particularly pay-per-view providers, took several decades to navigate the entrenched policy ideas which centred on the existing broadcasting industry structure and the related Cancon requirements.

Terzic's (2006: 421-443) summary of the early days of pay-per-view television provides a useful focus on the key issues. In 1983, First Choice (later known as The Movie Network), commenced the provision of pay television to Canadian cable subscribers. Experiments in pay-per-view had commenced in 1960 in Etobicoke, Ontario, using a coin-box system run by International Telemeter. However, the experiment was terminated in 1965 with Telemeter suffering losses of some $3 million. It was not until the 1970s that cable television providers 'sought licences to provide their subscribers with pay-per-channel services featuring films and specialized programming', although the CRTC did not consider the applications 'because no general policy on pay television had yet been established'. Nevertheless, there was some scope for experimental

[142] The Canadian Government also used income tax legislation to ensure that advertisers could only claim advertising expenses as eligible deductions if the advertisement was broadcast in Canada. For example, paying for advertisements from broadcasters in US border cities to target Canadian audiences would not be eligible tax deductions (Armstrong 2010: 45-46).

operations provided these experiments 'contribute[d] to the achievement of establishing broadcasting policies'. Armstrong (2010: 49) argues that pay television did not attain the same levels of success in Canada as it did in the US because most Canadians already had cable services, whereas US customers were being offered a cable service for the first time. Canadians rejected 'the new concept' and 'a series of bankruptcies and amalgamations' followed.

In her article on the political economy of pay television, Terzic (2006: 424) has described the 1970s as the 'decade of uncertainty, debate and regulatory drama'. During this period the CRTC investigated the available policy options for pay-TV, amid pressure from the cable television industry to deploy the services and the existing broadcasters and telecommunications providers concerned about the increased competition resulting from infrastructure which enabled alternative delivery means. Ultimately, fears about the impact on Canadian culture led the CRTC to cite the objectives of the *Broadcasting Act 1968* as the reason for denying the introduction of pay television and this view was maintained until well into the 1990s (Terzic 2006: 428; Armstrong 2010: 49-50). Nevertheless, a host of unlicensed satellite dishes '[sprung] up in northern and remote areas of the country to pirate US television signals' and the cable industry threatened to 'simply go ahead on its own and introduce pay television without government approval' (Terzic 2006: 426). The cultural protectionism afforded the broadcasting industry continued to delay the introduction of pay-TV and various CRTC reports and committees (despite other evidence to the contrary) determined that there was no evidence of substantial demand for the services, and therefore 'no need for hasty action' (CRTC in Terzic 2006: 426).

As pay-TV services from the US continued to grow, there was a very real risk that US cable television 'could gain a foothold in Canada' (Terzic 2006: 427). The CRTC held numerous public hearings on the introduction of pay-TV, with the cable companies and the traditional broadcasters proposing different models for supplying the services. A third CRTC inquiry into pay television, at the insistence of the federal Department of Communications, included a call for submissions for the provision of pay television services via satellite. According to Kirby (1980 cited in Terzic 2006: 427), the different proposals put forward by the potential competitors resulted in little more than 'artfully constructed packages designed to protect established interests'. The Therrien Committee (from the third inquiry), consisting of both federal and provincial representatives, argued that all 'models presented for a single national pay television agency would have power that would not, in the opinion of a majority of members, be to the best interest of the Canadian public'. The CRTC subsequently called for applications for pay television services, with a public hearing in 1981. However, the CRTC's opposition to pay television services continued until 1991 when 'an experimental and temporary licence' was issued to Viewer's Choice Canada, a consortium of Astral, Rogers and CTV, 'on the basis of the parent company's expertise in the pay television industry' (Terzic 2006: 428).

Much like the radio industry, the advent of digital communications technologies is changing the nature of the television industry as digital signals replace the older analogue system. Canada's transition to digital television on 31 August 2011 created a 'digital dividend' from the additional spectrum available from the conversion from analogue to digital signals, which has been identified for use 'for advanced wireless and public safety services for police and fire departments, and other important services to benefit Canadians' (CRTC 2008b). One of the major impacts of digital television for consumers is the need to purchase additional equipment, particularly for receiving OTA services. However, as many Canadians access cable television services, the service providers managed most of the transition. Further, US stations converted to digital transmission in June 2009, so it is likely that many Canadians converted their equipment sooner than the official changeover date to take advantage of the US OTA services. The CRTC's role in coordinating the transition to digital was largely technical as consumer equipment used for reception of television services is not regulated by the CRTC (2008b). Unlike their US counterparts, Canadians did not receive a subsidy from the government to offset the cost of purchasing new equipment.

Canada's television penetration has remained steady at approximately 99% of households throughout the beginning of the 21st century (Armstrong 2010: 59). However, pay television has had a significant impact on traditional advertising revenues in both the radio and television industries. As at 2010, radio and television advertising revenues were decreasing in proportion to the increase in revenues for pay television and specialty broadcasting services (CRTC 2010). Further, the traditional divide between the telecommunications and broadcasting industries has become increasingly irrelevant with direct competition between telecommunications carriers and broadcasting distribution undertakings (BDU)[143] common in both sectors. Indeed, by 2010, 67% of cable companies' revenues were from telecommunications services (CRTC 2010). Nonetheless, by 2010, approximately half of all Canadians were beginning to watch broadcasting content via the Internet (CRTC 2010) which is extremely difficult to regulate. Further, the convergence of telecommunications and broadcasting services creates a clash of ideas: On the one hand, broadcasting content is traditionally regulated for cultural reasons; on the other, telecommunications common carriers are required to carry any message to prevent the control of information. To address these competing ideas the concept of 'net neutrality' is currently being debated in Canada as a policy response to the regulatory dilemma created by convergence (see Mac Sithigh 2011).[144]

5.3 Institutional Origins of the Broadcasting Monolith in Australia

5.3.1 Enabling, Coordinating and Regulating the Australian Radio Industry

The 'pre-history' of radio in Australia[145] commenced as early as 1888 when Professor Richard Threfall of the University of Sydney was able to repeat Hertz's experiment to prove the existence of 'free electromagnetic waves'.[146] In 1897, some three years after Marconi had successfully transmitted Morse code via radio waves, public demonstrations of wireless technologies were being conducted in Adelaide and Melbourne.[147] Experimental work was also conducted by several postal, telegraphic and naval employees between 1899 and 1901 (see Ross 1998: 3). At federation, the Constitution transferred posts and telegraphs to the Commonwealth. In accordance

[143] In Canada, cable and DTH satellite providers are referred to as broadcasting distribution undertakings (BDUs) for CRTC licencing purposes and the abbreviation BDU is in common usage in the industry.

[144] The concept of net neutrality is addressed in the next chapter.

[145] Griffen-Foley (2009: 3) refers to this period as radio's 'pre-history'

[146] Threfall repeated Hertz's experiment in 1888, the same year that Hertz published his findings. He also had a 'profound impression on his contemporaries such as William Bragg and Ernest Rutherford', two other Australian radio pioneers (Ross 1998: 2-3).

[147] William Bragg conducted a public demonstration of wireless telegraphy at the University of Adelaide in 1897 (Jones 1995: 8), as did G.W. Selby in Melbourne (see Charley cited in Ahern 2000: 2). Further, Henry Jenvey of the Victorian Post Office made radio contact with the Duke of York's escort ship during a royal visit in 1901.

with Colonial Office policy, the *Wireless Telegraphy Act* of 1905 expanded the Commonwealth's powers to include wireless technologies as part of its responsibility for 'postal, telegraphic, telephonic and other like services' in section 51(v) of the Constitution. The *Wireless Telegraphy Act* was implemented following pressure from Colonial Office in London to secure public control of the empire's airwaves, with the option to licence airwaves for use by private providers (Given 2010: 60.2).

Consequently, the Postmaster-general's Department (PMG) was granted exclusive control over the 'ether' in Australia, leading to concerns that the government was attempting to thwart patent laws. However, government policy, then Attorney-General Isaac Isaacs (cited in Brennan 2000: 73) argued, was designed 'not to appropriate the invention, but to control it'. Further, others argued that public ownership would be beneficial, as 'a monopoly would ensure the new organisation did not resist new technologies that threatened existing investments' (Given 2010: 60.2). The result was that, with very little debate, the *Wireless Telegraphy Act* gave the Postmaster-General wide-ranging powers over radio infrastructure *and* content (including censorship), with penalties including the 'search and seizure of apparatus used in contravention of the Act' and penalties for broadcasting without a licence including a fine of '£500 or a maximum of five years' imprisonment "with or without hard labour" (Brennan 2000: 72-74). The decisions taken by government in 1905 (well before the new medium was established) were of such significance that they would influence broadcasting policy in Australia for most of the twentieth century (Brennan 2000: 74).[148] Indeed, the extraordinary powers granted to the Postmaster General established a punitive culture in Australian broadcasting that would remain until the 1970s when listener licences were eventually abandoned.

While numerous successful wireless experiments had already been conducted in Australia by 1905, these were mostly by researchers or amateur enthusiasts. In 1906, however, the Marconi Wireless Telegraph Company Limited demonstrated the capabilities of wireless telegraphy to parliamentarians at Queenscliff in Victoria and

[148] Further, Hansard records indicate that a 'state monopoly of the ether was argued to be "purely a formal measure"' at the time of establishing the *Wireless Telegraphy Act*, in accordance with (British) Colonial Office policy at the time (Given 2010: 60.2).

interest in wireless technology attracted political interest. According to Given (2010: 60.2), more than 'three-quarters of the members and all but two of the Cabinet' members accepted an invitation to the Marconi demonstration, even though it was a parliamentary sitting day. Marconi himself, by this stage an international celebrity, did not attend the demonstration. Instead, Captain Louis Walker, the Australasian agent of the Marconi Company, conducted the demonstration in hope of earning 5% commission on any business contracts secured for the Company. Given (2010: 60.2) states that Walker's role in Australasia was to sell 'the idea of wireless, the Marconi wireless system, and shares in Marconi's Wireless Telegraph Company'. While the Commonwealth placed £10,000 in future estimates for 'a chain of coastal wireless stations', Walker (cited in Given 2010: 60.4) failed to sell either Marconi equipment or shares, and remarked that Australian investors did not understand wireless technology and found it 'too speculative'.

Part of the problem for investors may well have been government uncertainty about international *and* local issues that made it difficult to make decisions about the adoption of wireless. For example, shifting priorities for the British hampered deployments of integrated wireless stations in the Pacific (which were to be co-funded with Australia and New Zealand), whereas in Australia a series of tenuous political coalitions (required to achieve control of the lower house to form government) focused government attention away from any attempt at a coherent policy response to the new technology. In particular, Prime Ministers Alfred Deakin and Andrew Fisher, both who appear to have had different preferences for Telefunken and Marconi equipment (respectively), traded places twice each as prime minister from 1905 to 1910, inevitably shifting the focus from any serious consideration of wireless deployment (Given 2010: 60.5; NAA 2012a).

However, it is clear that the PMG 'wanted absolute control' over wireless and that the Australian Government deliberately delayed the introduction of wireless technology in Australia (Moyal 1988: 110). While the Australian government was influenced by 'a British post office hostile to Marconi', it rejected a decade of offers from a variety of other companies including Telefunken and De Forest (Moyal 1988: 110) until it was criticised for its cavalier attitude towards wireless after the *SS Yongala* disappeared off the coast of Queensland during a cyclone in 1911.[149] The *SS Yongala* was still in sight of land when a nearby signal station received a telegram warning of the cyclone but without a ship-to-shore wireless capability observers could only watch as the ship sailed into the storm (Maritime Museum of Townsville 2008). Shortly after, it was decided that the construction of a series of coastal wireless stations would be put to open tender following the 1907 Colonial Conference in London. Following a further conference in 1909, the Navy and the PMG were at loggerheads over the use of wireless technology and how it would be deployed (Jose 1941: 436-437). Consequently, the establishment of coastal wireless stations in Australia did not occur until 1912 when the first wireless station opened in Melbourne's Domain using what the Commonwealth claimed was its own equipment (*Deloraine and Westbury Advertiser* 1912: 1; *Barrier Miner* 1912: 3; Given 2010: 60.3-60.5).

It appears that the government went to extraordinary lengths to maintain complete control of the coastal wireless stations by attempting to avoid the use of the Marconi system. After an introduction in London, Prime Minister Andrew Fisher appointed John Balsillie, the Australian-born founder of the British Radiotelegraph Company, as the PMG's engineer for radiotelegraphy.[150] Balsillie established twenty stations by 1915 (Cleland 1979), the first of which used his own 'invention'. The *Barrier Miner* (1912: 3) reported on the Commonwealth's reluctance to reveal any details about the first coastal station in Melbourne:

> The Commonwealth Government, in fitting up its wireless stations, is using what it claims to be a system of its expert (Mr. Balsillie). Nobody knows what this system is. The Commonwealth claims that it is one which does not infringe any existing patents, but in almost the same breath as this it was announced by the Postmaster-General [Charles Frazer] that if any other system was being pirated the Government would be prepared to make suitable reparation to the owners of the patents…
>
> When the Melbourne station was opened certain persons connected with the wireless companies in Australia sought permission to inspect the plant with a view to seeing if it was really all that was claimed by the Postmaster-General. Mr. Frazer, however, declined to allow such inspection, at the same time reiterating his statement that no patents were being infringed.

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[149] Australian naval warships were fitted with wireless telegraphy from 1910 but could only communicate ship-to-ship as no coastal stations existed (Jose 1941: 436). Harte (2002: 23) suggests that the loss of the *SS Waratah* in 1909 prompted the government to act on establishing coastal wireless stations. Unfortunately for the *SS Yongala*, the ship's wireless device was en route from Britain and was yet to be fitted (Maritime Museum of Townsville 2008). Regardless, Australia had no onshore wireless capability in the year before the RMS *Titanic* disaster proved the value of the medium for shipping.

[150] The Australian Government decided to use circuits designed by Balsillie exclusively in an attempt to avoid patent problems with Marconi (Goot 1991). However, the 'Balsillie System' of wireless telegraphy had been found to be 'an infringement of the Marconi patent' in 1911 (Cleland 1979).

> The representatives of the Marconi company in Australia are not content to take the Postmaster-General's assurance about the exclusiveness of the system of his expert.

Further, the contracts to build the major coastal wireless stations at Sydney and Perth did not go to the Marconi system. Instead, these contracts were granted to Australasian Wireless Ltd, a Sydney firm with the patent rights to equipment developed by the German company Telefunken (Goot 1991). Regrettably, the Navy's input had been disregarded by the PMG and the two main coastal stations at Sydney and Perth (which were only medium-powered stations, not the high-powered stations required by the Navy) hampered Australian naval operations during the First World War (Jose 1941: 436-437).

Consequently, as had happened elsewhere in the world, English Marconi challenged the Commonwealth for infringement of patent rights in 1912, eventually forcing the government to settle out of court in 1915.[151] In addition to the patent challenges, PMG had complete control over the wireless system until the early stages of the First World War when 'a PMG wireless operator innocently transmitted an uncoded message' on troop movements. Consequently, the Navy convinced Prime Minister Hughes to transfer responsibility for wireless communication to the Department of the Navy in 1915 (ABS 1915: 746) and Balsillie (the PMG's 'wireless expert') resigned (Moyal 1988: 113; Cleland 1979). By the beginning of the war there were 19 coastal stations in Australia (ABS 1915: 680), but there was little development of radio technologies beyond the government's initial commitment to establish a coastal radio service. Indeed, the Australian *Year Book* series indicates that from 1910 to 1919 that: 'Up to the present no further concerted effort ha[d] taken place' to expand wireless services (ABS 1910: 786-7; 1914: 680-1; 1915: 710-1; 1919: 745).[152] By the 1920s, wireless technologies were clearly off the PMG's policy radar.

Nonetheless, the solution to the various patent disputes between the Commonwealth, Australasian Wireless Ltd and English Marconi was to have a significant influence on

[151] The first challenge occurred in 1912 and the Australian Government settled in 1915 (see Goot 1991).

[152] The reporting of wireless telegraphy in the ABS *Year Book* series was temporarily discontinued in 1917 due to the First World War. Further, a number of German wireless stations (which used Telefunken equipment) in the Pacific were captured by Australia in the early stages of the war (Mackenzie 1941: 36).

the development of the broadcasting industry in Australia (see Moyal 1988: 111-113; Goot 1991; Cleland 1979). In 1913, Telefunken (Australasian Wireless Ltd) and Marconi operations merged to form Amalgamated Wireless (Australasia) Ltd (commonly referred to as AWA) (AWA 2012).[153] This was an important arrangement as it granted AWA 'exclusive rights throughout Australasia to the patents, "present and future", of both Marconi and Telefunken' (Goot 1991). In the same year, AWA established the Marconi School of Wireless[154] and commenced training wireless operators for coastal stations and the shipping industry. Amid the professionalisation of the industry, in 1910 various state-based bodies were formed which would eventually federate into the Wireless Institute of Australia (WIA), a fast-growing amateur organisation that was formed 'to represent interests of wireless experimenters to government' (WIA 2011). However, amateur wireless experimentation was prohibited during the First World War and existing amateur experimental installations were dismantled. Consequently, by the end of the war wireless technologies for civilian use were still focused on point-to-point communication (mostly for shipping) and the entire sector was dominated by AWA.

With the advent of radio broadcasting in the United States from 1922, by the early 1920s communication by wireless technologies could be categorised as either point-to-point or broadcasting (one-to-many). The distinction was important in the Australian wireless industry as the government was focused almost exclusively on point-to-point technologies and entered into long-term arrangements with AWA with little regard for emerging applications of wireless. For example, shortly before the Armistice in 1918, AWA developed the capability to receive a wireless telegraph message in Sydney from the Marconi station in Wales, and radio pioneer and AWA's managing director (later chairman) Ernest Fisk[155] convinced Prime Minister 'Billy' Hughes that a beam wireless service between Australia and Britain could, with sufficient capital, become a profitable commercial service after the war. Fisk's relationship with Prime Minister Hughes had an important influence on the direction of the wireless industry in

[153] The company is still known today as AWA, despite its various incarnations (AWA 2012).

[154] Upon its establishment, the Marconi School of Wireless was known as the Marconi Telefunken College of Telegraphy until 1914. Trained operators produced

[155] Later Sir Ernest Fisk, see Goot (1981) for biographical details. Fisk remained a prominent figure in the Australian broadcasting industry in Australia and internationally until the 1950s (see Given 2012 for details).

Australia. Fisk accompanied Hughes to the Imperial Conference in London in 1921 and, in contrast to the short-distance relay system (to connect the Empire) envisaged by the Imperial Wireless Committee, advocated the use of a long-distance beam wireless service. In 1922, the Australian Government backed Fisk's idea and 'commissioned AWA to create the service, boosted the company's capital, and become its majority shareholder' (Goot 1991). AWA went on to be pioneer radio within the Empire, connecting Australia via beam wireless to London in 1927 and Canada in 1928. Around the same time, AWA pioneered Empire broadcasting, and then in 1930 established an Empire wireless radio-telephony service (Goot 1991).

The arrangement between AWA and the government put the beam wireless service in direct competition with what was, in effect, a government-operated duopoly in the provision of an international wired telegraph service using the Overland Telegraph Line and the Pacific Cable (Given 2008: 105).[156] As part of the deal, AWA acquired control of the coastal wireless stations, agreeing to upgrade the existing equipment. AWA's wireless telegraphy service undercut the wired telegraph businesses by two-thirds of the usual price for messages between Australia and Britain. The Post Office wired telegraph service was still necessary to deliver wireless telegrams; therefore the service was never a serious 'facilities-based' competitor to the Post Office (Given 2008: 105-106). Regardless, the Australian government got what it wanted: a wireless service 'run on commercial lines by its existing management, but ultimately controlled by the Commonwealth'.[157] So did Fisk and AWA: remarkably, the deal ended 'the campaign to extend state control of wireless into areas where he saw AWA's future growth opportunities', effectively establishing a state-sponsored monopoly of the radio broadcasting industry for AWA.

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[156] The Australian Government did not control the Port Darwin to Singapore connection, which was privately owned and operated by John Pender's British Australian Telegraph Company. Pender's companies, including the British Australian Telegraph Company would eventually become Cable and Wireless. As Given (2008: 104) states, wireless was a 'disruptive technology', but Pender's telegraph companies merged with Marconi's Wireless Telegraph Company in 1929, which kept most international linkages in private hands until the company was nationalised by the British Government after the Second World War (Cable and Wireless 2011).

[157] Given (2008: 106) suggests that Hughes, who had been Attorney-General during the patent disputes with Marconi, knew that a public-private partnership would prevent the problems associated with patents which had occurred before the war. The arrangement with AWA was an important compromise for both parties, giving the Commonwealth exclusive access to the benefits of the patented technology while providing AWA with an exclusive market. Hughes was also keen to prevent the Post Office 'bureaucrats' from preventing the adoption of the technology as it would compete with their existing cable services.

While the government may not have been focused on the use of wireless technology for broadcasting, Fisk was well aware of the commercial potential for what was by this time referred to in the United States as 'radio'. Fisk conducted the first demonstration of wireless telephony in Australia in Sydney in 1919 and other demonstrations followed in Melbourne,[158] so by this time it was well-known that transmission of the human voice via wireless was practicable (Goot 1991).[159] Despite the potential civilian use of wireless telephony, however, the PMG was reluctant to take back control of wireless services from the Navy because the coastal wireless service operated at a considerable loss (ABS 1915: 677; Moyal 1988: 113). By this time pressure from the Wireless Institute of Australia and other experimenters seeking the removal of war-time restrictions on wireless experimentation encouraged, in the interim, the responsibility for wireless regulation to be transferred from the Navy to the Prime Minister's Department in 1921. The Prime Minister also wanted to 'keep close control of wireless' during the discussions with AWA at the time about the proposed Australia/UK wireless link (Burger 2007: 4).

The world's first commercial radio station commenced broadcasting in the United States in 1922 and in the same year, in the United Kingdom, the British Broadcasting Company (BBC) was formed. These events prompted the PMG to hold a 'conference to consider the best way to develop the medium in Australia' in Melbourne in 1923 (Given 2008: 109). At the conference, Fisk submitted a proposal for a 'sealed set' system, restricting listeners to a single station, as a way of avoiding the 'chaos' experienced in the United States. The majority of Fisk's proposals were accepted, and both broadcasters and listeners were required to purchase licences (*Brisbane Courier* 1923: 13). Interestingly, the conference 'agreed to affirm the principle of decentralised broadcasting services' while newspaper proprietors were concerned about news distribution:

> The collection and preparation of news involved great expense, and when made public it would not become the property of a broadcasting company to

[158] According to the *West Australian* (1931: 3), the Air Force conducted the first demonstration of radio telephony in Melbourne in 1920. However, Harte (2002: 46) argues that Fisk's Sydney demonstration the year before was overlooked by the newspapers, who gave 'but scant attention to this historic event'.

[159] Given (2012) outlines how 'a good deal of [Fisk's] story is a personalisation of [AWA's] corporate narrative'. Others involved in the various experiments were often overlooked in this narrative, for example Sir Lionel Hooke, who conducted the Melbourne experiment with Fisk in 1920 (Davies 1996).

incorporate into its services. No objection would be made to supplying news for broadcasting on a proper business basis (*Brisbane Courier* 1923: 13).

Nevertheless, the 'sealed set' system soon proved impracticable: after almost a year only 1,400 listeners had purchased 'listening licences', prompting a change to the regulatory system (*West Australian* 1931: 3). Consequently, a hybrid model of radio broadcasting was adopted, based on the US approach (which relied on advertising fees) and the British approach (which relied on the payment of licences by listeners). The hybrid model consisted of a two-tiered licensing regime: 'A' class licences were funded by listeners' licence fees, whereas 'B' class licences were offered to stations generating revenue through advertising.[160] In effect, government subsidised 'A' class stations by collecting licence fees from listeners and redistributing a portion of the fees to the 'A' class stations. The first commercial Australian radio broadcast was conducted in Sydney by the radio station owned by Broadcasters (Sydney) Ltd, using the call sign 2SB. Farmer & Co., which would later become the ABC's Radio National, commenced broadcasting two weeks later using the call sign 2FC (see NFSA 2012).

Unlike in the UK, where listener licences sold very well (Crisell 2002: 22), the 'A' class licences in Australia were less successful, requiring the PMG to ensure that listeners were appropriately licensed. Harte (2002: 56) states that the aerial required to receive broadcasts typically required two poles of some 12 metres in height, making it somewhat easy for PMG radio inspectors to identify an unlicensed listener. According to Harte (2002: 56), visits 'by inspectors were always followed by an inundation of fines, the details of which were published in the daily newspapers'. As in the UK (Crisell 2002: 22), many Australians found loopholes in the rules, such as purchasing cheaper experimental licences to build their own sets, or simply avoiding the licences all together (Harte 2002: 56-57). This appears to have been an issue for the Wireless Institute of Australia, as it specifically excluded from its membership 'persons whose sole interest in wireless is listening to broadcasting' (*West Australian* 1924: 7).

[160] Harte (2002: 56) suggests that 'C' class licences, for 'stations receiving corporate advertising from large sponsors', were never issued.

The 'A' and 'B' class licensing system was somewhat successful, in that the number of listener licences sold 'increased from 38,000 in June, 1925 to 310,000 in July, 1929' (*West Australian* 1931: 3). However, as wireless technologies enabled radio broadcasting, the relationship between the government and AWA (the patent holder for radio technologies) was increasingly precarious, despite lasting for some 30 years (Given 2008). The Commonwealth was able to enable some competition to AWA in broadcasting by ensuring that AWA's patents were available to competitors, in exchange for the government ensuring that AWA received a share of the relevant licence fees (Given 2008: 110). Nonetheless, Billy Hughes was no longer Prime Minister in 1923 when the first commercial radio broadcast was conducted in Australia, and a broadcasting nationalisation agenda, advocated by conservative and Labor supporters, threatened the AWA's stranglehold on the industry. While the original agreement between AWA and the Commonwealth 'had no end', and there was no agreement on how the arrangement between the company and the government would terminate should 'one of the major shareholders want to get out', Hughes sat on AWA's board and held the casting vote, effectively blocking any change to the Commonwealth's arrangement with AWA (Given 2008: 108-109).

In 1927, the Radio Research Board (RRB) was established with an initial purpose of improving general radio practices in Australia. Representatives on the RRB included members of the University of Sydney, the PMG, the Department of Defence, the University of Melbourne and the Council for Scientific and Industrial Research (CSIR).[161] Early studies conducted by the RRB into the transmission of radio waves along the ground and in the upper atmosphere enabled the large-scale deployment of broadcasting services which rapidly met with larger demand than traditional telecommunications services. Consequently, the Commonwealth government nationalised the radio broadcasting transmission facilities with the formation of the Australian Broadcasting Company in 1929,[162] which later became the Australian Broadcasting Commission (ABC) as a result of the *Australian Broadcasting Commission*

[161] The CSIR was established in 1926 to conduct research into Australian primary and secondary industries. The CSIR became the Commonwealth Scientific and Industrial Research Organisation (CSIRO) in 1949.

[162] According to the former Australian Broadcasting Authority's website (see http://www.aba.gov.au), AWA officially commenced radio broadcasting in Australia in 1923.

Act 1932. The ABC then controlled a number of amplification modulation (AM) radio stations throughout the country.

With the establishment of the Australian Broadcasting Control Board as a result of amendments to the *Broadcasting and Television Act* in 1948, regulation of the radio spectrum prevented the introduction of the superior quality of frequency modulation (FM) radio for several decades as this frequency range was initially reserved for the future introduction of television.

The High Court would later determine the scope of 'other like services' and the Canadian experience would again prove influential. The constitutional validity of the Commonwealth's *Wireless Telegraphy Act 1905-1919* was challenged when the High Court determined that the jurisdiction of the Commonwealth extended to radio broadcasting services.[163] As a result of a Canadian Supreme Court decision, 'other like services' were deemed by the High Court to include future technologies not specifically mentioned in the Constitution.[164] The consistency of the High Court's decision was apparent when the definition of 'other like services' was extended to include television services in the *Broadcasting and Television Act 1942-1962*.[165] Consequently, and until 1975, operational and regulatory functions for all postal and telecommunications services (which for some time included radio and television broadcasting services) would reside with the Postmaster-General's Department (PMG).

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[163] This position was confirmed by the High Court in the decision in The King -v- Brislan; [1935] HCA 78; (1935) 54 CLR 262 (17 December 1935).

[164] It is interesting that in reaching the Court's decision, Latham C.J. concluded that the '*Canadian Constitution* does not refer to telephonic services. The Dominion Parliament, however, has exclusive power to control "lines of steam or other ships, railways, canals, telegraphs, and other works and undertakings connecting the Province with any other or others of the Provinces, or extending beyond the limits of the Province" (*British North America Act 1867*, sec. 92 (10)). It has been held that in this section "telegraphs" includes telephones (*Toronto Corporation v. Bell Telephone Co. of Canada*). There is now the further authority of the Judicial Committee of the Privy Council for the proposition that broadcasting also falls within the description of "telegraphs" (*In re Regulation and Control of Radio Communication in Canada*). If broadcasting is included in the *Canadian Constitution*, then *a fortiori* broadcasting is covered by the words "telegraphic" and "telephonic" in the *Australian Constitution*'.

[165] See Jones v. The Commonwealth (No. 2) [1965] HCA 6; (1965) 112 CLR 206 (3 February 1965).

5.3.2 Enabling, Coordinating and Regulating the Australian Television Industry

As a result of the PMG's powers in relation to broadcasting, telecommunications policy implicitly influenced broadcasting policy for many years. In 1946, the Overseas Telecommunications Commission (OTC) was established with responsibility for all international telecommunications services by the *Overseas Telecommunications Act 1946*. At the same time, the Commonwealth Government acquired the short wave broadcasting assets of AWA. Further, the OTC acquired Cable and Wireless' (C&W) overseas telecommunications facilities. C&W would retain ownership of the submarine cables; however, these were bought back by the British Government, marking the end of the world's largest privately owned cable network. Subsequently, the British Commonwealth of Nations assumed centralised control of the cable network from London and private ownership of the Australian telecommunications and broadcasting network was considerably diminished. The nature of the telecommunications and broadcasting industries in Australia at this time reflected British and European trends of public ownership of infrastructure assets following the end of the Second World War.

Television in Australia was enabled by government in September 1956 through the adoption of an approach recommended by the Royal Commission on Television (1953-1954) (NAA 2012b). The Royal Commission was established to investigate how television might be enabled, and a major recommendation was that television should be implemented gradually, with commercial stations commencing in Sydney and Melbourne. The rationale for the approach included limited spectrum available for television services, leading to recommendations on 'the number of national commercial television stations which could be effectively established and operated and the standards to be observed in programs to ensure the best use of television broadcasting in the public interest'. There was also some concern about the ability of PMG to regulate television services in addition to its traditional functions (NAA 2012b). The resultant institutional framework had its origins in the Chifley government's amendments to the *Broadcasting Act 1942* implemented in 1948. Effectively, the government foreshadowed the PMG's inability to deal with issues relating particularly to television, and drawing on the experience of Great Britain, Canada, New Zealand, South Africa and the United States, established the Australian Broadcasting Control Board. The Board regulated the industry, with special provisions for ministerial approval, until 1976 when the Green Report recommended that the functions of the Board be dispersed among three separate organisations: Australian Broadcasting Tribunal, a Broadcasting Planning Board and a Broadcasting Council.

The end of the post-war age (McWilliams and Piotrowski 2005) was signified by the economic crises of the early-1970s, leading to significant policy changes being implemented by the Whitlam government. Responsibilities for broadcasting policy and regulation were by now institutionally and distinctly separate from postal and telecommunications services, although for short period the PMG incorporated the remnants of the Australian Broadcasting Control Board as a separate department. The government-controlled monopoly of the telecommunications industry, however, under the regulation of Telecom Australia, would remain for a number of years and continued to influence broadcasting services due to the reliance on Telecom's responsibility for equipment, infrastructure and administration of infrastructure which was used to deliver broadcasting services (DCITA 1997). Nevertheless, the long history of technological convergence within the broadcasting and telecommunications industries would remain in the background until the next major advancement in telecommunications and broadcasting technology brought with it increasing policy and regulatory challenges which foreshadowed the accelerated technological convergence associated with the development of broadband Internet services almost three decades later.[166]

Early signs of technological convergence were evident in the rationale for Australian media magnate Kerry Packer to encourage the government to launch a satellite for the delivery of broadcasting services. Packer's insistence gained the support of the Fraser Government to launch a satellite system, and this became national policy in 1979.

[166] A number of relevant device and infrastructure advances and also companies and institutions have not been included in the discussion of the terrestrial era of telecommunications due to reasons of concision and relevance to this thesis. These include, but are not limited to: beam wireless, telex, facsimiles, picturegrams, microwave, Integrated Services Digital Network (ISDN), television, the Common User Data Network (CUDN), the COMPAC and SEACOM submarine cables, Standard Telephones & Cables Ltd (STC), Commonwealth Cables Management Committee, International Telecommunications Union (ITU), Commonwealth Telecommunications Organisation and Australian Antarctic Division and its satellite telecommunications system.

Packer was keen to break Telecom's monopoly on control of the infrastructure that affected his ability to reach a larger television audience (Barr 2000: 80). However, rather than enable 'a simple, off-the-shelf [satellite] system' in the private venture that Packer had envisaged, the government adopted a 'Rolls Royce' satellite system which was owned 75% by the Commonwealth and 25% by Telecom. This meant that Aussat neither achieved Packer's aim nor provided a real competitor to Telecom. Further, the deployment of television broadcasting services in non-metropolitan areas was slow. For example, until the early 1990s, many remote areas, such as Darwin in the Northern Territory and Cairns in Far North Queensland, had access to only the ABC and one other commercial television station. Indeed, FNQ 10, the first commercial station in Cairns, did not commence broadcasting until 1966 - a decade after television was enabled in Australia, and Darwin did not have access to television services until 1971 (ABS 1968: 449). The gradual process instituted by the recommendations of the Royal Commission in 1954 would take until the early 1990s to deliver the standard three commercial stations and the government-run ABC and SBS stations to most urban areas. Regional television stations were aggregated over time to provide local content, particularly news and advertising, in a standardised format. Digital television commenced in 2001 with the SBS's deployment of the first digital television service and now most regions of Australia have access to free-to-air television, including a variety of additional channels provided by the major commercial stations, with the rollout expected to be completed in 2013 (Digital Ready 2012).

The government's major role in enabling commercial television broadcasting services was to grant licences to individual stations. Typically, this involved a judgement by government of the viability of commercial stations in new locations. Social policy objectives aside (such as content regulation), the rationale for economic regulation of the industry was to prevent market failures (Brown & Cave 1992: 379). However, Australia's television broadcasting system remains largely based on free-to-air television funded by advertising received via roof-top antennae. Three major commercial stations continue to dominate the industry and despite the opportunity to change the industry in light of the digital switchover, the free-to-air model remains the major method of television service delivery despite several pay-TV providers being available in most metropolitan areas. Sixteen channels are now standard throughout most of the country but these continue to be dominated by the three major commercial operators.

The system created by government had the effect of stymying the introduction of pay-TV in Australia, and, in particular, preventing the introduction of alternative delivery technologies. Unlike Canada's community cable delivery systems, Australia's over-the-air delivery system did not produce an alternative network for use in delivering Internet services. Media magnates such as Kerry Packer were concerned about the impact of pay-TV on advertising revenues (as had occurred in the UK and the US) and were able to delay its introduction by some 15 years (Barry 2008: 505). When pay-TV was introduced, the major free-to-air networks were able to encourage the government to ban advertising on pay-TV stations for five years, and at the same time to prevent a proposal for the government to 'throw open the airwaves' to other providers (Barry 2008: 505-506).

With the sale of the AUSSAT satellite system in 1991, the government considered the introduction of pay-TV as a way to make the system commercially viable. However, the power of the three commercial stations to persuade then federal Communications Minister Senator Graham Richardson to ensure the introduction of pay-TV did not damage their oligopoly position led to a number of interventions by government in the television industry. An interesting feature of the Australian television industry was that, unlike telecommunications, commercial operators and government-provided television services had co-existed since the technology had first been enabled in 1956. Although television services were delivered via an oligopoly, the major players were so embedded in the industry that meeting between then Prime Minister Paul Keating and network executives were not uncommon. Indeed, the opportunity to enable diverse technologies for the introduction of pay-TV was neglected in favour of the major televisions stations (see Productivity Commission 2000). Indeed, the oligopoly would be extended to pay-TV by guaranteeing the three commercial networks a major stake in the AUSSAT delivery system (Barry 2008: 509).

The federal government's penchant for selecting particular technologies to deliver communications services emerged in the television industry during the introduction of pay-TV. Barry (2008: 513-521) outlines the story of former head of Channel Ten Steve Cosser and his attempt to introduce a microwave (MDS) delivery system in Melbourne Sydney. At first, the government appeared to support the introduction of a variety of technologies. Indeed, then Prime Minister Paul Keating (cited in Barry 2008: 517) had argued:

> I have been quite uncomfortable about the fact that we are about to exclusively nominate satellite television as the only vehicle for pay TV, particularly when other technologies are available, like cable, fibre optic and MDS [microwave].
>
> The Government has decided to allow, from the out-set, the widest possible range of services, using a variety of technologies, including satellite, cable and microwave.
>
> While the beneficiaries of regulation always say that regulation is wise, that would have closed off Australia to the higher technology of fibre optics and MDS in favour of plastic dishes and satellites for a decade. I was never prepared as prime minister to shut that technology off.

Initially, MDS was believed to be an inferior technology, but Cosser had proven that the system worked. This presented a challenge to Kerry Packer's potential market with satellite pay-TV, as Cosser had a head-start with his microwave system and could deliver the services at much lower prices. Controversially, the Prime Minister intervened and the MDS tender process was abandoned, and, combined with Packer's influence over potential content providers in the US, effectively ended Cosser's business and the introduction of MDS pay-TV.

The Australian monolith in the television industry was an interesting combination of government and business provision but standardised on a national scale. The oligopoly of commercial providers coexists with the government-run ABC and SBS. Nonetheless, the most pertinent aspect of the monolith is the single delivery system. Although HFC cable systems exist in major metropolitan areas for the delivery of pay-TV services, for the most part the national television broadcasting system remains an over-the-air system. As has been shown, attempts to develop alternative technologies, such as MDS, were thwarted by government in the interests of the oligopoly and the pursuit of government's own objectives. The absence of alternative technologies in the television industry, in comparison to Canada, has had a significant impact on the delivery of broadband services, forcing broadband service providers to rely, for the most part, on Telstra as the major wholesale operator until the NBN is completed.

5.4 Comparative Institutional Analysis: Ideas, Interests & Institutions

An interesting feature of regulatory policy in the Canadian and Australian television industries is the similar wording of the relevant legislation (see Box 5.2: Regulatory Policy in Canada and Australia). Nevertheless, the way that regulatory policy has been practised in each country is very different. In practice, Canada enabled a variety of technologies (albeit delaying the introduction or competition between platforms at times) while protecting cultural content through various content rules. On the other hand, Australia used cultural content rules as a way to protect the three major commercial networks from new competition, including the prevention of alternative technologies and a continuation of the three-network oligopoly well into the pay-TV era. Further, the way that the 'public interest' has been interpreted has led to divergent approaches to licensing requirements.

A major driver of the Canadian broadcasting industry has been the proximity of the US and the cultural threat posed by its vast broadcasting content industries. Nonetheless, the Canadian mosaic incorporated public and private interests which intersected at the various levels of government, and a single, coherent national technology solution was not implemented in the delivery of television services. Further, the influence of Quebec on broadcasting content has been significant, leading to greater diversity in content and provincial involvement in the industry (Raboy 1990 xiii). Canada's mosaic encouraged a variety of technologies to be deployed and adapted to local conditions. Social policy objectives were a major focus for institutional design, in particular Cancon, rather than enabling a standardised technology system to deliver services. However, the development of the CRTC as a specialist regulator for both the broadcasting and telecommunications sectors from 1976 recognised, institutionally, the imminent impact of technological convergence well before the Australian Communications and Media Authority was established to regulate both industries in 2005, with many regulatory functions still the domain of the ACCC.

Box 5.2: Regulatory Policy in Canada and Australia

Regulatory Policy as outlined Canada's *Broadcasting Act 1991*, Appendix B:

The Canadian broadcasting system should be regulated and supervised in a flexible manner that:

(a) is readily adaptable to the different characteristics of English and French language broadcasting and to the different conditions under which broadcasting undertakings that provide English or French language programming operate;

(b) takes into account regional needs and concerns;

(c) is readily adaptable to scientific and technological change;

(d) facilitates the provision of broadcasting to Canadians;

(e) facilitates the provision of Canadian programs to Canadians;

(f) does not inhibit the development of information technologies and their application or the delivery of resultant services to Canadians; and

(g) is sensitive to the administrative burden that, as a consequence of such regulation and supervision, may be imposed on persons carrying on broadcasting undertakings.

Regulatory Policy as outlined in Australia's *Broadcasting Services Act 1992*, Section 4(2)

The Parliament... intends that broadcasting services... in Australia be regulated in a manner that, in the opinion of the ACMA:

(a) enables public interest considerations to be addressed in a way that does not impose unnecessary financial and administrative burdens on providers of broadcasting services...; and

(b) will readily accommodate technological change; and

(c) encourages:

(i) the development of broadcasting technologies..., and their application; and

(ii) the provision of services made practicable by those technologies to the Australian community.

In Australia, the broadcasting policy 'has been based on perceptions rather than hard information'; especially in relation to the degree of influence broadcast content has on the community (Productivity Commission 2000: 5). Indeed, the Productivity Commission stated that 'neither the basis of this influence nor the effectiveness of the regulatory measures used have been subject to proper analysis'. While Australia's domestic content rules or similar, the threat to Australian culture by US content industries did not focus as heavily in policy debates at it did in Canada. Nevertheless, regulatory barriers to entry which have benefited the three major commercial networks have long been justified 'on the grounds that it is necessary to enable [the industry] to meet the higher costs of local content programming required for cultural policy purposes (Productivity Commission 2000: 21). Further, the Productivity Commission (2000: 5) argued that broadcasting policy 'evolved in an analog era of distinct media that could be regulated separately... and continues to be characterised by highly prescriptive regulation'.

The impact of the two different approaches to deploying television services has resulted in a diverse, 500-channel television service in Canada, compared with an oligopoly limited to 16 free-to-air and 200 pay-TV channels in Australia. The various interests in the Canadian industry, which included telecommunications providers for telephone pole access to string cables, resulted in greater cooperation between firms. On the other hand, the regulation of the Australian television industry continues to benefit the three major commercial stations and despite various calls to liberalise the industry (Productivity Commission 2000), Australia's broadcasting policy remains heavily influenced by the oligopoly providers.

5.5 Implications for Future Technologies

When broadcasting services were first enabled in Canada and Australia, policy-makers did not have the benefit of hindsight to see how the regulation of broadcasting services would impact upon the broadband era. Indeed, Canada's deployment of cable services and the resulting benefits to cross-platform competition and infrastructure deployment in the broadband era are serendipitous rather than a direct result of good policy.[167] Nonetheless, the benefits of a decentralised system which enabled the deployment of a variety of technologies, compared to Australia's technologically conservative approach (Herd in Ward 2006: 71), have paid dividends. While both countries have achieved mature market penetration of broadcast receivers and content, Australia's single national solution approach, which continues to the present, has not delivered the diversity of services and amount of content available to Canadians.

Canada's mosaic did not delay the introduction of new technologies as happened with the monolith in Australia with FM radio, cable-TV, pay-TV and alternative delivery

[167] Canadian industry experts generally agreed that cable penetration was a major enabler of Canada's early lead in broadband adoption. Indeed, one industry expert suggested that the proliferation of cable networks enabling cross-platform competition was more important in explaining Canada's early lead in broadband rather than government policy.

systems. Further, the Australian monolith effectively blocked cross-platform competition, with the Australian government's policy objectives favouring the protection of the major industry players and preventing diversity and competition beyond the oligopoly. Finally, the late move to institute a specialist regulator to deal with issues of technological convergence in Australia, combined with missed opportunities to open the Australian broadcasting industry to increased competition, has kept the traditional boundaries of the broadcasting and telecommunications industries largely intact. This has had the effect of limiting the available broadband delivery technologies in Australia for to the traditional telecommunications industry – an industry which might also have benefited from cross-platform competition.

Chapter 6: Broadbanding the Nation: Canada and Australia

6.1 Introduction

To explain the institutional development of broadband in Canada and Australia it is first necessary to explain the development of Internet technologies[168] as access to an increasing array of Internet content and services represents the major driver for increased bandwidth. Effectively, the establishment of the long-distance network of computers now known as the Internet represented the 'marriage of computing and communications' (Clarke 2004). The Internet is crucial infrastructure for advanced economies, and throughout the developed world the majority of households now have a personal computer *and* an Internet connection (OECD 2011a; 2011b). The Internet began as a project of the Defense Advanced Research Projects Agency (DARPA) in the United States. In 1969, nodes[169] at the University of California, Los Angeles (UCLA) and the Stanford Research Institute (SRI) (several hundred kilometres away) were connected via 50Kbps lines provided by AT&T. This network became known as ARPANET and expanded progressively throughout the 1970s (Clarke 2004). During the 1980s, the development of the Transmission Control Protocol (TCP) and the Internet Protocol (IP) were 'the foundation for the subsequent explosion' in growth of what was by this time referred to as the Internet (Clarke 2004). The development of TCP/IP enabled the practicable, long-distance interconnection of computers using existing telecommunications carriage systems and was the technological catalyst for the convergence of the telecommunications and broadcasting industries.

By 1985, the evolving 'self-governing community' (a collective of specialists and volunteers who contributed to the development of the Internet) implemented the Domain Name System (DNS) which provided 'more human-friendly ways of referring to and remembering network' addresses (Clarke 2004; see also Lance 1998). Although an

[168] In historical context, the term 'broadband' is used primarily as a functionality to distinguish the converging broadband 'era' from the earlier telecommunications and broadcasting eras. The author acknowledges that there are different attributes to the various ways that broadband technologies can be delivered. However, in the context of assessing the penetration of broadband in a cross-national comparison, the broader term 'technology' is deliberately used here.

[169] The nodes consisted of Interface Message Processors (IMP) built by Bolt Beranek and Newman Inc. (BBN). According to Korporaal (2009: 7), these devices 'looked like fridges and would later be called routers'.

early commercial version of the Internet (known as TeleNet) became accessible in 1974, it was not until country-specific DNS addresses (known as 'country codes' such as .au for Australia) were provided to individual 'trustees' by the International Assigned Numbers Authority (IANA) that the Internet became a useable 'international' network (Clarke in Goggin 2004: 31). In the mid- to late-1980s, the national wide-area research networks connecting universities in Canada (NetNorth) and Australia (AARNet) became part of the Internet, serving mostly the technical and academic communities. The invention of the World Wide Web by Tim Berners-Lee in 1989 improved accessibility of the Internet, subsequently enabling the development of web browsers such as Mosaic[170] which brought the World Wide Web to the general public during the 1990s. Initially, household Internet connections, provided via dial-up services over traditional telephone lines, delivered useful Web experiences once speeds of 28.8Kbps, 33.6Kbps and eventually 56Kbps (known as 'dial-up') became affordable for consumers. The development of broadband, in particular asymmetrical digital subscriber line (ADSL) technology with download speeds of 256Kbps, provided consumers with practicable multimedia experiences of the Web. By the early 2000s, broadband technologies were available throughout the developed world and the technological convergence forewarned in eras past became a reality.

In the communications industry, the *meaning* of the term 'broadband' has been through several iterations as the capacity to move data via cables or airwaves has increased over time. Today, however, 'broadband' tends to refer to a network capacity that enables the transmission of data over wires or airwaves at a speed which is much faster than the speed of transmission over 'traditional' copper wires. In its contemporary sense, 'broadband' refers to the connection between a computer and the Internet which enables data transmission at speeds fast enough to enable users to interact via high definition video and audio materials in 'real-time'. Numerous attempts to label the speed of 'broadband' prove fruitless as the need for greater capacity increases as the ability to reproduce audio and video materials of greater quality or 'realness' advances. For most of the first decade of the 21st century the minimum rate of data transmission (on the download side) was 256Kbps and this

[170] Mosaic is often regarded as the graphical Web browser that popularised the World Wide Web (Clarke in Goggin 2004: 32).

measure remains the minimum speed for reporting organisations such as the OECD. A more useful way to define broadband is the capability to engage in a two-way, real-time, high-quality video conference. Typically, this requires at least 1.5Mbps of data transmission (both upload and download) and was the definition adopted by Canada's National Broadband Task Force and also the 'standard' according to the International Telecommunication Union (ITU) (Lie 2003: 5-6).

A major problem is that the speed at which transmissions are considered to be 'broadband' increases proportionately as the measure of 'high-quality' audio-visual content increases. For example, to conduct a 'full HD' video conference requires much faster transmission speeds than 1.5Mbps. Consequently, broadband infrastructure must be 'future-proof' if the investment is to be worthwhile and current 'very high-speed broadband' services aim for theoretical upload and download speeds of 100Mbps. Potentially, such speeds enable several users within a household, for example, to engage in high-bandwidth activities simultaneously: the bandwidth is not only important to increase individual incidences of download speeds. The distinctions are very important because the definition of 'broadband', particularly in comparing cross-national communications outcomes, can refer to distinctly different capabilities. For example, if the 256Kbps measure is adopted, then the difference in communications outcomes in Canada and Australia is relatively minor in comparison to the rest of the OECD or indeed the world. However, if the capabilities of broadband services include higher broadband speeds, the price of broadband for consumers, and the extent of download limits which restrict consumer access to higher speeds and ever-larger amounts of data, the definition of broadband is paramount.

For instance, consumers restricted to 256Kbps Internet connections will not be able to access the same amount and quality of data as consumers on 20Mbps connections. Further, consumers restricted to 15GB of data download per month, for example, will not have the same online access to government, business, community and education and health services available to consumers with unrestricted access to very high-speed broadband. Such differences have significant impacts on equal and equitable access to social and economic services for consumers which, in turn, can affect the efficiency of government or business service delivery and ultimately the growth of a nation's digital economy. Further, the longer it takes for infrastructure to be built to enable consumers to access high-speed broadband services, the more the technical skills necessary to participate in modern economies and societies tend to lag. Attempting to 'future-proof' infrastructure, then, represents a trade-off between present and future access to the benefits of broadband services. The desire to 'future-proof' broadband infrastructure creates a major policy problem because the transmission capacity must keep pace with improvements in the quality and amount of data that can be processed by modern computers.[171] The problem is exacerbated by the starting point for legislators: the constitutional powers and laws which govern the industry were originally established to govern the telegraph and telephone industries. Therefore, the governing instruments 'are expressed in archaic terms' which are challenged by the pace of technological change (see for example ABC 2012). Regulating the broadband industry proves problematic as regulators are forced into 'playing perpetual catch-up' as consumers adopt a variety of broadband-capable devices (Smith 2012).

The preceding chapters focused on particular technologies and identified some of the key issues in how governments *enable*, *coordinate* and *regulate* the deployment of communications technologies. This chapter focuses on broadband technologies, which effectively combine the telecommunications and broadcasting industries, bringing into conflict the institutional arrangements that govern these formerly diverged industries. Identifying the precise beginning of the broadband era is a difficult task due to the ever-changing classification of broadband services in relation to narrowband. Many large organisations, particularly military and research institutions, had access to ARPANET or TeleNet from the early 1970s. However, it is important to understand that the development of broadband coincides with the development of the Internet (infrastructure) and the World Wide Web (content), as advances in one continue to trigger advances in the other and so on. A useful starting point for the broadband era,

[171] Moore's Law refers to a series of predications by Gordon Moore (which have been 'uncannily' accurate) that (in simple terms) the number of components that can be added to a silicon chip (at a price which consumers can afford) doubles every one to two years. Moore's Second Law states that in order to keep up with Moore's Law, the cost of research and development increases exponentially. Indeed, Hutcheson suggests that: 'Moore's Law will fall victim to economics before it reaches whatever limitations exist in physics' (Schaller 1996).

then, is 1992, as this year marks when affordable provision of Internet services via a graphical Web browser was first available to consumers.[172]

The remainder of the chapter outlines the development of the infrastructure and institutions of the broadband era in Canada and Australia.

6.2 Institutional Evolution of the Broadband Mosaic in Canada

6.2.1 Broadband Leadership and the Canadian Mosaic

Stemming from the communications mosaic approach, Canada's Internet began in the 1970s with a series of regional networks interconnecting university mainframe computers which would later be interconnected by a national network (Miller et al. 1999: 17). In 1984, the NetNorth Consortium was established by a group of universities to interconnect their IBM networks with plans to eventually interconnect with BITNET in the US and the European Academic and Research Network (EARN) (NetNorth Consortium 1990). By 1988, regional university-based networks were established in Ontario, Quebec and Nova Scotia, and, following the pattern of development of earlier communications technologies, plans were hatched to interconnect the regional networks. Shade (1994) outlines the importance of NetNorth in establishing this 'underlying co-operative principle that guides Canadian networking today, whereby the regional networks form[ed] the basis for the national [network]'. At the same time, the National Research Council provided funding for what would later become the backbone of the Canadian Internet, known as CA*net. The University of Toronto, IBM, and INSINC (a value-added telecommunications reseller) became the organization that comprised CA*net Networking in October 1990. By 1992, NetNorth had been wound

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[172] The precise origins of the Internet are disputed. For example, some suggest that ARPANET heralded its introduction in 1969; others suggest that it was not until Tim Berners-Lee developed the World Wide Web and it became publicly available on 6 August 1991. Similarly, in Australia, AARNet was available in 1989 but it was not readily accessible by the general public. Similarly, NetNorth was available in Canada from 1984. However, and for the purposes of this thesis, 1992 represents a useful starting point. From this time, in both Australia and Canada, ordinary citizens could access the Internet (as we now know it) via dial-up services. For example, the first two commercial ISPs commenced operations in Australia in 1992. Further, CANARIE (2001: 116) acknowledges 1992 as the year the Nova Scotia Technology Network (NSTN) introduced public dial-up services. 1992 is also significant as the year when Mosaic, an early graphical Internet browser, is credited with popularising the World Wide Web. Importantly, it was not until 1992 that the 'acceptable use policy' in the US was amended to allow commercial traffic on the Internet (Clarke in Goggin 2004: 32).

up (Watt cited in an addendum to NetNorth Consortium 1990) and in 1993 Canada's Advanced Research and Innovation Network (CANARIE) was incorporated by Industry Canada to upgrade and maintain what was now known as CA*net. By April 1993, CA*net had been upgraded to deliver speeds of 1.5Mbps, ushering in the broadband era well ahead of other developed countries (CANARIE 1999: 3). An interesting feature of Canada's Internet infrastructure was that key players in the various traditional communications industries recognised the benefits to be gained from facilitating technological, and hence industrial, convergence.

Historically, Canada's broadcasting and telecommunications industries were deliberately made divergent by numerous corporate agreements established amid government policies based on the idea that telecommunications was a natural monopoly. Serendipitously, Canada's implementation of the natural monopoly concept resulted in the establishment of a series of provincial monopolies, rather than a single national monopoly as in Australia. However, by the 1990s, regulators and key industry players were arguing for the reconvergence of these industries (Winseck 1998: 9-10, 265). In 1994, the Canadian Governor-General's "Speech from the Throne" advised that the 'Government [would] implement a Canadian strategy for an information highway' (Hnatyshyn 1994). As early as 1995, the Canadian Government established the Information Highway Advisory Council (IHAC) to 'address the threats and promises of the Internet' (d'Haenens & Proulx 2000: 282). According to then Minister for Industry John Manley, the reason for Canada's interest in broadband technologies was to take advantage of the knowledge economy:

> The future is high technology. The present is high technology, but the future is even more so. And the nations that create wealth in the next century will be the ones that invest in people to gain the knowledge and skills to compete in a world in which acquiring and using information are central. And developing innovative approaches to problem solving is imperative. That fits with why we're putting a lot of emphasis on this notion of making Canada the most connected nation.

By the early 1990s, the 'information superhighway' was clearly on the Canadian government's policy agenda with businesses, the media and academics actively supporting the need for reconvergence and greater cross-platform competition in the communications sectors to ensure Canada's place in the digital future (Babe 1995;

CRTC 1996; Dorland 1996; Keenan & Pitts 1994; Stentor 1994). Indeed, Stentor (1994) argued that:

> Canada must act now or get left behind… If we don't act quickly to make the information highway a reality, Canadian industry will fall steadily behind industries in other countries, Canadian employment will suffer and Canadians' standard of living will fall.

In enabling the information highway, a spirit of cooperation was articulated by the key industry players (reflecting the historical mosaic), such that:

> The emphasis on the supply [of communications services] must be on openness instead of concentration; on diversity rather than on one single perspective. According to the Canadian vision, what is interesting about the internet had more to do with communication than information (d'Haenens & Proulx 2000: 282; see also Lie 2003: 5).

Numerous early policy discussions focused on the concept of technological neutrality, where access to Internet services should not be limited by the particular technology used to deliver the service. Combined with the provinces' ability to deploy communication networks, and the willingness of provinces and municipalities to deploy broadband infrastructure, federal funding was available for all levels of government to deploy infrastructure. For example, under the 'Broadband Canada: Connecting Rural Canadians' program, funding was available to municipalities to deploy networks and receive 50% of the costs associated with deployment, which could then be supplemented by provincial and private sector funding.[173] This approach has been typical of Canadian broadband programs and has enabled a number of municipal initiatives such as the Eastern Ontario Regional Network (using funding from federal, provincial and municipal governments and the private sector) and Stratford's municipally-owned Rhyzome Networks to fill what one industry expert referred to as 'broadband holes'. Typically, local broadband initiatives incorporate a 'local broadband committee', such as the Broadband Renfrew Access Valley Ontario (BRAVO) project (Walker 2007a).

As a development of IHAC, Industry Canada established the Internet Highway Applications Branch (IHAB) to address 'broadband holes' where market failure had

[173] The Broadband Canada: Connecting Rural Canadians program is due for completion in 2012 and at the time of writing had delivered broadband services to some 218,000 households which previously did not have access to infrastructure.

occurred. The approach was to use market aggregation by encouraging communities to submit a Request for Proposal (RFP) involving various partnerships between governments, businesses and community groups. One example of a First Nations' response to the program, Kuhkenah Network (K-Net), established private network to service indigenous communities in the remote northern regions. The HFC network was used to provide a variety of community services including e-health, online education and advanced video conferencing system. Indeed, many industry experts suggested that such initiatives had assisted the growth of some of the remote northern communities due to the advanced connectivity provided by regional initiatives such as K-Net. The federal government's role was viewed by many industry experts as a 'facilitating, stimulating and legitimating' community involvement in the process of infrastructure deployment in areas of market failure.

Provinces also used federal funding or provided their own funding to promote economic development in the regions. A major example of a provincial project is Alberta's SuperNet. The fibre and wireless network can now be accessed by approximately 85% of Albertans and consists of some 12,000km of fibre optic cable and 1,814 km wireless connections (Service Alberta 2012). Similarly, the province of New Brunswick partnered with Bell Aliant to deliver FTTH in major cities and achieved near-universal access to broadband technologies using a combination of fibre, wireless, DSL and satellite services by the end of 2010 (*Backbone Magazine* 2010). Further, municipal governments and community groups have been involved in the deployment of Wi-Fi networks in many cities, often providing free services for consumers to attract businesses. Many Canadian industry experts suggested that the multiple approaches to enabling connectivity, supported by organisations such as CANARIE, enabled communities to address issues of market failure. Indeed, Professor Michael Geist from the University of Ottawa suggested that competition drove early take-up in metropolitan areas, but that competition had 'run its course', and new services to currently unserved areas would not happen 'unless you get government involved'. Nonetheless, the government was involved in a variety of regional and local solutions, rather than a single national solution, to drive the deployment of infrastructure in areas where market solutions had not been forthcoming.

6.2.2 The Resilience of the Canadian Mosaic

A defining characteristic of Canadian government policy towards the convergence of communications technologies is its prescience. Indeed, Professor Michael Geist suggested that IHAC (and later IHAB) was driven by John Manley who was able to gain the support of the prime minister and cabinet, leading to 'a good deal of policy activity and a desire [by policy actors] to use [the IHAC platform]... to get the government's attention'. Yet the approach to enabling broadband in Canada is a continuation of the mosaic approach, with each province continuing to engage in a variety of regional and broadband initiatives.[174] Despite the involvement of the federal government, regional and local participation in the deployment of communications infrastructure remains the norm.

One feature that differentiates the Canadian institutional framework from Australia's relates to the responsibility for the provision of electricity and water services. Traditionally, electricity and water provision in Canada has been managed at the municipal level, providing municipalities with exclusive access to the duct structure (power poles and underground conduits). In recent decades, many municipal providers diversified and developed telecommunications carriers as part of the business plan. Although there have been numerous cases of privatisation of these formerly municipally-owned carriers, federal initiatives have encouraged the development of Wi-Fi and other communications technology systems to read electricity meters as smart of environmental initiatives, further enabling communications networks in concert with the duct structure. Indeed, one industry expert commented: 'it's all about the duct structure'. Where municipalities had access to the important duct structure, they were able to deliver broadband services using their own rights of way. Another industry expert suggested that, similar to railways, a major role for government in deploying network infrastructure is to clear the rights of way for communications service providers to deploy various technologies. In many ways, the mosaic has facilitated government at all levels in performing this role.

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[174] The Industry Canada website provides a comprehensive list of the numerous provincial broadband initiatives in progress as at 31 March 2012: see http://www.ic.gc.ca/eic/site/719.nsf/eng/00050.html.

An enduring feature of Canada's communications mosaic is its resilience. As has been shown, this is not just a feature of the communications industries, but to politics at all levels of the federal systems. The importance of enabling regional and local solutions to regional and local problems has facilitated the communications sector's ability to address the regional and local varieties of particularism in deploying various technologies. In effect, the mosaic permeates many aspects of Canadian political culture which makes it difficult for the federal government to implement single national solutions. Nonetheless, the cultural embeddedness of Canada's mosaic may make the approach difficult to replicate in jurisdictions which favour standardised approaches. The next section outlines Australia's broadband trajectory and provides an analysis of the institutional framework.

6.3 Institutional Evolution of the Australian Broadband Monolith

6.3.1 The Politics of Australia's Emerging Broadband Monolith

The beginnings of the Internet in Australia are the starting point for this section. This period coincides with the liberalisation of the Australian telecommunications industry, which had its origins in the proposal for a satellite service put to the Fraser Government by the Australian media magnate Kerry Packer in 1977 (Barr 2000: 48). By the 1980s, Aussat was running at a loss and failed to achieve the promised transformation in the delivery of business and government services to regional communities. After the government paid off Aussat's accumulated debts, Optus purchased the satellite system thus obtaining a licence as a telecommunications carrier and becoming Telecom's first competitor (White 2011; see also Barr 2000: 80; Lamberton 1993: 114; Tindal 2009).

Some years before telecommunications competition commenced in Australia, however, a variety of influences worked to bring about a change in government policy. The separation of telecommunications and postal services occurred in 1975 'in keeping with international trends' (Barr 2000: 80). Later, not-for-profit interest group, the Australian Telecommunications Users Group (ATUG), formed in 1981 to work 'for better choice, value and services in the sector' (ACCC 2012), amid a 'global agenda' for liberalising telecommunications industries (Raiche 2009). Further, in 1982 the Davidson Inquiry had recommended the introduction of competition in telecommunications. However, government was concerned about the amount of cross-subsidisation required by Telecom[175] to provide basic telephone services to rural and remote areas. Here, social policy goals outweighed economic concerns. Raiche (2009) states there were 'strong pressures to open Telecom's monopoly position to competition'. In addition to pressure from businesses, moves towards greater public participation in telecommunications policy-making were facilitated by Telecom and government, particularly in response to issues raised by the Davidson Inquiry (in 1982), the Economic Planning Advisory Committee (EPAC) (in 1983), and voter reaction to Telecom 'raising the possibility of introducing timed local calls' resulting in the Hawke government losing the safe ALP seat of Adelaide at a by-election (in 1988) (Raiche 1997; 2009).

Liberalisation of the telecommunications industry was conducted in three phases, driven by three major laws: the *Telecommunications Acts* of 1989, 1991 and 1997. The *Telecommunications Act 1989* established AUSTEL as the industry's regulator, which took over Telecom's regulatory function for ensuring compliance with technical standards for any equipment connected to the national network. The new regulator's purpose was to facilitate competition in value-added services (such as the sale and installation of non-Telecom telephony equipment), including the interconnection of privately-owned networks. This allowed businesses and other large customers to establish non-Telecom networks for the first time, but otherwise had little impact on household consumers. Nonetheless, formal structures for consultation with consumers were established with funding from Telecom in 1988 (the Interim Telecom Australia Consumer Council or TACC) and in 1989 (the Consumers' Telecommunications Network or CTN).

[175] According to Raiche (1997), the government was less convinced by 'natural monopoly' arguments against infrastructure competition and more concerned that competition would threaten Telstra's ability to cross-subsidise the 'policy of universal service', as it appeared to have done in the United States and the United Kingdom.

The second phase of liberalisation occurred shortly before the Internet became generally accessible to Australian consumers, commencing with the *Telecommunications Act 1991*. This act established a legislated duopoly in fixed-line telecommunications services provision by the government-controlled Telecom and the private firm Optus, and a legislated 'triopoly' in mobile telephony by Telecom, Optus and Vodaphone (Raiche 2009). Competition in mobile telephony seemed to be effective as demonstrated by Australia's rapid increase in penetration rates (see Chapter 2); however, mobile Internet access was unheard of at this time. Nevertheless, in the fixed-line sector, neither Telecom nor Optus had corporate plans for Internet service provision in the first half of the 1990s, as the companies were focused on competing in the provision of telephone services and other profitable value-added services such as pay-TV. The infrastructure used to deliver pay-TV in the major metropolitan centres of Sydney and Melbourne was also capable of delivering high-speed broadband Internet connections, however this was barely regarded as a profitable use of the infrastructure at that time. This situation is exactly what the Australian government had been concerned about: competitors focusing on the lucrative metropolitan markets while ignoring the less-profitable rural and regional areas. Nevertheless, it was difficult to include Internet service provision as part of the universal service obligation (USO) which remained Telstra's responsibility.

Whereas Canadian governments and industry purported to make Canada a world leader in the penetration of high-speed Internet services (Lie 2003: 5; see also Atkinson, Correa & Hedlund 2008: 19; Babe 1995; CRTC 1996; Dorland 1996; Keenan & Pitts 1994; Shade 1994; Stentor 1994), Australia adopted a 'wait and see' approach (Turner 2007). Broadband service provision in Australia was enabled by Telstra[176] in 1996, but only as an add-on service to the HFC cable infrastructure[177] deployed to deliver pay-TV services in metropolitan areas. In light of the Hilmer Report's recommendations to establish competitive markets and to undo the large public monopolies of the past, effectively the reiteration of the recommendations from the Davidson Inquiry, the third phase of liberalisation commenced with the introduction of

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[176] Telecom Australia adopted the trading name 'Telstra' internationally in 1993, and domestically in 1995.

[177] Both Telstra and Optus had established hybrid fibre coaxial (HFC) cables by 1995 and these were technically capable of providing broadband Internet services in addition to provide pay-TV services.

the *Telecommunications Act 1997* (Commonwealth of Australia 1993). In addition to increasing the number of service providers in telecommunications services, including Internet service provision, a major part of this phase was the privatisation of Telstra. The privatisation process would eventually be conducted in three main stages between 1996 and 2008 (see Box 6.1).

Box 6.1 The Privatisation of Telstra: Timeline of Events

Following the Howard Government's election in 1996, the privatisation of Telstra occurred over the period 1996 to 2009 as follows:

April 1996: Scoping study conducted into the initial sale of one-third of the company.

November 1997: T1 - The Australian Government sold 33.3% of its shares for $AUD 14 billion. Subsequently, Telstra was listed on the Australian Securities Exchange.

October 1999: T2 - The Australian Government sold 16.6% of its shares for $AUD 16 billion.

November 2006: T3 – The Australian Government sold 66% of its remaining shares for $AUD 15.4 billion. The remaining shares held by the government were transferred to the Future Fund, and were subsequently sold

May 2008: The final instalment of T3 shares was payable, officially ending the government's control of Telstra.

August 2009: The Future Fund, which received the government's 16.6% holding of Telstra shares (left after the completion of T3), sold a further 6% of its Telstra shares at a loss (on paper) of $AUD 115 million. There is some speculation that the Future Fund will invest in infrastructure projects which might include the National Broadband Network at a later date.

Sources: ANAO 2008, Durie 2009.

Yet during this period, the deployment of broadband in Australia stalled as the government focused on privatising Telstra. In the meantime, piecemeal, scattered policies targeting market-failure in remote and under-served regions were developed. Despite various programs designed to improve Internet services in the under-served remote and regional areas, the default action by government was to provide subsidies to businesses to provide services to individual consumers. In effect, consumers would apply for an Internet connection with a local provider, and the provider would install the necessary equipment at the consumer's premises using a government subsidy paid directly to the provider. However, governments, regardless which party was in power, were inconsistent in the application of these rules. The historical precedent which tied telecommunications policy to politics was played out in a number of ways. Indeed, in 2002, in the electorate of Eden-Monaro, often regarded as a bellwether for election outcomes (Rodgers 2010), the federal government supported the establishment of

Southern Phone, an unlisted public company owned exclusively by local councils, with funding from the Networking the Nation program.[178]

For the most part, local councils were specifically excluded from federal assistance under the Broadband Connect program because the program rules only allowed funding to be provided to businesses in the form of subsidies based on consumer demand. Except for situations where political advantage could be gained, the default policy instruments have had the effect of keeping other levels of government and other non-business organisations outside of the various programs, an approach which, over time, has discouraged active involvement far below the extent observed in Canada. This has been despite the efforts of numerous state and local governments and not-for-profit organisations to deliver broadband services by adopting a variety of approaches, based on the use of non-traditional carriers, which were believed by their proponents to provide 'models' for a national rollout to other areas not served by commercial interests (see for example Victorian Government 2006; MRDB 2006; Port Macquarie-Hastings Council 2006; ALGA 2006). Nevertheless, the successes achieved in a variety of local initiatives were for the large part ignored by federal policy-makers.

In the absence of a clear broadband strategy, the government relied on competition in the market as the main motivation for carriers to deploy their own infrastructure. However, after a bout of infrastructure competition between Telstra and Optus in 1996, 'investment in local access infrastructure had virtually come to a halt, and was not revived until the NBN was announced over a decade later' (Ovum 2011: 12). Amid an uncertain policy environment, coupled with Telstra's dominant market position, investor reluctance largely led to this distinct lack of broadband infrastructure deployment. In the meantime, the government waited for Telstra to rollout broadband, Telstra waited for the government to fund the rollout, and regulatory

[178] One industry expert outlined how Southern Phone commenced as a communications provider but had difficulty selling services (via a microwave network) to other government bodies as payment for the services was not a budget item for these bodies. Despite the availability of a network to provide broadband services, the infrastructure was later converted to a monitoring system for other council infrastructure (such as sewerage). Nevertheless, the council's objective was to increase employment in the region, not to provide broadband services. Southern phone now operates as an on-seller of telecommunications services and operates as a call centre. While this is similar to the driver for many municipal networks in Canada (suggested by a Canadian industry export when commenting on 'Fred e-Zone' in Fredericton, New Brunswick), the constitutional powers in Australia prevented the council-based project from successfully operating as a carrier.

uncertainty forced the rest of the industry to adopt 'second-mover' corporate strategies (Ovum 2011: 10). The uncertainty that emerged during the period 1997 to 2007 was remarkable in telecommunications - one of the fastest growing markets in the country - with a growth rate of 300% per year. Growth of this magnitude was significantly faster than the typical single-digit growth rates experienced in traditional telecommunications services (Korporaal 2009: 56). By 2006 Telstra had been effectively privatised, and after numerous failed attempts by the Howard government to establish a 'national high-speed broadband network', the Rudd government announced the formation of NBN Co on 7 April 2009. After 20 years of attempting to unravel Telstra's monopoly, the Commonwealth created yet another communications monolith as a way to fix Australia's broadband problems.

The creation of NBN Co provided Labor with a way to fix the problem created with the privatisation of Telstra by the Howard government. By privatising the monopoly carrier without first structurally separating Telstra, the Howard government had, on the one hand, enabled competition through the *Telecommunications Act 1997*, while on the other hand, stifled competition by enabling the unfettered monopoly provider to dominate the market. Initially, the NBN was regarded as a visionary project (White 2011), but by the time Telstra agreed to sell its ageing copper infrastructure back to the federal government at a cost of $AUD 11 billion (AAP 2012), it was quite clear that NBN Co provided the means for the federal government to have a second chance at creating a competitive telecommunications retail market by forcing Telstra's structural separation in a way that did not upset shareholders. Indeed, after three years of negotiations between Telstra, the ACCC and the federal government, Telstra was in a very comfortable position in that it had converted its ageing copper infrastructure into cash (at taxpayers' expense), and NBN Co could roll out its wholesale fibre network for the most part without interfering with Telstra's commercial operations (Adhikari 2012; Taylor 2012).

What is remarkable about the recent culmination of Australian telecommunications policy in the roll out of the NBN is that, yet again, the federal government has returned to its historical default policy of government control to achieve communications outcomes for citizens, albeit with government interests at the forefront of policy.

Indeed, the political nature of the NBN roll out was highlighted by numerous media commentators when it was revealed in early 2012 that the roll out of the NBN was heavily concentrated in important Labor seats (Corner 2012; Franklin 2012; Jacob, Coote & Klein 2012; Laming 2012). The remainder of this section outlines the trajectory of the Australian broadband industry.

6.3.2 From the Internet to the NBN

The work of a handful of entrepreneurs and researchers brought the Internet to Australia in 1989 and these small ISPs held the greater market share in Internet service provision until the mid-1990s when both Telstra and Optus took over the operations of various Australian ISPs. While these smaller Australian ISPs had kept pace with Internet deployment in other advanced economies (outside of the US) in the first half of the 1990s, the liberalisation of the telecommunications industry in the latter half revealed a distinct lack of comprehension by government of the complexities of technological convergence and its impact on the broadband industry. Telstra did not introduce Internet services to Australia and government's focus on specific policy issues in the media industry prevented any significant facilities-based competition. Once broadband services became available, the major network technology remained ADSL over Telstra's ageing copper network. Research has demonstrated how a reliance on an unconditioned local loop service (ULLS) to increase access to the local loop owned by the incumbent local exchange carrier (ILEC) actually discourages facilities-based investment (Crandall, Ingraham & Singer 2004: 5). Indeed, one Australian industry expert suggested that enabling access to the ULLS was 'the shining light' in the story of Australian communications industry competition. Earlier decisions by the Australian government, particularly in relation to pay-TV infrastructure and the focus on providing local loop access for Telstra's competitors encouraged the growth in predominantly ADSL broadband services. However, before Telstra became involved in Internet service provision, there existed a vibrant and innovative group of ISPs centred on the network established by the Australian Vice Chancellors' Committee (AVCC) – the Australian Academic Research Network (AARNet).

Pegasus, often regarded as the first commercial ISP in Australia, began operations in 1989 (Peter in Goggin 2004: 44),[179] the same year the operation of the AARNet commenced. Although a relatively small operation, Pegasus serviced 85% of the small commercial ISP market in Australia until 1996 when it was sold and later taken over by Optus. Also in 1996, Telstra took over management of AARNet as the business grew so quickly it had become unwieldy for the AVCC. Not long after, however, poor service provision and a lack of commitment to increasing the capacity of the network by Telstra led to the development of AARNet 2 by the AVCC through a partnership with Optus. By this time, AARNet was almost exclusively a service for universities, with most of its initial commercial customers moving to Telstra's Big Pond or Simon Hackett's Internode in the mid-1990s. Subsequently, AARNet, which had sparked a rapidly growing network with very high levels of demand from consumers, became a private network.

By the late 1990s, consumers were restricted to Internet services connected to either Telstra's or Optus's networks, with over 600 ISPs operating predominantly dial-up services. Although Telstra was providing broadband services in the late 1990s, broadband would not become available to the majority of Australians until the late 2000s.[180] Despite the deployment of high-speed broadband services by Telstra in Sydney and Melbourne in 1996, there would be no further investment in cable infrastructure on a large scale for more than a decade. Remarkably, the introduction of 'competition' to the telecommunications industry appeared to put an end to the innovative and entrepreneurial spirit which emerged during the early days of the Internet in Australia. However, by 2007, Australia's poor rankings in broadband penetration became a key focus of Kevin Rudd's election campaign with a promise to rollout the National Broadband Network (NBN), based predominantly on fibre optic cable, to deliver the fastest connection speeds available (Rudd, Conroy & Tanner 2007: 15-18).

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179 Initially, Pegasus (which used Telstra's Austpac system at speeds of 300, 1200 and 2400 baud or bps) used 'international calls to the US every hour or so to collect and send email, and one long off-peak call every night to collect newsgroup material' (Peter in Goggin 2004: 48).

180 Australia's broadband take-up by households did not surpass 50% until 2007 (refer to Figure 2.10 in Chapter 2).

Despite the innovative beginnings of the Internet in Australia, the interests of government and big businesses intervened and stalled what had been a dynamic industry with diverse interests. For example, during the 1970s, Australian researchers connected 'spasmodically' to ARPANET using the Overseas Telecommunications Commission's (OTC)[181] international dial-up service and soon after, networks linking various computer science departments to ARPANET became the Australian Computer Society network (ACSnet) (Korporaal 2009: 23; Clarke in Goggin 2004: 31). The CSIRO had also established CSIROnet, and ACSnet used this service for its interstate linkages (Clarke 2001). Interoperability was a persistent issue until the advent of TCP/IP and the establishment of a permanent email connection to ARPANET in the mid-1980s. In 1986, Robert Elz of Melbourne University became the custodian for the .au domain (via the IANA) and during the late 1980s there were several attempts to establish inter-university networks (Korporaal 2009: 24-25).[182] In 1988, the AVCC, commissioned the 'Carss Report',[183] which recommended the establishment of 'a national backbone connecting all capital cities', with initial funding to be sought from the Commonwealth and access to the network charged on a fee per service basis to users. The AVCC was successful in obtaining $1.77 million in funding from the Australian Research Council (ARC) to establish the national network, which became known as AARNet (Korporaal 2009: 30). In 1989, a satellite link developed and funded by NASA, the University of Hawaii and the University of Melbourne connected ACSnet (and consequently Australia) to the Internet.[184] The international link was subsequently 'taken over by AARNet' in 1990 (Korporaal 2009: 30). Governments and large telecommunications carriers had very little to do with the initial deployment of the Internet in Australia.

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[181] The Overseas Telecommunications Commission was established in 1946 to control Australia's international telecommunications. It merged with the Australian Telecommunications Corporations (Telecom Australia) in 1992 to form the Australian and Overseas Telecommunications Corporation (AOTC) and became Telstra Corporation in 1993.

[182] The difference protocols used for the various networks (which included Telecom Australia's Austpac data service and Viatel its video-text service, the FAX service, Telecom/OTC's Keylink system, Telex, SPEARNet, CSRIONet, and ACSnet) was a major problem, with some favouring the UK's 'Coloured Book' protocols while others were interested in adopting TCP/IP (used by ARPANET) as the standard protocol. Using equipment that accepted a variety of protocols solved the problem of catering for the differing opinions of the decision-makers but facilitated the use of TCP/IP which became the dominant protocol throughout the world (Korporaal 2009: 25-30).

[183] Dr Brian Carss from the University of Queensland produced the 'Carss Report' for the AVCC. The document was significant in convincing the AVCC to proceed with the deployment of AARNet (Korporaal 2009: 27).

[184] Korporaal (2009: 30) states that the establishment of this link 'is argued by some as marking the beginning of the internet in Australia'.

AARNet, designed primarily to facilitate research in Australian universities, was 'the genesis of the wider Australian Internet' (Hackett cited in Korporaal 2009: 47; AARNet 2012). Indeed, the establishment of the network had a major influence on the development and transfer of skills, especially among AARNet employees, university staff and the supporting telecommunications companies (Korporaal 2009: 30). Many of the pioneers involved with AARNet went on to establish their own Internet businesses[185] or become employees of Telstra (Korporaal 2009: 50). Initially, the majority of AARNet's customers were educational or research institutions or associated organisations (Clarke in Goggin 2004: 31-32). However, AARNet *al.*so positioned itself as a wholesale Internet Service provider (ISP), which allowed small firms to establish themselves as ISPs without the initial capital outlay required to establish the infrastructure. In 1992 there were two commercial ISPs and this number had grown to over 300 ISPs servicing 600,000 customers by 1995 (AARNet 2012; Korporaal 2009: 50).[186] Increasing demand and the need to continually increase the speed of the network (to relieve congestion) meant that the operation became unwieldy for the AVCC, particular because AARNet was a part of the organisation, not an entity incorporated in its own right. To put the scale of AARNet's operations in perspective, by the mid-1990s AARNet was one of Telstra's largest customers. In 1995, AARNet's commercial operations were sold to Telstra and this operation became BigPond, Australia's largest ISP, in 1996 (AARNet 2012). According to Clarke (cited in Korporaal 2009: 50), the public's response to the deal:

> was variously regarded as the salvation of the internet in Australia, a commercially realistic negotiation, a necessary transition, a give-away by the AVCC, a sell-out by the AVCC and/or a naked grab by Telstra for commercial control of the internet in Australia.

Further, Barrett (cited in Korporaal 2009: 50), AARNet's legal adviser, argued that the AVCC, and not Telstra, was responsible for changing the nature of the Australian telecommunications industry:

> The size and impact of the Telstra transaction cannot be underestimated... It moved the vice chancellors out of the day to day activity of AARNet and it changed Telstra, pushing it into the twenty first century.

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185 For example, Simon Hackett established Internode (one of Australia's largest ISPs) in 1991 (Internode 2011), and Geoff Huston, one of AARNet's founders, went to Telstra (Korporaal 2009: 48)

186 Initially, OzEmail was a customer of AARNet. With funding from (later) Liberal opposition leader Malcolm Turnbull, OzEmail became an ISP, which later merged with iiNet, one of the largest ISPs in Australia today (iiNet 2012).

It is apparent that the Keating and later Howard governments were fixated on the benefits of competition in the telecommunications industry, but from within the existing players and providers. AUSTEL (cited in Commonwealth of Australia 1993: 12) reported that 'STD peak rates on the Melbourne-Sydney route fell by over 20% between June 1992 (when Optus entered the market) and May 1993'. However, competition in broadband Internet services for residential customers remained elusive, despite Telstra's occasional innovations in service delivery (Telstra 1995; 1996).

The year 1996 (the same year BigPond was formed) is significant in Australian communications technology history as it marks the first time that Australia *enabled* new communications technology *ahead* of Canada (Telstra 1996). Hybrid fibre coaxial (HFC) cable was rolled out specifically for pay-TV and incidentally for broadband Internet services. Telstra (1997: 18), as part of the FOXTEL pay-TV[187] service, deployed HFC cables which 'passed approximately 2.1 million homes... with some 200,000 [pay-TV] customers at the end of June [1997]'. Telstra's BigPond service utilised the cable to offer high-speed broadband Internet services via cable modem to customers in the Sydney and Melbourne metropolitan centres (using the cable developed predominantly for the FOXTEL service) (Telstra 1996). However, this initial deployment of cable broadband services was deliberately delayed by Telstra and News Ltd for financial reasons (1997: 11-12):

> While we are hopeful about the future potential for broadband services, we recognise the need to balance investment with returns in the context of the changing competitive environment and developing markets and services. Telstra has worked closely and productively with our partners and other players in the Pay-TV industry during the second half of the financial year to seek to resolve some of the financial issues that have contributed to the instability of the industry. The outcome of these discussions is that Telstra and News have further agreed to limit, at this time, Telstra's broadband cable rollout obligation to 2.5 million homes by the end of 1997. Any resumption of additional broadband cable rollout will be delayed until overall market conditions justify such investment.

Due to a proposed merger between FOXTEL and Australis at the time, a pay-TV provider with a satellite and microwave distribution system, there was no commercial

[187] FOXTEL is owned by Telstra (50%), News Corporation (25%) and Consolidated Media Holdings (25%)

reason for Telstra to continue expanding cable infrastructure to compete in the pay-TV market (Telstra 1997: 12).[188] Atkinson, Correa & Hedlund (2008: 53) found that:

> The Australian government allowed Telstra, the incumbent telecommunications operator, to take over the nascent cable companies in the early 1990s, thereby dramatically limiting broadband cable competition. Consequently Australia has among the lowest cable penetration in the OECD.

During the 2007 federal election, the Labor opposition placed blame Australia's broadband situation squarely on the Howard government (Rudd, Conroy & Tanner 2007). However, decisions taken by the Hawke and later Keating governments concerning pay-TV infrastructure clearly impacted upon the industry many years later (Barry 1994: 468-489).

By 2001, Australia's major metropolitan centres were connected by numerous fibre optic networks, owned and operated by numerous private companies (BIS Shrapnel 2001). However, these networks were deployed to service large business and government clients in central business district (CBD) areas, as it was believed to be 'uneconomical to launch a broadband access product to the residential market segment, and of questionable feasibility to the low end of the Small to Medium business segment' (BIS Shrapnel 2001: 90). Although the ACCC had 'declared access to Telstra's local network' on 4 August 1999 (BIS Shrapnel 2001: 53), this had little impact on competition in the provision of broadband services. In 2002, however, the ACCC declared the line-sharing service (LSS) to allow 'for the installation of infrastructure, but the ISP shares the last mile network, with Telstra continuing to provide voice services and the ISP providing broadband services simultaneously on the same copper pair' (ACMA/ACCC 2006: 4).

Despite the introduction of the above competitive access regimes in the early 2000s, by 30 June 2004, Telstra still overwhelmingly dominated the market. For example, 87% of local access networks were copper wire networks, with 11% hybrid fibre coaxial (HFC) cable, and fibre optic cable providing less than 1%. SingTel Optus remained the major 'alternative carrier', yet its share of subscribers was a paltry 6% compared to

[188] Nonetheless, several attempts at a merger were blocked by the ACCC and in May 1998 Australis went into liquidation (Budde 1999; Commonwealth of Australia 1997; Fisk 1997).

Telstra 93%. Further, of the $871.2 million invested in local access infrastructure in 2003/2004, Telstra's investment was four times that of the rest of the industry combined (ACCC 2005:3). Optus, Telstra's major competitor, was beset by changes in major shareholders and, despite the benefits of greater consumer choice and prices (Commonwealth of Australia 1993: 4, 12), was barely able to remain a going concern until the early 2000s (Anderson cited in ABC 2004). To put the state of Australian Internet services in perspective, by 2003, when almost 15% of Canadians were connecting to the Internet at broadband speeds (OECD 2003: 173), OptusNet (Optus' ISP) was announcing that it was capable of providing dial-up Internet access to Western Australians 'from Broome to Geraldton' (SingTel Optus 2003). Then Optus CEO, Chris Anderson (cited in ABC 2004), blamed the government for the difficulties Optus experienced in competing with Telstra:

> [O]ne of the things is the fault of the legislation. Clearly, Telstra hasn't been constrained enough, and they have used predatory pricing, they have been able to cross-subsidise. I think, a lot of those things are failures to actually get a truly competitive regime. I mean, the thing you need in this game is scale, and what it's taken is some time for Optus, which is now 11 years old - I've been there for 7 - is to build up that scale.

Numerous collapses and subsequent mergers and acquisitions occurred in the industry during the early 2000s. For example, in the same year Cable & Wireless Optus was acquired by Singapore Telecommunications (SingTel) (SingTel Optus 2001a), the collapse of One.Tel saw Optus take over former One.Tel customers (SingTel Optus 2001b). However, the industry consolidation that occurred during this period related to the provision of mobile telephony services (see for example SingTel Optus 2001c) – one of the only communications technologies in Australian where penetration outperformed (and continues to outperform) Canada (OECD cited in ITIF 2012: 100).

The *Telecommunications Act 1991* enabled the establishment of the Telecommunications Industry Ombudsman (TIO) in 1993 to 'provide a free and independent alternative dispute resolution scheme for small business and residential consumers in Australia who have complaints about their telephone or internet services' (DBCDE 2011a). It is interesting that the TIO took on the role of handling 'Internet services' as these had been specifically excluded from the 'regulatory consumer safeguards' the Howard government had imposed upon Telstra to ensure the government could curb the excesses of the monopoly provider once the government's majority share in the company was sold in 'T3' (Dodson 2006).[189] In the government's advice to constituents, it stated:

> [T]he Government does not need to own Telstra in order to ensure that you have reasonable access to telecommunications. It is our strong regulatory regime which guarantees you get decent services.[190]

The 'regulatory consumer safeguards' were, specifically, the Universal Service Obligation (USO), the Customer Service Guarantee (CSG), the Network Reliability Framework (NRF), and '[s]trict price controls to ensure price parity, including local call costs capped at 22 cents and equivalent retail line rental prices' (Dodson 2006). Further, under the CSG, the TIO was empowered to demand compensation, as a set amount, for consumers where services were not provided within the relevant timeframe.[191] However, in 1999 Telstra's performance under the USO and the CSG was being monitored by the Australian Communications Authority (ACA) due to a substantial decline in Telstra's performance against these so called 'iron-clad' regulations.[192] The ACA investigation found that, while Telstra had demonstrated serious 'organisational intent' to address the USO and CSG, it also found 'a number of systemic factors contributing to poor performance such as inadequate infrastructure (ageing and under-provisioning of the customer access network), deficient records of cable distribution pairs, and poor work practices and procedures' (ACA 1999: 4). What is clear is that the ability of the deregulated market to bring even basic telephone services to consumers in remote and regional areas was well below the performance expectations established by the regulations, *let al.*one the delivery of Internet services.

Once T3 was completed (see Box 6.1), there appeared little the government could do to influence the telecommunications industry, beyond the role of regulation, which

[189] See Dodson (2006) for the link to the Coalition's confidential 'Fact sheet – Telecommunications Regulatory Regime'. Dodson (2006) provides links to three confidential documents (including 'two proforma letters') provided to Coalition MPs to address constituent's concerns about the sale of the government's controlling share in Telstra. The documents were obtained by *The Sydney Morning Herald* and made available to the public.

[190] See Dodson (2006) for the link to the Coalition's 'Standard letter for Coalition MPs to constituents concerned about Telstra sale from a consumer perspective'.

[191] See ACMA's (2011) CSG 'Fact Sheet' for details.

[192] See Dodson (2006) for the link to the Coalition's 'T3 Q&A' document prepared by Senator Nick Minchin's office.

was clearly one of the government's reasons for selling Telstra in the first place.[193] Nevertheless, once the government had reduced its majority shareholding in Telstra, any opportunity for structurally separating Telstra into two separate companies (that is, one wholesale and one retail company) was severely limited by the impact this might have on the integrity of the Australian share market. The government cited several reasons for not structurally separating Telstra (see Dodson 2006):[194]

> [I]t is longstanding government policy to oppose the forced structural separation of Telstra. Not even the Labor Party supports it
>
> Labor made the decision to set Telstra up as one complete vertically integrated company in 1992. It has operated as an integrated company for 14 years and it is too late to unscramble the egg
>
> There are so many unanswered questions about how you would physically separate the company, working out which bits went where? Who owns the IT, who owns the systems and intellectual property? What compensation would have to be paid to the 1.6 million shareholders?
>
> And virtually every country that has looked at structural separation has rejected it - 20 US states, Japan, Norway and the UK have all rejected it
>
> Pro-competition economic experts like both the OECD and the Productivity Commission have opposed structural separation on the basis that the cost of unscrambling the egg is greater than the benefits
>
> They have both said that there are benefits in having a large vertically integrated telco with the economies of scale to invest and innovate
>
> ...the advocates of structural separation [do not] actually understand that breaking Telstra into a network company and a retail company will not directly benefit competition

What is interesting about the problems associated with the fixed line industry is that the mobile industry was significantly different. For example, by 2000, Telstra's share of the mobile market had fallen to below 50% in the face of competition (which became more intense after full number portability was initiated in 2001) (Ovum 2011: 21). By the late 1990s, DSL services, which enabled fast Internet connections over the existing copper network, became a reality. The Australian Competition and Consumer Commission (ACCC), which took responsibility for the regulatory functions of AUSTEL following the introduction of the *Telecommunications Act 1997*:

> Declared ULLS (Unconditioned Local Loop Service) in 1999, imposing a legal requirement on Telstra to provide this access to competitors, but leaving the crucial question of price unresolved (Ovum 2011: 23).

[193] That is, to end the Commonwealth's 'conflict of interest between the Government being the regulator of more than 100 telecommunications companies at the same time as it is the majority owner of the largest player' (see Dodson 2006 for the link to the Coalition's 'T3 Q&A' document prepared by Senator Nick Minchin's office).

[194] See Dodson (2006) for the link to the Coalition's 'T3 Q&A' document prepared by Senator Nick Minchin's office.

The source of the current broadband problem is very much a result of decisions taken at this period: no parameters to determine Telstra's wholesale price for competitors, no prospect for the structural separation of Telstra without affecting its potential share price, and no incentive for Telstra to open its local loop to competitors other than the threat of regulatory action. The situation was exacerbated by the competing political agendas of needing to obtain a sufficient share price for the sale of Telstra, while at the same time ensuring adequate service provision for citizens. On both counts, the government failed: 'mum and dad' investors paid AUD$7.40 per share in T2, only to see the 'tech bubble' reduce their investment to about half by the time (AAP 2006b; 2006c);[195] and, to make matters worse, see Australia descend into the bottom half of the OECD as late as 2010 in terms of broadband penetration (Taylor 2010). Further, the blame for Australia's position in the OECD rankings was firmly placed with Telstra, despite the fact that its ability to pursue its own agenda had only really existed since government had rescinded control (via T3) in 2006.

What can be readily observed is that the deployment of broadband services, much rather than being a commercial matter, was inherently a political problem. Telstra was the obvious 'scapegoat' for responsibility, whereas the political reality for government was that telecommunications remained a matter for government intervention, despite that same government's very public decision to hand over the role of service provision as part of the rationale for the *Telecommunications Act 1997*. Publicly, the government reiterated that the full privatisation of Telstra was an appropriate way to address the government's inherent 'conflict of interest', created as a result of being both provider *and* regulator of telecommunications services. Simultaneously, the government blamed Telstra for the state of Australia's broadband services yet continued to utilise telecommunications as a policy lever. As late as 2008, the Regional Telecommunications Independent Review Committee (RTIRC) (2008) found that: 'specifically mobile services and the availability of broadband internet access... are still inadequate'. Yet despite the federal government's reliance on the NBN as the solution to Australia's broadband woes, by the time negotiations between Telstra and the ACCC were finalised in 2012, pushing the handover of Telstra's fixed-line customers to NBN

[195] At the close of trading on 20 April 2012, Telstra shares were valued at AUD$3.38 on the Australian Securities Exchange.

Co by 2018, the temptation to utilise communications policy for political purposes proved simply too much for the federal government.

In confirming the government's desire to take control of the politics of communications policy, the demise of the Australian Telecommunications Users Group (ATUG) in 2011 provides a useful anecdote. Although ATUG was a major interest group that was established relatively independently of government in 1981, in 2009 the federal government funded the creation of the Australian Communications Consumer Action Network (ACCAN), incorporating a number of earlier iterations including the Consumers Telecommunications Network (CTN) (ACCAN 2012). By actively influencing the relative importance of consumer representative groups, the federal government effectively ended the thirty-year history of ATUG. The establishment of ACCAN meant that the major supporters of ATUG no longer had an incentive to continue paying membership fees to ATUG; significantly, management cited 'a decline in membership and the rise of a number of similar organisations in the last few years' (Taylor 2011a). Nonetheless, former Managing Director of ATUG, Rosemary Sinclair, has since been selected to chair the Regional Telecommunications Independent Review Committee (Taylor 2011b).

By the middle of 2012, the federal government's control of the Australian telecommunications industry was complete. Not only did the government have control of the wholesale network, but it had also brought about the decline of the major consumer representative body (ATUG) and replaced it with its own body (ACCAN). Further, the government presented the NBN as a double-edged sword: on the one hand, the government guaranteed very high-speed broadband services to the majority of Australian citizens. On the other hand, the government insisted that Internet content should be censored to provide adequate protection for Australian Internet users (DBCDE 2011b), despite the obvious unpopularity of the policy (AAP 2010). Not only did the federal government have effective control of the infrastructure, but it also had effective control of the content that could be supplied over that infrastructure. By early 2012, numerous political commentators saw Australia's communications industry as being at the wrong end of the democratic spectrum, despite at least three decades of policies supposedly designed to democratise the industry after more than three-quarters of a century of government control (Ovum 2011; AAP 2012; Banks 2012; Smith 2012).

6.5 Comparative Institutional Analysis: Ideas, Interests & Institutions

Before analysing the ideas, interests and institutions which permeate the broadband era, it is first necessary to digress and to examine the impact of wireless technologies and their respective convergence with or complementarity to hard-wired broadband services. Incidentally, in both Canada and Australia, once the relevant mobile phone systems were enabled, coordinating and regulating mobile services tended to be achieved, beyond the allocation of spectrum via auctions, in an *ad hoc* and, in particular, an *ex post* fashion. At this stage in the development of communications technologies, a great deal of speculation exists as to the importance of the various wireless technologies in comparison to the hard-wired technologies such as fibre optic cable. Regardless, wireless networks eventually require hard-wired technologies to connect to the Internet, which means that wireless networks cannot be considered in isolation to the hard-wired network. Presently, fibre optic cables provide the most effective means of enabling connectivity, however, deploying a fibre network to or near to individual subscribers requires a 'huge investment' (Yoon *et al.* 2005: 450).

6.5.1 'Wireless' as an Outlier: Convergence or Complementarity?

Although the term 'wireless' commonly referred to the radio in earlier times, today the term refers to a variety of mobile cell phones, smart phones, tablets and other devices which connect to the Internet wirelessly. In addition to mobile phone services such as two-way, full-duplex speech and short message services (SMS), the development of smart phones and tablets enables users to access high quality multimedia content including pay-TV channels and the World Wide Web. Users can connect to these services in a variety of ways, including GSM, Wi-Fi, Wimax, HSDPA (third generation or '3G') and increasingly, Long Term Evolution (LTE or fourth generation or '4G') networks (see Box 7.1 for details).

Mobile telephony represents the only communications technology where Australia's penetration exceeds Canada's. Indeed, Canada has one of the lowest penetration rates of mobile telephony of all OECD member countries. In an interesting turn of events, establishing GSM networks as the major mobile phone system in Australia removed many of the problems in switching from analogue to digital spectrum which was somewhat imposed on Canada by the need to follow the United States' adoption of the AMPS standard. Despite AUSTEL's (1990: 18) assertion that attempts to 'pick technology winners and losers [were] fraught with risk' , the industry appeared to have 'picked a winner'. Coupled with three major competitors in the mobile telephone sector since 1991, the 'monolith' approach worked in the deployment of earlier technologies with Australia's three major competitors all operating GSM networks and facilitating a reduction in the dominance of Telecom's AMPS-based MobileNet.[196] Unlike fixed-line telephony, Australian governments have not regarded mobile telephony as an essential service and most regulations (such as number portability) have been in response to industry or consumer demands. Indeed, AUSTEL (1996) advised the government that 'mobile and fixed services are essentially different markets' which were unlikely to compete in the foreseeable future and that there would be no threat to the fixed line network and hence cross-subsidisation of Telecom's Community Service Obligations (CSOs). While Canada's 'mosaic' approach appears to have faltered in the mobile sector, with Geist (2009) pointing to Rogers' monopoly of the GSM network as one of the major policy issues for Canadian politicians and policy-makers to focus upon - and a crisis in a lack of real competition in the mobile sector later becoming a major policy issue (*The Economist* 2011) - in comparison with Australia's deliberate choice not to enable regional and local mobile providers, Canda's mosaic remains relatively intact in the mobile sector.[197] Nonetheless, there are a number of explanations for the differences in take-up of mobile telephony in both countries and it is difficult at this stage of the observable impacts of technological convergence to make a claim about how this will impact upon broadband adoption as mobile broadband becomes readily available.

[196] AUSTEL (1990: 58) explicitly rejected 'regional or localised licences' in recommending the structure of the mobile telephone sector. This choice was path dependent in that 'MobileNet was already national'. Consequently, a single national solution was proposed and spectrum licences were issued on a national-only basis.

[197] Although, as had happened with many earlier small providers, many of more recent mobile entrants (such as Mobilicity and WIND Mobile) have often been the subject of much media coverage speculating about acquisition by Rogers or TELUS.

Box 7.1 Generations of Mobile Phone Technologies

In recent times, the terms 'third generation' or '3G' and 'fourth generation' or '4G' have entered common usage as ways to distinguish between different levels of advancement in mobile phone technologies. Nevertheless, these generational terms remain largely undefined beyond the speed at which data can be transmitted (ITU 2010). The difficulties in defining each generation are exacerbated by the limitations of the various handsets. For instance, a 3G network may be capable of transmitting data at 14.4 Mbps; however, the handset may not be capable of transmitting more than Simplified definitions[198] of each 'generation' are provided below to facilitate the analysis conducted in this section:

1st Generation or '1G': Analogue systems such as AMPS are typically referred to as 1G. Canada and Australia adopted the AMPS system. Typically, 1G networks are capable of connection speeds of up to 56 Kbps (the mobile equivalent of dial-up Internet access).

2nd Generation or '2G': 2G systems are digital networks. A 2G version of CDMA was used widely by Telstra to provide services to rural customers in the late 1990s/early 2000s due to its greater range from a mobile phone tower. GSM (later with GPRS and EDGE), the standard adopted in the major Australia cities by the three main competitors, had a shorter range but enabled the use of popular devices (such as Apple's iPhone), whereas in Canada, only Rogers adopted GSM, which Geist (2009) suggests restricted competition by limiting users of iPhones to Rogers' network until further spectrum auctions occurred later in 2009. In the meantime, Australians had enjoyed a decade of competition in GSM services in Australia, possibly resulting in Australia ranking number two in the world for take-up of smart phones (Moses 2011). Typically, 2G networks are capable of connection speeds of approximately 256 Kbps (the equivalent of early broadband Internet access).

3rd Generation or '3G': Systems using HSDPA (such as Telstra's NextG network in 2009) are regarded as 3G because of the much higher transmission speeds available. LTE, GSM EDGE and some WiMax technologies may also be considered to be 3G or '3.5G'. The designation generally corresponds with the ITU's specification IMT-2000. Typically, 3G networks are capable of connection speeds of approximately 1.5 Mbps to 8 Mbps(roughly the equivalent of ADSL1).

4th Generation or '4G': The ITU (2010) has referred to the mobile phone standard IMT-Advanced as '4G'. LTE-Advanced and WirelessMAN-Advanced are acknowledged by the ITU as 4G. In Australia, Telstra (2012) has marketed its LTE/HSPA+ service as 4G with advertised speeds of up to 40 Mbps. However, there was some controversy over the label '4G' when Apple released its iPad 4G in Australia on 8 March 2012 and it was not compatible with the Australian 4G network due to differences in the frequencies used in Australia compared to North America (Griffith 2012). Typically, 4G networks are capable of connection speeds of above 8 Mbps (roughly the equivalent of ADSL2 or potentially ADSL2+).

First, mobile phone subscriptions are less expensive in Australia (see Figure 6.1 below).

[198] Sullivan (2012) recorded actual 3G and 4G speeds from four providers in thirteen US cities. Sullivan's recorded actual speeds (as opposed to theoretical connection speeds) demonstrate that 3G services average approximately 2 Mbps while 4G services average 6.4 Mbps. Given the subjectivity of definitions for the various generations and the range of geographical and provider particularities, the definitions provided here are designed to assist the non-technical reader to conceptualise the different generations, rather than to provide an exhaustive technical definition.

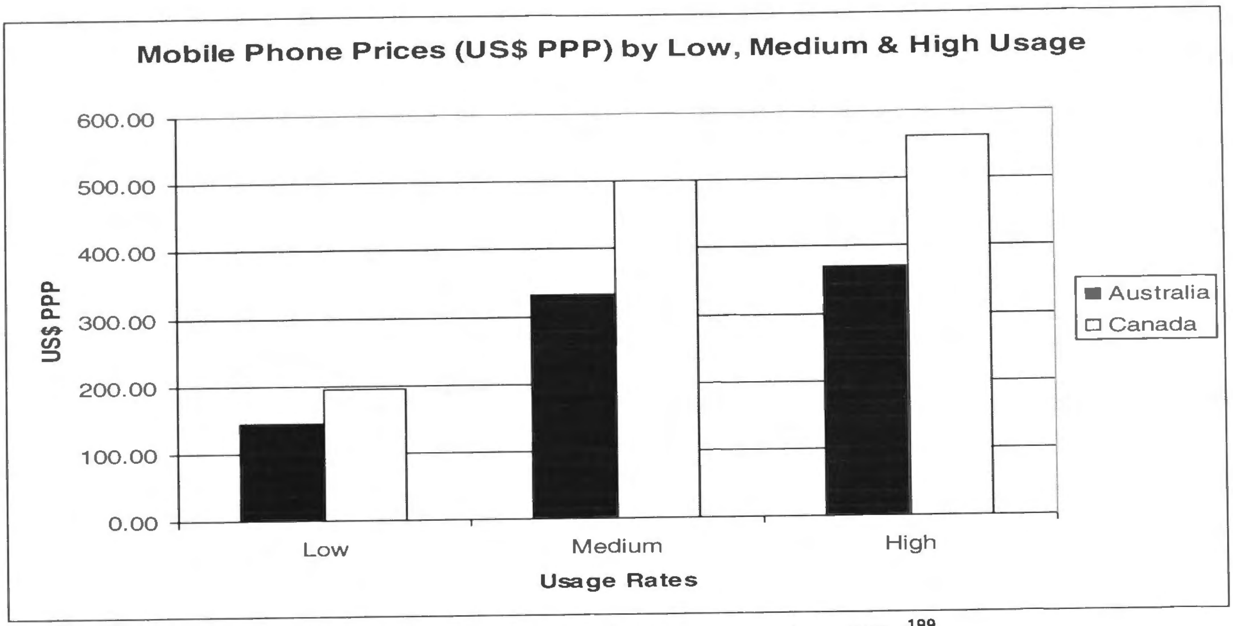

Figure 6.1: Mobile Phone Price Comparison 2009[199]

There was little opportunity for network dominance in the Australian mobile market as the introduction of mobile telephony in Australia coincided with market liberalisation in the telecommunications industry. Although the non-cellular public automatic mobile phone system (PAMTS) was introduced in Australia by Telecom in 1981, it was not until 1987 that the first cellular analogue mobile phones were available for public use in Australia. By the time mobile telephone technology had developed sufficiently to enable a truly portable device,[200] liberalisation of the telecommunications industry in Australia, on AUSTEL's (1990) recommendation, enabled the licensing of Telecom, Optus and Vodaphone as the three main competitors in mobile telephony. Initially, the Australian analogue mobile phone network adopted the US system known as the advanced mobile phone system (AMPS). However, by 1993 Telecom, Optus and Vodaphone had adopted the GSM digital standard in metropolitan areas and the analogue system was shut down in 1999 when it was replaced by the CDMA network (AMTA 2003). Nonetheless, while Canada's mobile telephone market today has a similar number of competitors, the higher prices are a significant variable (CWTA 2012).

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[199] Source: ITU (2012).

[200] Early PAMTS mobile telephones were mounted in cars as the battery life was particularly short. Rapid improvements in mobile phone technologies in the late 1980s saw the PAMTS network closed down in June 1991, despite the typical price per mobile phone of $5000 causing an outcry from existing customers of the network (Goggin 2006: 7).

Third, the substitution of fixed-line telephone services for other voice services in Australia was largely restricted to one alternative: mobile telephones. Alternatives to fixed and mobile subscriptions such as cable telephone and Voice over Internet Protocol (VoIP) in Australia did not have the same impact as in Canada, no doubt due in part to the lack of broadband services (ACMA 2008: 1). This explanation is supported by research conducted by ACMA (2008) which indicates that Canada's fixed-line services peaked in 2001 and declined 8% between 2001 and 2005, while Australia's fixed-line services peaked in 2004 and declined 6% between 2004 and 2008. Further, 14.9% of Canadian households had adopted cable or VoIP telephony by 2007 (Statistics Canada) whereas the low take-up of VoIP in Australia was having little impact on other services in Australia as late as 2008 (ACMA 2008). Consequently, the lack of fixed-line broadband services combined with the lack of accessible substitutes has arguably fuelled mobile phone growth in Australia.

Fourth, an important consequence of the lag in mobile telephone take-up in Canada is the proliferation of public telephones.[201] In 2005 there were 149,000 public telephones in Canada (2005), compared to 20,000 in Australia (2009 – not including 25,000 payphones located in businesses and hospitals). For instance, public telephones at the Montreal bus terminal (counted in July 2007) numbered some 18 public telephones, more than nine public telephones at a roadside service station in northern Quebec, and numerous public telephones readily accessible on most city blocks in Ottawa.[202] Anecdotally, the limited number of public telephones available in metropolitan Canberra and Sydney is obvious; empirically, reliable comparisons of public telephone availability by metropolitan area are not readily available. No doubt the much higher penetration of mobile telephones in Australia accounts for a large portion of this difference.

[201] Industry experts in Canada suggested, in addition to higher prices for services, the availability of public telephones was a major reason many people chose not to subscribe to mobile telephone services. Other explanations are detailed in Chapter 6.

[202] Counts conducted by the author during a field trip to Canada in July 2007. Interviews with industry elites conducted in Canada during this period confirmed the author's view of poor take-up of mobile telephones due to the number of public telephones which consumers 'expected' to be provided, particularly by Bell Canada, the dominant carrier in Ottawa and Quebec.

6.5.2 Ideas, Interests and Institutions in the Broadband Era

Despite the development of broadband as a new communications technology (in that it enables high-speed multimedia Internet content and services), the approaches stemming from the respective constitutions of both countries have proven resilient since the time of the telegraph. Canada enables regional and local solutions to regional and local problems, whereas Australia continues to focus on standardised service across the continent. Indeed, one industry expert commented that the federal government's insistence on providing equal access across the nation limited the industry players who could be involved in the NBN process. Rather than enable regional solutions, such as the broadband service provided by TransAct in the Australian Capital Territory, NBN Co has effectively taken on the role performed by Telstra prior to privatisation.

Both Canada and Australia have now recognised the impact of technological convergence, leading to the merging of institutions into the CRTC and ACMA respectively. However, Canada's mosaic has enabled cross-platform competition and faster penetration of broadband services while Australia's monolith has tended to benefit the established players, restrict the available technologies used to deliver broadband services, and ultimately take longer to achieve the same levels of penetration as Canada. Succinctly, the ideas and interests have remained quite static, while institutional change has remained incremental. Succinctly, the trajectories that each country started along at the time of the telegraph have not changed. The next section considers the implications for future technologies of the respective trajectories.

6.6 Implications for Future Technologies

Broadband technology is a major driver of convergence in communications technologies which, in turn, is synonymous with the evolution of the global digital economy (Dwyer 2010: 40). However, broadband is increasingly being viewed in terms of two separate realms: fixed line and wireless. While fixed line services tend to be faster and more reliable for data carriage, increasingly, mobile technologies are enabling greater access to Internet content from any location. It is not clear at this stage whether fixed line services will remain in demand as mobile technologies improve. Mobile technologies still require the necessary backhaul capabilities such that broadband infrastructure remains essentially about deploying hard wires or wireless towers. Nonetheless, it remains to be seen how Australia's preference for single national solutions will compare with Canada's regional and local solutions once the NBN is complete. Further, Canada's lag in mobile penetration is significant and this may become a future policy problem once the issue gathers enough inertia.

The remainder of this section discusses how the concept of the network society impacts upon how communications infrastructure is adopted, deployed and coordinated. The purpose of the discussion is to facilitate the argument developed in the next chapter that the decentralised, 'bottom-up' solution, as in Canada's mosaic, is better than Australia's 'top-down' monolith in addressing the regional and local varieties of particularism. While Canada is lagging in mobile technologies, the mosaic has consistently outperformed the monolith in every other technology since the time of the telegraph, hence leading to faster deployment of broadband technologies. Given that technological convergence has not impacted the Australian broadcasting industry to the same extent as has occurred in Canada, an important future implication for broadband technologies is how these technologies will enable the digital economy to function in a network society (Clements *et al.* 2011).

6.6.1 More to the Puzzle: Convergence and the Networked Society

Traditional measures of communications technology outcomes such as penetration rates and number of subscribers (outlined in Chapter 2) are increasingly problematic in the current era of convergence. This section, then, outlines the current state of the 'network society' (see Castells 2011) in Canada and Australia. The diversity of technologies and functions and their respective complementarities make these traditional measures less useful in assessing a nation's ability to participate in the digital economy, to increase participation in policy-making (through e-government), or to access online services such as e-health and e-education. According to Reeve (2002: 5), 'industry-level studies that focus only on industry-specific variables may miss a significant part of the explanation'. Indeed, several different approaches now exist[203] to measure cross-national performance in various elements of the network society.[204] When these newer measures are considered in addition to the puzzle mapped out in Chapter 2, a peculiar situation arises: the Canadian and Australian outcomes, despite the obvious differences in the penetration of broadband services, tend to converge in the many elements of the network society. For instance, convergence in 'network society' outcomes appears in the following reports:

- UN Public Administration Programme's (UNPAN) 'e-Government Survey' series (see Figure 7.1)
- Boston Consulting Group's (BCG) (2011a) 'e-Intensity Index'
- Economist Intelligence Unit's (EIU) Digital Readiness series (see Figure 7.2)
- BCG (2012) *The Internet Economy in the G-20* (see Figure 7.3)

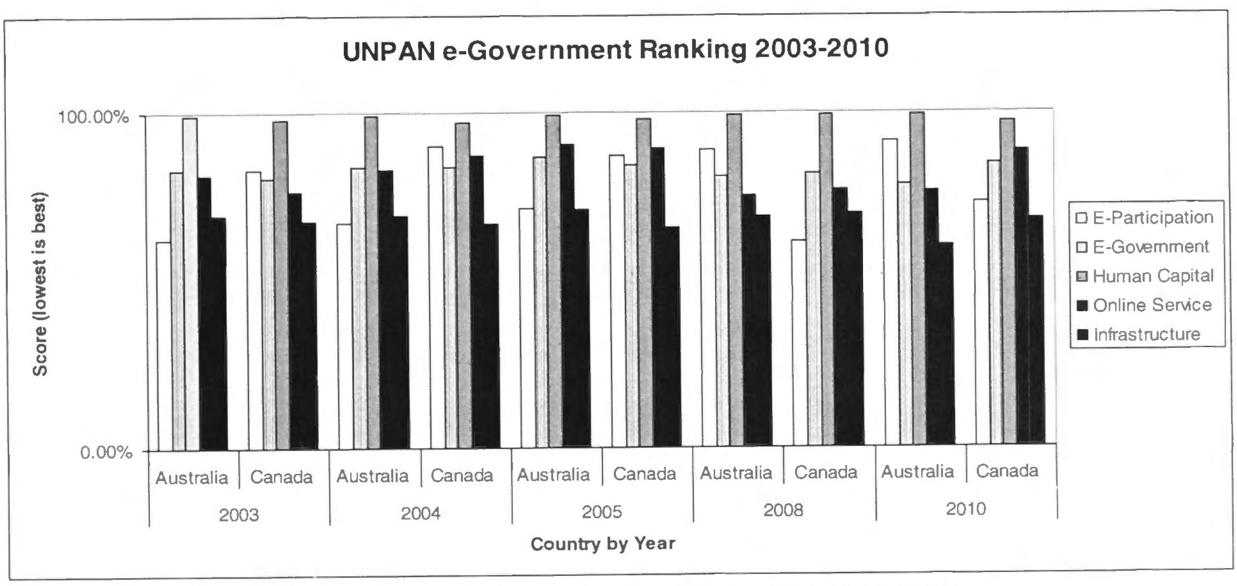

Figure 6.2: UNPAN e-Government Ranking 2003-2010

An interesting observation from the data is that Canada and Australia tend to track each other over time in the first three reports. Nonetheless, Figure 7.3 presents a conundrum: despite Australian households being less 'connected' via broadband subscriptions (in comparison to Canada – see Figure 2.10), Australia's Internet economy represents a greater share of GDP than Canada's, and Australians tend to

[203] There are various measures of cross-national performance in the network society (in addition to statistical reports provided by the OECD and the World Bank), such as the World Economic Forum's Network Readiness Rankings, the Economist Intelligence Unit's e-Readiness Rankings, the United Nations Public Administration Programme's e-Government Survey, and various reports by the Boston Consulting Group (2012) such as *The Internet Economy in the G-20: The $4.2 Trillion Growth Opportunity*.

[204] Castells (2011) outlines in depth the characteristics of modern society and the importance of communications technology in what he refers to as 'the network society'.

spend more online (as a percentage of total retail sales) than Canadians. It is quite plausible that this difference can be accounted for by the greater uptake in mobile broadband by Australians; however, it is equally plausible that Australians are interested in participating in the global economy, but do not have adequate access to fixed-line broadband services. The historical trends observed in each instance of the introduction of a new communications technology (as outlined in Chapters 4, 5 and 6) corroborate this explanation. Further, when viewed over time, the World Economic Forum 'Network Readiness Rankings' series 2002-2012 (see Figure 7.4) indicates that Australia has remained behind Canada over the last decade in terms of network readiness, but this lack of readiness is not confirmed by the extent of participation in the digital economy. Given that, in recent times in particular, Australia's GDP per capita is some US$9,374.64 per year greater than Canada's,[205] Australia's poor performance in the penetration of broadband services is extraordinary.

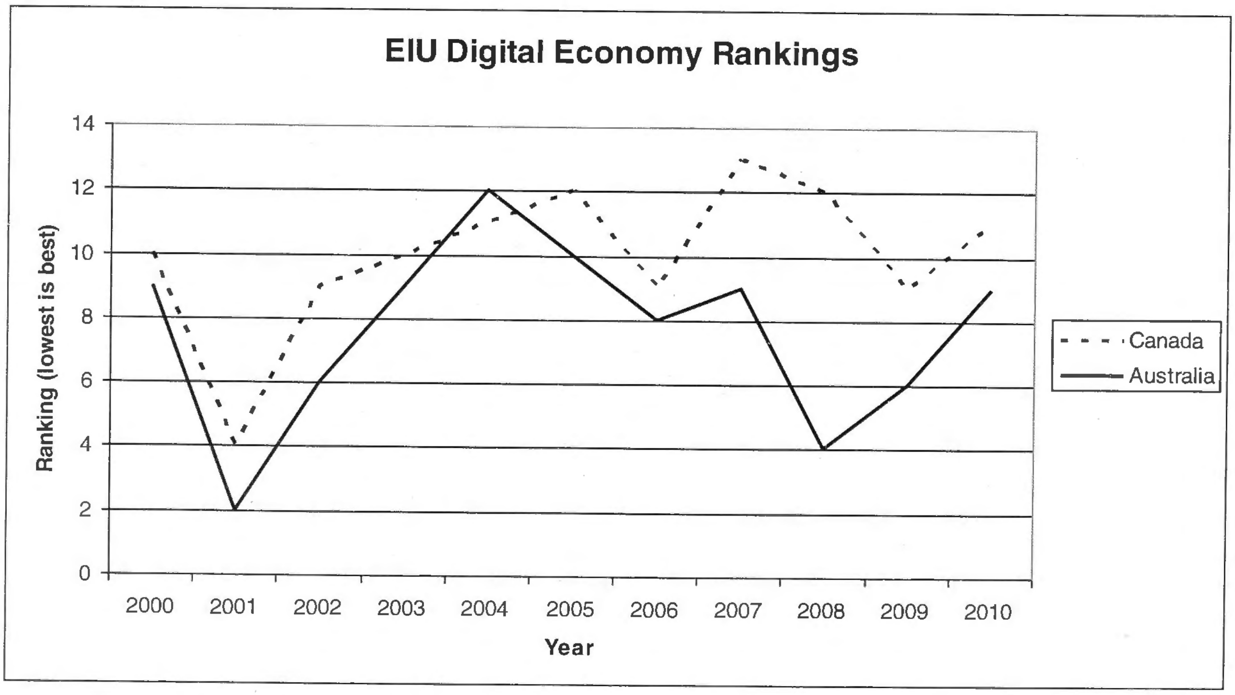

Figure 6.3: Economist Intelligence Unit (EIU) Digital Economy Ranking 2000-2010

205 According to the World Economic Forum's (2011) Global Competitiveness Report, Canada's GDP per capita in 2011 was US$46,214.91 whereas Australia's GDP per capita was US$55,589.55

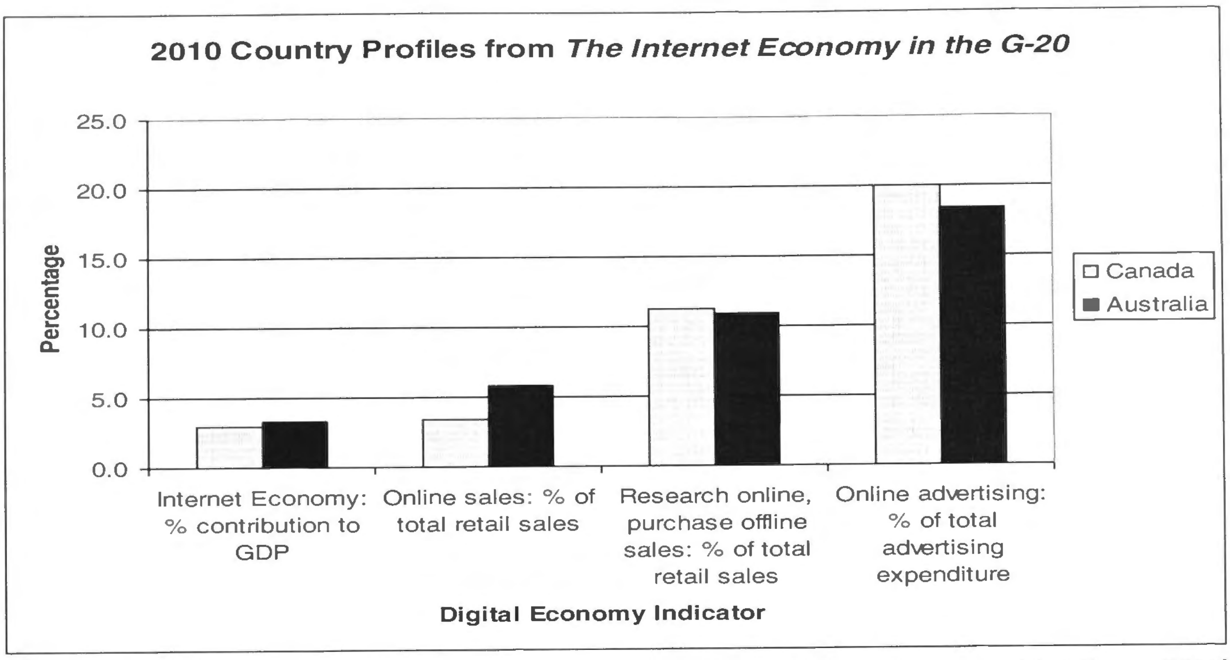

Figure 6.4: 2010 Country Profiles: *The Internet Economy in the G-20* (Boston Consulting Group 2012)

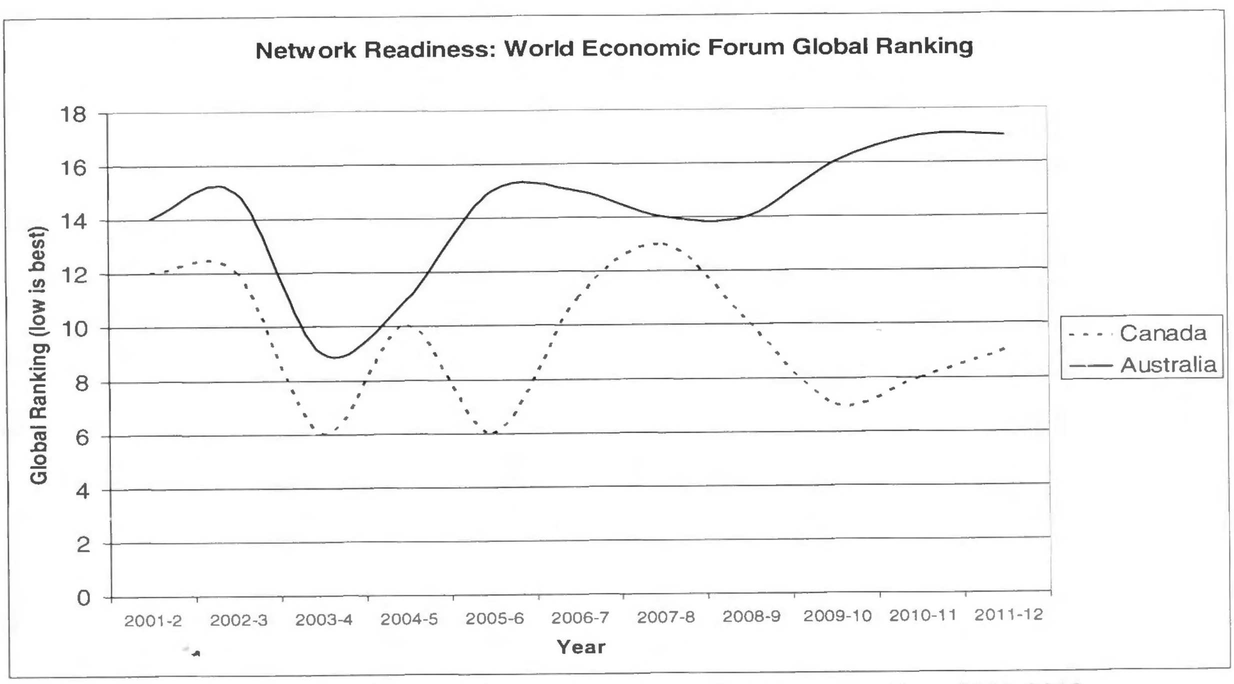

Figure 6.5: World Economic Forum Network Readiness Rankings 2002-2012

The World Economic Forum's Global Technology Report series reveals, over time, some interesting differences in the Canadian and Australia 'network society' indicators which corroborate the empirical evidence provided in Chapters 4, 5 and 6. While Figure 7.5 demonstrates that, in the period 2007-2011, many of the indicators tend to track each other over time, it also demonstrates that the gap between the indicators for Australia's rankings in 'Market Environment', 'Infrastructure Environment', 'Individual Readiness', 'Business Readiness' and 'Business Usage' widen in comparison to Canada's rankings over time.

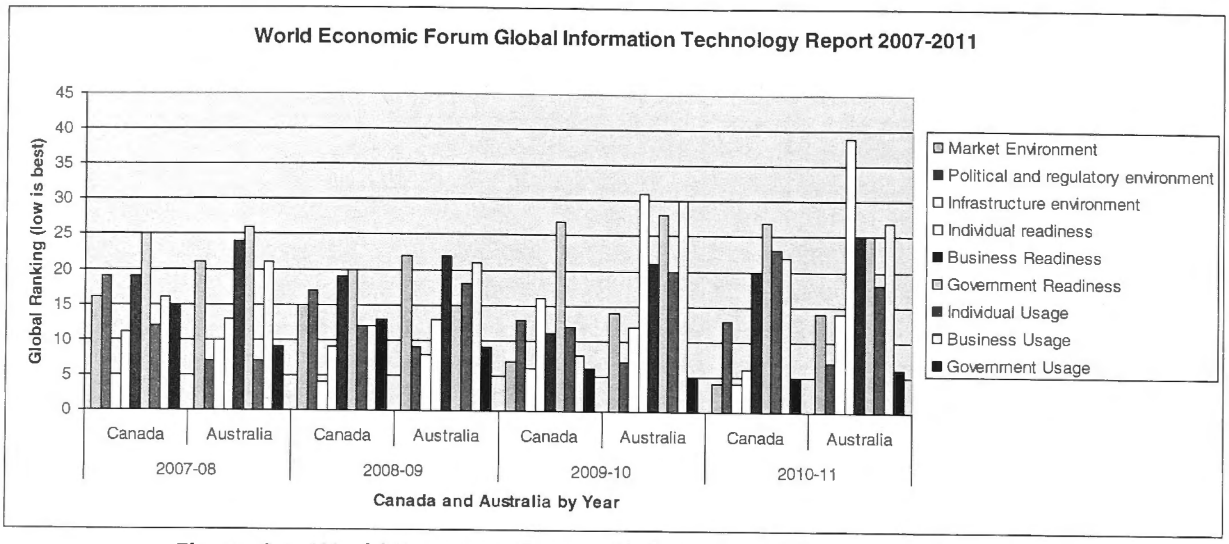

Figure 6.6: World Economic Forum Global Information Technology Report

While the World Economic Forum rankings over a period of some five years may not provide sufficient evidence to develop a plausible explanation for the divergent communications technology outcomes in Canada and Australia over time, the evidence does tend to corroborate what has happened in Australia when national governments have taken responsibility for communications technologies in earlier times. Indeed, single national solutions which ignore the varieties of particularism tend to disengage policy participants (see for example Akerman 2012; Corrigan 2012; Regional Development Australia – Far West NSW) and slow down deployment. Indeed, in some areas the NBN rollout was characterised by government announcements and community consultations followed by more government announcements and community consultations with little additional information for consumers or physical deployment of the infrastructure.[206]

The next section explores an important difference in the Australian and Canadian communications industries: the penetration of wireless and mobile technologies. As

[206] Consultations by NBN Co in far west New South Wales in early 2012 provided little information for potential customers of the service and appeared to be designed by the company to gauge the attitude of residents towards the NBN. The flyer for the meeting read: 'These consultations will not provide technical details about the NBN rollout. Also, we still do not know the timetable for the NBN rollout in our region... The purpose of the consultations is to obtain your views about the things we need to do now and plan to do in the future to become ready to accept and use high speed broadband' (Regional Development Australia, Far West NSW 2012: 1). Similarly, an NBN Co consultation session conducted at the Palmerston Community Centre in the ACT (attended by the author) on 13 October 2010. No details were offered and during the meeting one of the NBN Co employees emerged from the floor, apparently 'trying to gauge the concerns of the community' by sitting among them. At the meeting NBN Co claimed that rollout would commence in the second quarter of 2011 (GCC 2010). However, by July 2012 NBN Co had conducted a second consultation and numerous announcements had been released by Minister for Broadband Senator Stephen Conroy, ACT Senator Kate Lundy and ACT Chief Minister Katy Gallagher, but the NBN rollout had not commenced.

mobile communications technologies improve, the various fixed and wireless platforms are becoming complementary and substitutable. However, the differences in the Australian and Canadian wireless markets have important implications for the future of broadband technologies, including the structure of communications service providers and how both governments and businesses address the varieties of particularism at the local level.

6.6.2 Wired versus Wireless: Complementary, Substitutable and Local

Wireless technologies have improved rapidly in recent years and with the development of 4G mobile networks, mobile broadband, in particular, provides a viable substitute for fixed-line broadband. Consequently, the concept of natural monopoly adopted to govern many early communications networks is increasingly irrelevant. Natural monopoly was justified on the basis of subadditivity, where 'one firm can produce a given combination of outputs more cheaply than can any combination of two or more firms using the same technology' (Snow & Jussawalla 1986: 67). The inherent assumption in subadditivity is that both the network and the function of the devices attached to the network facilitate only a 'given combination of outputs'. While this may have been true of telephones, pagers and facsimile machines, the development of mobile broadband networks and convergence of the telecommunications and broadcasting industries has expanded this 'given combination of outputs' to blur the boundaries of various networks that the concept of natural monopoly is no longer useful to deliver efficiencies in communications infrastructure deployment (Quiggin 1998: 429).

Moreover, technological limitations in the past resulted in exclusive networks restricted to individual subscribers where efficiency improved along with the value of the network as the number of subscribers increased (Quiggin 1998: 429). Technological convergence, and in particular, the ubiquitous Internet, mean that subadditivity is no longer relevant in generating efficiencies based on the number of subscribers to a particular network.[207] Indeed, research by the Australian Communications and Media Authority (2009: 7) into subscribers' reasons for selecting fixed versus wireless services acknowledges a 'blurring of boundaries' in services and consequently the difficulty in isolating discrete sets of a 'given combination of outputs'. The concept of varieties of particularism is important in understanding how the delivery and use of broadband services will continue to evolve, particularly with the growth in mobile broadband services. As information economy becomes increasingly accessible via either wired or wireless networks, content on the Internet is increasingly tailored to different devices such as Apple's iPad and iPhone and Samsung's Galaxy range of smart phones. The Internet is no longer a single source of content but a place where the same content can be tailored in terms of presentation or quality for a variety of devices.

The future implications of the Australian monolith and the Canadian mosaic (as they now stand) in the delivery and use of broadband services are complex and uncertain. Evidently, the current state of wireless networks in Canada and Australia cannot be explained by the theory of technological determinism. Technological momentum can be observed in the differences between the mobile markets in both countries. For example, Australia's preference for mobile telephones has resulted in an increase in the use of smart phones with Australia's penetration at 53% compared with Canada's penetration of 33% (Google 2012). However, four out of five Australian websites are not optimised for mobile viewing (Moses 2011). Moreover, while Canada's use of smart phones lags Australia's, Canada is much better served by Wi-Fi technologies,[208] particularly at the municipal level. This is important because global Wi-Fi Internet traffic is set to surpass wired Internet traffic by 2015 (Cisco 2012), which may make Australia's lead in mobile telephony less relevant as the technologies continue to

[207] Although Quiggin (1998: 430) suggests that technological development may create new forms of natural monopoly.

[208] Canada's Wi-Fi penetration was 67.8% 2011 compared with Australia's penetration of 53.8%, with Australia forecast not to reach the 2011 level of Wi-Fi penetration in Canada until 2016. Further, in 2011, Australia's growth in mobile traffic was 103% compared with Canada's growth in traffic of 158% (Strategy Analytics 2012). This indicates that, in light of technological convergence, conceptualising the various industry sectors by adopting a technological determinist's lens would suggest that Australia was outperforming Canada in wireless services. However, if the industry sectors are conceptualised using technological momentum as the analytical framework, some elements of 'catching up' can be observed while social factors can also be observed limiting the technological options available to consumers. Institutions, then, play an important role in the communications policy choices which influence which technologies are adopted.

evolve. Indeed, and in light of technological convergence, focusing on 'devices' such as mobile phones is less helpful in determining communications technology outcomes.

Given that fixed and wireless technologies can be simultaneously, complementary and substitutable, it is more appropriate to consider communications outcomes in terms of functions rather than devices. Functionality rather than devices or types of infrastructure is the essence of the Canadian mosaic: local solutions are adopted to address local varieties of particularism. These local solutions are less likely to be hindered by centrally mandated 'rules of the game' as has often been the case in Australia with earlier technologies. More recently, the Australian government's deployment of the NBN has focused on a single national solution using a fibre-optic network (with wireless and satellite services in remote areas). However, the deployment is controlled by a single entity, NBN Co, which has attracted much criticism since its inception for its slow rollout and low take-up by consumers (see for example Denholm 2012; Hutchison 2012; Johnson2012; Masanauskas 2012; Mawby 2011).

According to the Boston Consulting Group (2012), telecommunications providers can no longer operate as if they were natural monopolies, and will need to develop 'a comprehensive commitment to a new operating model—a decentralized, adaptive structure that addresses current challenges and positions telcos to face future ones'. This includes the ability to provide tailored and multi-channel services to businesses and consumers. Further, deploying fibre-optic networks (in particular FTTx) requires providers to address the local varieties of particularism to be competitive: universal service is no longer a reasonable goal and rather than the natural monopoly's 'build it and they will come' approach, a 'sell first, build later' approach is proving to be more effective where companies 'make nice with the locals' (Boston Consulting Group 2011). However, the regulatory framework must be highly responsive to industry requirements and quick to make decisions to enable such flexible business models to be effective (see BCG 2011: Exhibit 2).

Industry experts generally agreed that Canada's regulatory framework facilitates such flexible business arrangements at the local level whereas Australia's return to the single national solution with the NBN is unlikely provide the flexibility needed in the future. Further, the different policy approaches to communications technology deployment in Canada and Australia present two very different challenges for telecommunications engineers. A major problem facing telecommunications engineers is how to design broadband networks - which are capable of meeting user demand for ever-increasing bandwidth - while taking into account various risks posed by technological path-dependency (Fijnvandraat & Bouwman 2005: 425). Fijnvandraat & Bouwman (2005: 436) warn against 'undesirable [technological] path dependency' which can occur when upgrading existing networks:

> Different technologies demand different adjustments to existing networks. The more adjustments are needed, the higher the costs involved in upgrading and the greater the chance it will lead to path dependency. In cases where many adjustments to the existing network have to be made, careful decision-making and comparison between different technologies can prevent undesirable path dependency. Going from regular ADSL towards ADSL2+ only requires new line cards in the DLSAM's and new customer premises equipment (CPE). Moving towards VDSL requires, in addition to specific VDSL equipment, a further optification of the copper network towards end-users, which makes it a more expensive and complicated solution than upgrading from ADSL to ADSL2+.

Australia's single national solution approach has tended to 'lock-in' particular technologies. In the preceding chapters, it has been shown that single national solution has failed to achieve faster penetration when compared with Canada's decentralised approach. With the communications industry increasingly diverse and requiring multiple ways to address the varieties of particularism. For Hughes (1993: 405):

> These differences and their causes need to be emphasized because they are often overlooked in our era, which tends to advocate a superior, advanced technology - "the one best way" - a way that transcends regional and national differences.

The next chapter evaluates the cases and offers an explanation for the divergent communications technology outcomes in Canada and Australia.

Chapter 7: Evaluating the Cases

This chapter evaluates the different institutional and policy frameworks in the Canadian and Australian communications industries over time and how these influence communications technology outcomes. In developing an explanation for the different communications technology outcomes, three key themes emerge: (1) New communications technologies represent critical junctures at which point important policy decisions can set in motion or modify institutions which have important consequences (or establish path dependencies) for future communications technologies; (2) Communications technologies and the institutions which enable, coordinate and regulate communications technologies tend to be path dependent, and hence, they co-evolve. In particular, new technologies create new policy problems which then require a response from the state. Addressing such policy issues is far from a case of 'keeping up' as assumed by the theory of technological determinism. Indeed, despite the economic imperative for nation-states to 'keep up', the state's response can help or hinder the deployment of new communications technologies in a variety of ways (not entirely in a social constructivist sense, but certainly as a form of soft determinism within the context of technological momentum); and (3) Modern communications technologies are not single function networks; they are socio-technical networks which co-evolve in conjunction with cultural capabilities. A decentralised policy approach facilitates greater cultural capabilities and encourages a proactive industrial culture that is able to address regional and local varieties of particularism effectively, whereas a centrally-controlled approach attempts to address these using particular types of technology. Therefore, a decentralised approach is aligned closely with the evolutionary concept of network development and creates efficiencies and ameliorates uncertainty while minimising investment risk in deploying local communications infrastructure.

The previous three chapters outlined the institutional frameworks (using the organising themes of enabling, coordinating and regulating) and the path-dependent nature of communications technology policies in Canada and Australia over time. This chapter evaluates the cases by applying the historical institutionalist framework to the previous three chapters before providing a plausible (as opposed to falsifiable) explanation for divergent communications technology outcomes in Canada and Australia.

7.1 Evaluating the Cases: The Application of Historical Institutionalism

This thesis has attempted to demonstrate how institutional legacies shape communications policy, beginning with the adoption of the telegraph. Chapters 4, 5 and 6 have demonstrated how the approach adopted by each country at the time of the telegraph represents the point of departure for communications technologies more generally, and the beginnings of the policy regimes referred to herein as the 'mosaic' (Canada) and the 'monolith' (Australia) specifically. Although the introduction of the telegraph predates federation in both countries, the respective approaches were reinforced by the constitutional powers for communications technologies in each country, and these approaches survive to this day. Hence, it has become not only difficult for governments to attempt alternative approaches to enabling, coordinating and regulating communications technologies, but in each instance, the mosaic and monolith have remained the dominant policy paradigms. Further, the thesis considered the ideas and interests which interacted with the political and industrial institutions as a way to explain how these paradigms were reinforced over time.

Chapter 4 considered in detail the beginnings of the telegraph and telephone industries, acknowledging the influence of the United States on the deliberate divergence of the telegraph and telephone industries in Canada, and the nature of the Canadian mosaic (commencing with local start-ups) enabled by provincial legislature and later by municipal governments. Australia, on the other hand, prevented the private sector's involvement in operating telecommunications services, either by compulsion (as in the case of James McGeorge's early commercial telegraph system), or by acting in accordance with the interests of pastoral and mining interests to take public control of the operations of the Melbourne and later Sydney telephone exchanges, thus making it extremely difficult (or indeed impossible) for the private sector to be involved in the Australian telecommunications industry as service providers.

The influence of the mosaic in Canada was evidenced in chapter 5's coverage of the broadcasting industry, with local and regional start-ups facilitating experimentation in wireless and enabling new technologies (such as FM radio) well in advance of Australia's government-controlled monolith. While private sector involvement by organisations such as AWA (in partnership with government) played a key role in Australian broadcasting, the representation of corporate interests by key politicians (such as former-Prime Minister Hughes as an AWA board member) and the rejection of diverse local and regional initiatives left Australia's broadcasting landscape somewhat protected by steep barriers to entry for smaller commercial start-ups. Compared with Canada, communications industry politicking was played out at the federal level almost exclusively in Australia, with state and local politicians far removed from citizens' concerns regarding communications policy.

With a major opportunity for institutional change occurring in the 1980s (in line with global trends promoting competitive communications industries) and as the Internet came to the fore, neither Canada or Australia changed the fundamental nature of their respective industries, despite a move towards greater competition and a general move away from public ownership or government control of monopoly carriers. Privatisation of the dominant carrier was a major federal government initiative in Australia, repeatedly appearing as a 'big-ticket' item in federal elections; whereas Canada's diverse industry and mix of private and provincial/municipal ownership meant that federal politics played a minor role in the industry beyond strategic policy and governance-related issues. Chapter 6 outlined this period up until the broadband era and ends with the federal government's decision to own and control the wholesale fibre cables for the National Broadband Network, despite some two decades of attempts (by governments on both sides of politics) to undo the publicly owned monolith that had survived since federation. When the dominant telecommunications carrier was finally privatised, the state of broadband services in Australia were such that communications policy became a major election issue in 2007, culminating in one of the largest investments in infrastructure in Australia's history.

From chapters 4, 5 and 6 the policy regimes of the mosaic and the monolith emerge and re-emerge with the introduction of each new communications technology. As the institutions of the state established themselves in the industries, and citizens became familiar with how to approach communications policy (supported by the respective federal governments' constitutional powers), the range of ideas which might be capable of bringing about changes in the institutional bases of each industry were limited, often with the support of the private and public interests that had formed around the peculiar institutional frameworks. While it may be argued that the path dependencies may have had less influence than suggested in this thesis, by starting at the beginning (with the telegraph), the respective constitutional powers for communications policy in each country which emerged from the telegraph industry remain to this day. As the ideas for communications policy, supported by the interests which have formed around the respective industries, the combination of limited choices (path dependencies), the industrial culture (of ideas and interests), support the emerging policy regimes to such an extent that despite technological convergence and a global move towards competitive communications markets, the mosaic and the monolith remain largely intact. While Canada's mosaic has waxed and waned (and it may also be argued that competition in Canada's communications industries is far from ideal), provincial and local alternatives, overlaid with cross-platform competition at the infrastructure levels are well in advance of Australia's initial flirtation with infrastructure competition that was only recently ended by a return to the publicly-owned monolith model, via NBN Co., which places communications policy firmly back within the realm of federal politics. Further, this restricts private sector involvement in the industry, particularly by creating uncertainty for all market players with many gear-down for retail-only operations in a government-controlled era that may well last another thirty years.

What is clear from the story that emerges from chapters 4, 5 and 6 is that in each case, the institutional framework has played a significant role in the communications technology outcomes. Time and again, Canada's local and regional start-ups were able to bring new communications technologies to the market quickly, and in each case (except mobile telephony), Australia lagged behind Canada in terms of adoption and take-up. While mobile telephony's impact on communications policy is yet to be fully realised, especially as mobile broadband becomes readily available, what is clear is that where the Australian government has had less of a political interest in a particular communications technology, that technology has proliferated. Of course, it may be simply that a lack of other services, combined with adequate competition in the mobile sector, have facilitated Australia's growth in mobile telephony, whereas Canada's higher prices and current crisis in mobile service competition may be the result of complementarity. Regardless, from a historical perspective, it is certainly too early to tell where future mobile broadband applications will lead the respective industries.

Based on the literature discussed in chapter 3, this thesis has considered the major eras of communications technology developments in comparative perspective to draw together the historical institutionalist approach. As technological convergence becomes such that industries and institutions are increasingly under pressure to adapt, this process can be seen to be quite evolutionary, albeit tied to policy choices made in the past and often relating to the manner in which the impetus, the telegraph, was deployed and reinforced later by the respective constitutions. Nonetheless, upon entering the broadband era, it can be observed that the approaches to address the issues of infrastructure and services to facilitate the growth of the digital economy in both Canada and Australia have evolved along distinct trajectories. The model outlined in the following section, drawn from the material presented in chapters 4, 5 and 6, explains the process of co-evolution of communications technologies and institutions which can be observed in the cases of Canada and Australia.

7.2 Explaining Co-Evolution: Institutions and Technologies

The most-similar systems design adopted in this research reduces the number of potential variables which explain the divergent communications technology outcomes in Canada and Australia. The research design focuses on institutions as the explanatory variable for these divergent outcomes. From the analysis of the trajectories of the main communications technology advancements from the telegraph to broadband in both countries, it is apparent that Canada outperforms Australia in all cases except mobile telephony. Further, two distinct approaches to the deployment of new communications technologies can be observed, stemming from the respective constitutional powers of the federal governments. Canada's *Constitution* allows communications infrastructure to be deployed or enabled by any level of government, resulting in a rich mosaic of different approaches in different geographical locations. This diverse approach results in a variety of regional and local outcomes with the various networks beginning at the local level which were later interconnected via national systems. On the other hand, Australia's *Constitution* provides for a centrally-controlled monolith where the federal government, through its sole authority for deploying or enabling new communications technologies, has hindered or blocked widespread private sector and community involvement in the industry. Even in recent times, the Australian federal government's policy preference for government-controlled monoliths to address communications technology needs has culminated in the NBN. Yet overall, the Australian monolith has been slower than Canada's mosaic to facilitate the penetration of new technologies and this problem is likely to be exacerbated by technological convergence and the resultant increase in the regional and local varieties of particularism (see Boston Consulting Group 2012).

The constitutional powers in both countries represent the starting points for path dependencies, both technological and institutional, and these path dependencies have had important consequences for the deployment of future technologies. Moreover, the power of the state to enable or prevent the deployment of new technologies has important technological consequences: institutions and technologies tend to co-evolve. As a starting point to develop an explanation for the divergent communications technology outcomes in Canada and Australia, the process of co-evolution of institutions and technologies is explained in the next section.

7.2.1 Model of Co-Evolution: Communications Technologies and Institutions

New communications technologies represent critical junctures at which point important policy decisions can modify or set in motion institutions which have important consequences (or establish path dependencies) for future communications technologies. Yet communications technology outcomes – adoption, deployment and take-up of infrastructure – are not as 'inevitable' as technological determinism would suggest. Institutions are important in enabling, coordinating and regulating new communications technologies and the state, in particular, plays a key role. The process that can be observed in the adoption of new communications technologies (see Figure 7.1) starts with the invention of a new communications technology (the exogenous event) which may occur outside of the nation-state. However, as not all new inventions are adopted by consumers within a given jurisdiction, a new technology does not become a critical juncture unless it is enabled by government. Typically, the popularity of the technology or its economic potential increases until it reaches a 'tipping point'. In the cases at hand, this tipping point is the point at which governments enable (or do not prevent) the adoption of a new communications technology and often commences with the enactment of a new law.[209]

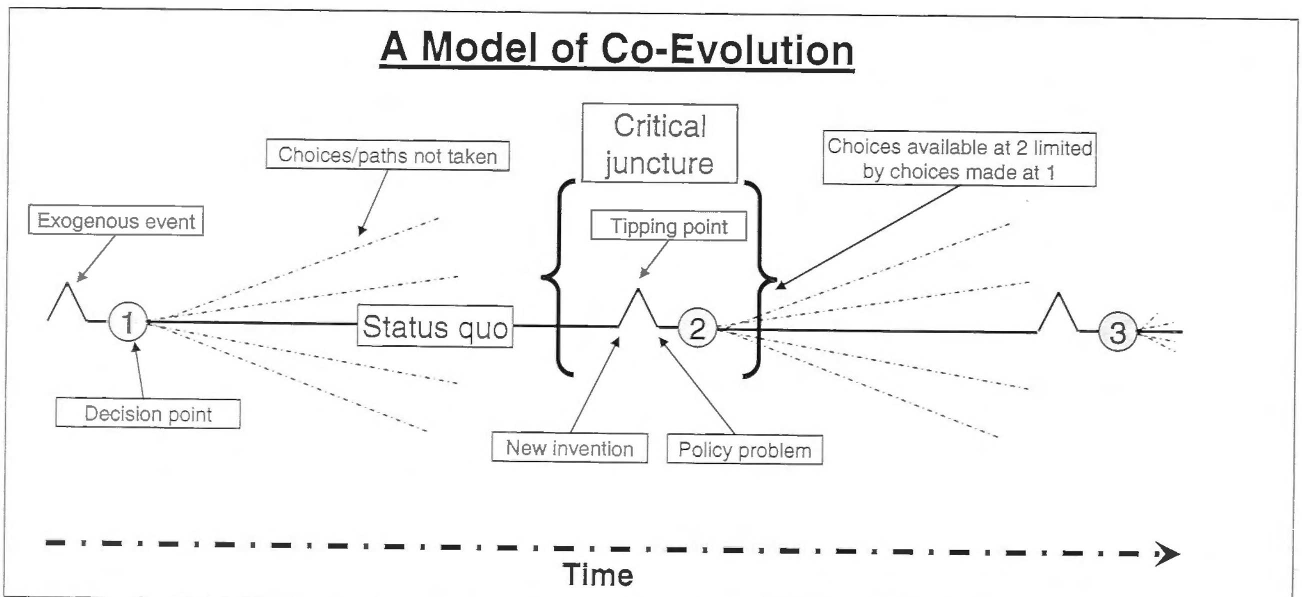

Figure 7.1: Model of the Co-Evolution of Communications Technologies and Institutions

Focusing on the roles of enabling, coordinating and regulating new communications technologies in Canada and Australia, a model of the co-evolution of communications technologies and the institutions designed to perform these roles can be observed. If each new technology is viewed as an exogenous event, the emergence of a new technology may be classified as a critical juncture if the following conditions materialise. First, the new technology must affect society in such a way that its use becomes a policy issue or problem. For the policy issue or problem to occur there must be a tipping point where governments can no longer rely on the to facilitate

[209] The point at which consumers adopt new technologies, as opposed to government enabling or not preventing the adoption of new technologies, has been a topic of much research. See for example Gartner (2012) and Whitt & Schultze (2009). It is entirely possible, as happened with Australia's *Wireless Telegraphy Act 1905*, that government may 'enable' particular technologies for exclusive use by government and then not deploy the new technology until much later. Nonetheless, this situation is more likely to arise in the monolith rather than the mosaic.

coordinating or regulating the use of the new technology.[210] In effect, governments are forced to enable the use of the new technology in a way that can be governed to meet social or economic goals, or indeed block the legal use of the new technology until some point in the future.

Second, the way in which governments address the policy issue or problem must result in a decision to create a new institution, or to amend an existing institution or set of institutions, in order to govern the new technology. Typically, the institutional choices available to governments may be limited by decisions made in the past, although this is not a necessary condition to be deemed a critical juncture. Although it is difficult to demonstrate empirically, policy regimes and industrial cultures that have developed over time can restrict the choices available to policy-makers. Repeated patterns of policy choices do not create 'lock-in' – it is entirely possible for policy-makers to choose to do things differently – however the pressures to maintain the policy style or conform to the industrial culture can be significant. Australia's NBN, for example, is a continuation of the government monolith that was largely supported by voters at the 2007 election: government control would 'fix' what the private sector had failed to do, even if it meant undoing the government's own government competitive neutrality policy to do so (Morgan 2012).

Third, a period of equilibrium usually follows where the technology either replaces an existing technology, or continues to operate complementarily with some other communications technology. Often, as with the telegraph's role in long distance communication until long distance telephony was mastered or fixed-line broadband until 4G mobile networks were established, a period of complementarity may precede substitution until the new technology can replace or improve upon the functions of the old technology. In an era of convergence, it will become increasingly difficult for governments to anticipate the variety of technologies and devices available as new technologies enable more 'over the top' (OTT) services and global communications providers move away from traditional telecommunications carrier operational models

[210] Barr (2008) refers to Gladwell's (2000) concept of a 'tipping point' in relation to broadband technologies. However, Barr (2008: 277) refers to a tipping point in the sense 'how demand for a service eventually reaches significant across the board numbers [sic]'.

to become more 'agile' in the market to tailor services to address the varieties of particularism (Boston Consulting Group 2012).

If the above three conditions are met, then it may be said that a critical juncture has occurred. The first condition is important, as many new communications technologies are developed which do not necessarily impact upon society in such a way as to create a policy problem. For example, the early years of the Internet and the World Wide Web did not create major policy problems as there was a distinct lack of content or services to be regulated amid very little competition in the marketplace. For many years, the institutions which governed the traditional telecommunications industries specifically excluded services based on the Internet or the World Wide Web, and in some cases this is still happening.[211] For instance, problems with spam on Web-based applications are not reflected in Australia's anti-spam laws, as only unsolicited emails sent to a particular email account are defined as spam under the act, even though the technical differences between receiving spam via email and spam via a blog or a wiki page are minimal.[212] Email was at such a mature level of adoption that increased spam created the need for legislation to criminalise spamming via email, whereas spam via other means of communication which are not in general use were simply left out of the legislation.[213]

It can be observed that new inventions in communications technologies do not necessarily lead to changes in institutions. However, where the invention creates a

[211] For example, the development of wireless application protocol (WAP) phones showed promise in the late 1990s (Taaffe 1997), only to become irrelevant in a very short timeframe as better technologies developed. Consequently, no policy problem was created by WAP phones as the take-up was relatively slow and the development of content was limited. The introduction of the iPhone and Android mobile telephones, on the other hand, has created numerous policy problems as the applications and content available are extensive and enable the creative use of all sorts of government information (see Moses 2009, for example), not to mention community expectations about the delivery of health and education services and other business and government services via mobile devices.

[212] In response to a query about Australian companies spamming the comments section of the author's blog, the ACMA stated: 'The Spam Act 2003 covers unsolicited commercial electronic messages. This includes emails, SMS, MMS and iMS services. Under the Spam Act, the distinguishing feature is that a commercial electronic message needs to be sent via an Internet carriage service or any other listed carriage service to an address connected with an account of some sort. In the case of the posting commercial messages on blogs, the blog itself and not an account (such as an email address) is used to receive the message. Therefore, such postings are not within the scope of the Spam Act'. See http://www.politicalscience.com.au/2010/03/blog-comments-provide-spam-act.html for more details.

[213] Many blog and wiki accounts are maintained in offshore servers and these accounts are difficult to monitor in comparison to telephone calls and email correspondence. Further, it is very difficult for domestic governments to enforce laws on foreign offenders via communication means which are located offshore.

policy problem, then the exogenous event (that is, the invention) creates a critical juncture which can challenge the . This process is recognised in much of the literature on policy agendas and policy dynamics as the 'punctuated equilibrium' model. According to Baumgartner *et al.* (2006: 959):

> [Studying] policy agendas trace[s] levels of attention to issues within government over time… [and follows] the history and development of policies over long periods, seeking to explain the causes and/or consequences of their rises or falls on the governmental agenda.

New communications technologies, where they form critical junctures, force governments to act and either change existing institutions, create new institutions, or subsume the new technology under the authority of an older institution.[214] Nevertheless, there are a number of ways that governments can be forced to act.

Increasingly, attention to new technologies is drawn by government or business leadership or when overseas experiences portrayed in the media depict a sense of local 'lacking' when new devices or services are not available within domestic markets (see for example Crowe 2006). With broadband, for example, the Canadian government decided to adopt a world-leader approach, whereas the Australian government largely avoided broadband in policy debates until reports by the OECD and World Bank indicated the level of Australia's lagging the developed world, providing then opposition leader Kevin Rudd with the opportunity to make broadband an election issue in 2007. Once such a tipping point is reached, a policy problem is created and policy-makers need to consider the options that are available to address the policy problem. However, the model of co-evolution must be viewed within the context of a theory of technology adoption. Indeed, Colebatch (2006: 6) argues that by not clearly stating a theoretical position in relation to how the policy process is conceptualised 'simply indicates the underlying conceptual framework will not be disclosed or investigated'. Large-N cross-national comparisons of communications outcomes typically adopt an undisclosed technological determinist stance; however, the model presented here is based on the concept of technological momentum.

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[214] For example, the interpretation of 'other like services' in the Australian Constitution has facilitated control of virtually all communications technologies by the federal government.

There are three major ways that policy influences on communications technology can be conceptualised: technological determinism, social constructivism or technological momentum. Technological determinism suggests that any lacking in deployment or penetration is only a matter of time: cross-national variations will eventually converge. On the other hand, social constructivism would suggest that governments can craft the desired infrastructure to suit national requirements or simply provide public funding or incentives or subsidies for service provision as had occurred when addressing market failure with earlier technologies: technology is constructed by society. However, technological momentum, where new communications technologies are viewed as critical junctures, provides a middle position. This middle position is important because governments can often only craft infrastructure by adopting technologies developed elsewhere (as is typically the case in Australia) and then attempt to predict which technologies will adequately address the regional and local varieties of particularism.

Technological momentum's middle position enables what can be observed in practice: governments can either plan and control communications networks, as has happened in Australia or plan and control some activities while allowing communications networks to evolve in a bottom-up, decentralised manner, as has happened in Canada. However, the effectiveness of planned technology adoption via Australia's monolith is questionable as it has almost always lagged behind Canada's mosaic. This is still happening in the present, with Australia's NBN, the most recent evolution of the monolith, struggling to meet its rollout deadlines (Morgan 2012). There are a number of reasons that the centrally-controlled approach does not work. For the Boston Consulting Group (2012), the 'telco operating models that were shaped in an era of government-owned monoliths are showing signs of severe strain' as they are not 'agile' and they cannot address the myriad varieties of particularism. Australia's NBN has adopted such a model, much like Telstra and PMG before it. Governing monoliths tend toward monolithic institutions which lack the agility necessary to function effectively in the digital economy (Ansell in Rhodes *et al.* 2008: 86). Individuals were users of the old utility model of communications services provision but they were not an integral part of the network (beyond the value each new subscriber added for other subscribers). However, modern communications networks are socio-technical networks where the economy is not only facilitated by communications services, but individuals, communications technologies and the global economy are inexplicably intertwined. The next section, then, considers the impact of co-evolution and technological momentum on the societal aspects of communications technologies.

7.2.2 Co-evolution and Technological Momentum: Socio-Technical Networks

The institutions that govern communications technologies are not only influenced by new communications technologies. Indeed, society can influence institutions (and vice versa) in a variety of ways and, unlike earlier natural monopoly approaches, this is becoming increasingly important in understanding modern communications technologies as these become embedded in daily life (Nortel 2008). The extent that citizens can influence communications policy, then, is paramount in an era where these same communications technologies are changing policy-making from 'governmental dictum' to an 'ongoing negotiation among government and non-government actors' (Crozier 2008: 3). This section evaluates the societal impacts of the Australian monolith and the Canadian mosaic in the development of communications policies.

Much of the literature addressing historical institutionalism focuses on a 'punctuated equilibrium model that emphasizes moments of "openness" and rapid innovation followed by long periods of institutional stasis or "lock-in"' (Thelen in Mahoney & Rueschemeyer 2003: 209). In the absence of external (or exogenous) 'shocks' to the system, institutions shape behaviour to follow the path first set upon at the time of the institution's formation. Therefore, institutions tend to 'lock-in' a period of stability. Further, the trajectories of institutions are path-dependent because choices in the present are restricted by choices made in the past. Indeed, earlier choices may restrict the choices available in the present due to sunk-costs, legal jurisdiction, or other issues which are difficult or expensive to change once a *status quo* becomes entrenched. Nonetheless, the experience of history demonstrates that institutions can and do change, often quickly and in ways which may be radically different from the *status quo*. One of the challenges for institutional theory, given that institutions are designed to reinforce the *status quo*, is to explain how and why institutions change at all.

In providing an explanation for periods of rapid institutional change, a critical juncture is the term used to describe the period during which institutional change occurs. In many earlier studies, major wars have been identified as critical junctures because such events tend to be exogenous shocks to the *status quo*; in effect forcing institutional change from the outside. The logic of institutionalism requires that critical junctures are contingent and exogenous. As institutional theory argues that institutions limit, influence or restrict individual behaviour, it follows that institutions cannot simply change by themselves or institutional theory itself is logically flawed. But institutions do change, and in an attempt to remedy a potential flaw in the logic of institutional theory, the concept of a critical juncture has emerged. While there is no neat and tidy solution to this logical problem, the concepts of historical institutionalism have evolved to cope with institutional change. Critical junctures provide one solution to the logical problem, whereas another solution is the concept of ideas. Put simply, a contingent, exogenous event (critical juncture) may disrupt the usefulness of the *status quo*, or new ideas (such as market liberalisation, deregulation, or privatisation, for example) may become so powerful as to force institutions to be changed.

Nonetheless, in observing the historical trajectories of communications technologies in Canada and Australia, institutional changes were brought about by new technologies creating critical junctures more often than by ideas. Internationally accepted ideas, such as nationalisation and later liberalisation of communications networks, occurred less frequently in both countries. However, even when international ideas influenced institutional changes such as deregulation of telecommunications markets and privatisation of government-owned service providers occurred, the same institutions simply adopted similar rules while changing the method of service provision. In the cases at hand, the explanation for divergent communications technology outcomes is less about institutional change and more about institutional stasis. Institutional arrangements did change, but the path dependencies set out in the respective constitutions established standard operating procedures which have not changed in Canada or Australia from the time of the telegraph. This is an important component of the explanation presented here as the institutional frameworks reinforce norms which are very difficult to change once these become entrenched. As Greif (2006: 17) observes:

'[b]eliefs, norms and organisations inherited from the past will constitute part of the initial conditions in the processes leading to new institutions... The past, encapsulated in institutional elements, directs institutional change and leads societies to evolve along distinct institutional objectives'.

This means that institutional change remains path dependent, in that 'a fundamental asymmetry between institutional elements inherited from the past and technologically feasible alternatives' restricts the options available once the *status quo* is irretrievably disrupted (Greif 2006: 17). The path dependent and evolutionary approaches to understanding technical change are complementary, not deterministic (Ruttan 1997) and endogenous institutional change brought about by ideas is not evident in the present study. Ideas certainly do influence communications technology industries, particularly in recent decades, but these tend to have more of a functional rather than a structural impact on institutions which is typically exogenous, for example, the World Trade Organisation often requires member nation-states to liberalise their telecommunications industries as a condition of membership.[215] Further, international reporting agencies such as the OECD may draw attention to shortcomings in national industries which may in turn influence voter attitudes towards traditional policies. It would seem that in such instances the influence of ideas reaches a tipping point where national institutions change not in themselves, but in response to the exogenous pressures of international or external institutions. Obviously this does little to address the shortcomings of institutional theory, but it does help to explain how the *raison d'être* of an institution may change (such as from regulating a monopoly to regulating a market) without necessarily changing the policy regimes and the industrial cultures inculcated by the original institution. Often these characteristics are referred to as 'contextual factors' which play an important role in explanation (Thatcher cited in Jordana and Levi-Faur 2004: 81). Policy regimes and industrial cultures, then, are important 'mechanisms' that sustain existing institutions, making these difficult to change.

The policy regimes and industrial cultures which interact with the process of adoption and use of communications technologies have been framed in a variety of ways, and

[215] For example, on becoming a full member of the WTO in 2000, the Hashemite Kingdom of Jordan was obliged to fully liberalise its telecommunications sector by the end of 2004. This necessarily required numerous changes to the institutional arrangements which govern the Jordanian telecommunications industry (TCR 2009).

are deemed particularly important in addressing the global 'digital divide' (Warschauer 2003: 9). In this most-similar comparison, many of the common drivers of 'social capability' such as levels of literacy and education, access to healthcare and so on can be discounted due the similar levels in Canada and Australia. However, institutions play an important role in enhancing or reducing social capability. As Abramovitz (1986) states:

> [T]here is an interaction between social capability and technological opportunity. The state of education embodied in a nation's population and its existing institutional arrangements constrains it in its choice of technology. But technological opportunity presses for change. So countries learn to modify their institutional arrangements and then to improve them as they gain experience.

Indeed, Warschauer (2003: 203-206) points out that technological momentum is able to explain socio-technical networks because it takes into account the 'institutional embeddedness of technology' (Warshauer 2003: 209):

> [A]ny technology, especially a major new medium of communications - does not exist outside a social structure, exerting an independent impact on it. Nor is it a neutral tool to be deployed in a haphazard fashion. Rather, technological and social realms are highly intertwined and continuously co-constitute each other in a myriad of ways. This co-constitution occurs within organizations, institutions, and in society at large.

The Australian monolith and the Canadian mosaic interact with society in ways that tend to reinforce the respective policy regime. This, in turn, facilitates an industrial culture and draws upon or ignores social capabilities as part of the 'institutional embeddedness' of communications technology. Australia's monolith has produced a series of single national solutions which have invariably been accompanied by punitive measures designed to enforce government control, leaving businesses and communities to wait while government roles out the technology: a 'build it and they will come' approach that may have worked for natural monopolies but is not working (to date) with the roll-out of the unwieldy NBN. Canada's mosaic, on the other hand, is so diverse and local that central policy measures, while obviously influential, have not hindered the deployment and take-up of new communications technologies to the same extent observed by Australia's monolith. The next section examines the concepts of industrial culture and social capabilities in relation to the co-evolution of institutions and technology and argues that Australia's historically slow take-up rates are a result of political and industrial institutions which hinder the development and mobilisation of social capabilities necessary to enable socio-technical networks to flourish.

7.2.3 Industrial Culture and Social Capabilities: The Consequences of Co-Evolution

If institutions and communications technologies tend to co-evolve, and, in the case of Canada and Australia, centrally-controlled policy approaches to enabling and deploying communications infrastructure are slower to achieve penetration of new technologies than decentralised policy approaches, then it follows that a decentralised policy approach is more desirable to enable greater participation in the digital economy. However, the distinct approaches to communications policy adopted by Australia and Canada originated during periods of nation-building, and while a decentralised policy approach may facilitate greater cultural capabilities and encourage a proactive industrial culture that is able to address regional and local varieties of particularism effectively, it appears that the respective policy approaches are serendipitous rather than deliberate. To be sure, during the telegraph era, the time to sail from Britain to Canada was half that of Britain to Australia (Australian National Maritime Museum 2009; Merseyside Maritime Museum 2012), and Australia's lack of a nearby trading partner meant that the communications link with Britain was vital for effective government. Canada did not have the same pressing need for a communications link as it was less isolated by the proximity of the US. These initial conditions are no longer relevant, yet the policy approaches adopted to deploy communications technologies from this period persist.

There are three major reasons for the persistence of the respective policy approaches to deploying communications technologies. First, patterns of use of the respective constitutional powers over time have established policy regimes in the Canadian and Australian communications industries. Second, these policy regimes have influenced distinct industrial cultures which in turn influence the ways that firms deal with governments and consumers. Third, the respective policy regimes and industrial cultures have influenced the ways in which cultural capacity is mobilised in extending the reach of communications infrastructure – not just the physical network but the socio-technical network – and how this infrastructure is used.

Rather than being infrastructure which can simply be 'built', Hughes (1993: 79) argued that a variety of regional and local factors, referred to here as the varieties of particularism, influenced the evolutionary process of infrastructure deployment in the electricity industry:

> "Evolution" is an apt metaphor for an electric supply system... because internal forces alone do not direct its growth: the system grew within the context of geographical, economic, political, and organizational factors.

Indeed, Fijnvandraat & Bouwman (2006: 443) argue that adopting an evolutionary approach to policy development matches the optimal evolutionary path of technological development, which in turn avoids inefficient path dependencies brought about because:

> [Policy] decisions are often not based on technical and economic consideration alone. Political and regulatory issues as well as market power and economic, geographic and demographic circumstances all play a role, but most importantly user behaviour. If policymakers and operators have to make balanced decisions, they need to be aware of the flexible, cheaper and potentially better technical scenarios that are available.

One of the most important findings of this comparison of communications policy in Canada and Australia is the consistent approaches, 'mosaic' and 'monolith' respectively, to policy design. In the initial phases of the research, the historical insights provided by a series of chronologies[216] constructed using a variety of historical records indicated repeated patterns or a peculiar policy style in each case. The 'long-term patterns of policy processes – or policy styles – and long term patterns of policy content – or policy paradigms – can be combined into a single construct: the *policy regime*' (emphasis in the original Howlett & Ramesh 2003: 233). The policy regimes commenced during the early days of the telegraph and the telephone. In Canada, 'companies competed for business and developed strategies that brought them into conflict with each other and with government' and relationships in the early industries were managed by 'contracts, patents, and antitrust law' (Olufs 1999: 29). In Australia, however, businesses were specifically excluded from owning and operating communications infrastructure and the latest iteration of this policy regime occurred with the NBN over 150 years later. As the importance of communications technologies became apparent, particularly as part of the respective 'nation-building' projects,

[216] The chronologies were constructed as follows: (1) the development of communications technologies from the invention of telegraph to mobile high-speed broadband; (2) the Australian policy story from telegraph to the broadband era; and (3) the Canadian policy story from telegraph to the broadband era The chronologies were published on the Internet on 5 December 2009 at the following URL: http://sites.google.com/a/politicalscience.com.au/home/Home/chronologies.

governments became more involved in coordinating and regulating the networks. The peculiar approaches to 'the public interest' which inform the deployment and use of communications networks, however, remained quite different.

In Canada, politics at the local level led to local communications solutions for local problems – a bottom-up incubation of communications networks – that could later be connected by a coordinated national effort to form a national system. This occurred repeatedly as each new technology appeared. In Australia, it is apparent that a drive for universal service with politics located centrally with the federal government reinforced a top-down approach. In effect, by elevating the status of communications technologies to the federal level, political activity around the deployment of communications technologies became embedded at that level. Indeed, political activity at the local and state level rarely centres on communications technologies for consumer use. Where local governments have been involved in the communications sector, it has often been with some other purpose in mind such as creating employment or boosting the local economy rather than about improving access to communications services. The legacies created by the respective constitutions, then, have had a lasting impact on the development of communications policy that continues into the present.

Rather than facilitating an evolutionary approach to infrastructure deployment, the Australian government's decision to roll-out the NBN has effectively stymied private sector investment in fixed-line broadband infrastructure, following earlier approaches to prevent private sector control of infrastructure observed in South Australia (when the colonial government shut down James McGeorge's telegraph line in 1856, see Moyal 1984 and ABS 1900), in Victoria (when the colonial government shut down the Melbourne Telephone Exchange in the 1880s). In Canada, local initiatives were encouraged, and indeed, enabled by governments. These respective approaches may be deemed 'policy regimes' in that patterns of policy style and policy content are repeated and become the norm over time, therefore reinforcing the *status quo* (Howlett and Ramesh 2007: 233). In the Australian and Canadian communications industries, the respective policy regimes have developed over a period of more than 150 years, and have helped to shape distinct industrial cultures. Pierre (2003: 457) suggests that '[e]xisting administrative patterns and the selection of policy instruments are said to be shaped by the dominant national "policy style"' (Jordan *et al.* 1992). Further, institutions reinforce particular industrial cultures by providing:

> the cognitive, coordinative, and informational foundations of behavior... [which] reinforce these institutions by making the cost of deviation from the behavior these institutions generate emotionally or socially costly. Institutionalized behavior and the associated outcomes lead to reinforcing norms, senses of entitlements, identities, self-images, thinking patterns, and ideologies (Greif 2006: 180-181).

Focusing on the management of industrial crises, Dyson & Wilks (1983: 35) found that 'different styles of problem-solving and of accommodation of interests' existed in particular industries. Further, they found that different styles of managing 'industrial crises [were] embedded in industrial cultures, which reflect and are reflected in institutional structures and ideologies of government-industry relations' (Dyson & Wilks 1983: 35). Comparative research into mass media and media policy in Western Europe found that 'broadcasting policy reflected distinctive national policy styles and traditions' (Humphreys 1996: 135). These traditions are difficult to change once they become embedded in an industrial culture.

According to Wilson (1990: 16-17), industrial culture is important 'in shaping expectations about how states should act towards business'. Further, he argues that the role of the state in 'maintaining the institutional infrastructure needed for commercial activity' and the way that this is done shapes the way that businesses and interest groups interact. For instance:

> more interventionist states seek partners by promoting the growth of interest groups which, while enjoying a virtual monopoly on representing the sector of the economy for which they claim to speak, are in agreement with the basic thrust of government policy. Monopolistic rather than competitive groups suit the needs of interventionist states because they not only speak more authoritatively but are less likely to be constrained by divisions of opinion among their members. If there is only one interest group which can plausibly represent a corporation, corporations are less likely to resign if they disagree with a particular policy of the interest group. Monopolies can give interest group leaders the freedom from the control of their members they need to form alliances with the state. For such interest groups not only provide interventionist states with greater knowledge, but also assist government by promoting and helping to implement government policies among their members.

The myriad issues and circumstances - the varieties of particularism - which the recurring single national solutions preferred by Australian policymakers have failed to adequately take into account, have created centralised interest groups and businesses that tend not to act before government. Hence, Australia lagged Canada in all areas except mobile telephony, an area where the Australian government was largely uninterested from a political perspective. Serendipitously, Canada's decentralised 'bottom-up' approach to infrastructure deployment enabled multiple approaches and multiple solutions to the myriad problems presented by the various social, economic, political, geographical and technological issues inherent in communications networks.

Researchers attempting to identify how nation-states 'catch-up' to technology leaders often adopt metaphorical explanations or risk becoming mired in the details of how humans use technology. For example, it is commonly assumed that less-developed countries, which may not necessarily be constrained by years of investment in fixed-line infrastructure, can overcome the 'digital divide' by simply 'leap-frogging' ahead of developed countries by deploying less expensive wireless infrastructure. However, the instances of this occurring are rare, and Howard (2007: 136) suggests that during the period 1995 to 2005, only five countries (which were already wealthy) managed to 'leap-frog' some of the global communications technology leaders. Such metaphorical explanations for technological diffusion ignore the varieties of particularism which must be addressed in ensuring that infrastructure deployment is conducted efficiently. Indeed:

> Information technologies spread in complex patterns and are not only shaped by engineers' assessments of technical advantage, but also by the needs of users and the design of underlying infrastructure (Hughes 1983; Fischer 1992; Rogers 2003).

Hence, industrial culture becomes an important determinant of industry actors' behaviour: where governments are interventionist or restrict the enabling or deployment of new communications technologies through single national solutions (as in Australia) interest groups and firms tend to be reactionary. Where various levels of governments are more active in supporting innovative service providers or enabling a variety of technologies to be deployed to provide a particular communications function (regardless of the type of technology used, as in Canada), interest groups and firms are more likely to engage in more proactive behaviours to meet user demand.

7.3 Developing a Mid-Range Theory to Explain Divergent Outcomes

The working hypothesis detailed in the introduction and in Chapter 3 established political and industrial institutions (policy regimes and industrial culture) as the explanatory variable for the different communications technology outcomes observed in Canada and Australia over time. In the comparison of Canada and Australia, different institutional frameworks can be observed as a major cause of the different outcomes. Moreover, path dependencies stemming from the constitutional foundations of Canada's decentralised, bottom-up mosaic and Australia's centrally-controlled, top-down monolith can be observed where the respective policy regimes continue to reinforce the constitutionally-established trajectories. The resilience of these institutional approaches is such that the respective policy styles have not changed despite numerous opportunities for institutional change occurring at critical junctures provided by new communications technology innovations. Over time, it can be observed that the institutions which establish Australia's monolith reinforce a policy regime which hinders the deployment of new communications technologies in comparison with Canada's mosaic. In particular, Canada's decentralised system results in local and regional solutions to local and regional problems.

While it is not possible to develop a falsifiable theory to explain the divergent communications technology outcomes using the quasi-experimental approach adopted in this research, it is possible to develop a mid-range theory that explains what has been observed in this comparison of Canada and Australia. A mid-range theory would be applicable to similar geographically large, sparsely populated countries. However, the impact of federalism cannot be discounted as the additional complexity of three levels of government has been shown to either help or hinder faster deployment and take-up of new communications technologies. Therefore, based on the historical experiences of Canada and Australia, it is arguable that in geographically large and sparsely populated federal systems, a decentralised policy approach which is flexible enough to address regional and local varieties of particularism yet nationally coordinated to facilitate interconnection of disparate communications networks leads to faster penetration of new communications technologies. Further, a decentralised policy approach facilitates a proactive industrial culture and the mobilisation of local and regional cultural capacity to extend the reach and use of communications networks (Stoker in Pierre 1998: 39).

The Canadian approach does not necessarily result in consistent use and quality of various communications technologies, and indeed, instances of inadequate quality of service appear sporadically. However, Canada's decentralised, bottom-up approach outperforms Australia's monolith in addressing local and regional varieties of particularism, which leads to greater social involvement in the deployment and use of the various communications technologies. As technological convergence increases the extent of complementarity and substitutability of new communications technologies, addressing local varieties of particularism and mobilising local and regional social capacities are becoming increasingly important. Thus, while Australia's government-led monolith was historically sufficient to address local communications technology requirements in the early days of settlement, in the era of convergence the approach is inflexible, does not mobilise social capacities, and ultimately is slower to achieve penetration of new communications technologies (compared with Canada's approach) because the monolith fails to take into account regional and local varieties of particularism.

7.3.1 Limitations Imposed by Policy Subsystems in Addressing Convergence

Due to the extent of government involvement in the industry, telecommunications has long been a 'politically sensitive issue' in Australia (Emy & Hughes 1991: 462). Yet politics in telecommunications has occurred largely at the federal level in Australia. As a consequence, centralised power has led to centralised interest groups, with little opportunity for local and regional interests to influence the telecommunications policy agenda. Further, the broadcasting industry has been limited to a handful of established players, and these two centralised coalitions of interests – telecommunications and broadcasting – have reinforced the barriers between the respective industries and hindered technological and industrial convergence. Canada's decentralised system, on the other hand, has circumscribed the coalitions of interests by limiting their influence to distinct geographical areas and therefore requiring greater cooperation to achieve national goals through interconnecting networks. Further, cross-platform competition between telecommunications carriers and CATV companies encouraged by the Canadian government has brought the coalitions of interest in the telecommunications and broadcasting industries into direct competition. That is not to say that the Australian government has not recognised the impact of technological convergence. However, as can be observed time and again along Australia's centrally-controlled trajectory, Australia lagged behind Canada in creating a single regulator for the telecommunications and broadcasting industries.

Sabatier & Jenkins-Smith (1993: 16) refer to established coalitions of interests, 'whose participants advance ideas or problem definitions about a particular set of issues' (Baumgartner & Jones, 1993: 4–6), as policy subsystems. These subsystems are typically characterised by the rationale for regulation which is adopted by the respective industry. In Australia, it can be observed that government-controlled, single national solutions to communications technology policy problems occur time and again as the preferred way of addressing such problems. Ingrained in the Australian political psyche is a sense of equality of outcomes, coupled with a punitive approach to ensuring compliance. Conversely, the Canadian approach begins with provincial and local solutions – the 'bottom-up' approach - which are later interconnected through federal government action into a coherent national system. This disaggregated yet linked approach has been described by Ansell (2000: 311) as the 'networked polity'. Local politicians provide greater access for citizens to the policy process and consequently have much more influence over the direction of communications policy in addressing the regional and local varieties of particularism. Despite the impact of technological convergence on traditional industry structures (Lehne 2006: 165), the established institutions - policy regimes, industrial culture and coalitions of interests - have helped or hindered the penetration and take-up of each new communications technology, in that:

> These practices are often implemented in a subconscious - or at least, an unselfconscious - manner, and are repeated so frequently that they become naturalized ("second nature"), acquiring taken-for-granted status… these routine forms of behaviour are not simply inherited from past practice, according to some mysterious and inexplicable process. Instead, they are shaped and constrained - though not wholly determined - by a set of institutions that govern the way that work is organised, workers are trained and deployed, industrial relations are structured, and technology is implemented. While there is a strong degree of path dependency at work here, it is exerted primarily through the underpinning institutions which, by their very nature, evolve slowly over time (Gertler 2004: 5).

Further:

> Institutional pressure, the reluctance to give up power and control, and *status quo* 'inertia' can all play a role in locking in producer and consumer behavioral attitudes, and market forces alone may not change these attitudes' (Barnes, Gartland & Stack 2004: 372-3).

Canada's long history of decentralisation is reinforced by the institutional framework – in its broadest sense – whereas Australia's penchant for central control in the communications industry has been described as 'étatist' by Levi-Faur (cited in Weiss 2003: 164). Policy approaches, then, cannot be divorced from the institutional frameworks as the assumptions inherent in policy subsystems narrow the scope of viable policy options (Cahn cited in Theodoulou & Cahn 1995: 335; Peters *et al.* 2005: 1276). The combination of formal and informal institutional factors beginning, in particular, with the respective constitutional allocation of powers for communications dating from the time of the telegraph, when viewed in light of how the monolith (Australia) and the mosaic (Canada) address regional and local varieties of particularism, provides a significant explanation for divergent communications technology outcomes in Canada and Australia.

Chapter 8: Conclusion

This thesis offers an explanation for the divergent communications technology outcomes in Canada and Australia over time. The research adopted a historical institutionalist approach to explain how institutions constrain the available policy options for enabling, coordinating and regulating the deployment of new communications technologies. The thesis demonstrates that Australia's 'broadband emergency' is not an unusual occurrence in Australia's history of adopting new communications technologies (when compared with Canada). Adopting such a long historical trajectory highlights many of the recurring patterns in enabling, coordinating and regulating new communications technologies and the path dependencies that have occurred as both political and industrial institutions (the 'rules of the game') have co-evolved with communications technologies. As communications technologies are also prone to path dependencies, the role of the respective constitutions and the allocation of powers over communications technologies to either provincial (Canada) or federal (Australia) governments set each country on a trajectory which continues into the present. While these trajectories are not deterministic, the co-evolution of institutions and communications technologies makes it politically difficult to change the *status quo*.

Using publicly available statistics, Chapter 2 mapped the puzzle of penetration or take-up in both countries for each major communications technology from the time of the telegraph to the present. This demonstrated the extent of the divergent communications outcomes in Canada and Australia and that Australia has lagged behind Canada in the penetration of every new communications technology (except for mobile telephony) since the time of the telegraph. Beginning with the telegraph, then, is an important aspect of the research because the different trajectories, referred to in this thesis as 'the mosaic' (Canada) and 'the monolith' (Australia), were established and reinforced by the respective constitutional powers.

Chapter 3 outlined the historical institutionalist approach to cross-national explanation and established technological momentum as the theoretical framework for the study and examined the role of the state in enabling, coordinating and regulating communications technologies. In the broadband era, technological convergence and the way that communications technologies are governed by nation-states helps or hinders the take-up of new communication technologies.

To assess the impact of institutions on the deployment of new communications technologies and to examine the legacies of traditional institutions on communications technologies which are now both technologically and functionally converged by broadband technologies, chapters 4, 5 and 6 outlined the trajectories for the telecommunications, broadcasting and broadband industries. The empirical analysis conducted in these chapters also examined the ideas, interests and institutions in the respective industries and their implications for the deployment of future technologies. Data collected from interviews with industry elites tended to guide or support the analysis and provided insights into the respective industries which were not forthcoming in historical records.

Chapter 7 evaluated the two cases and set out a model of the co-evolution of communications technologies and institutions observed in the research. Although each new communications technology represented a critical juncture, or an opportunity for new policy choices, the institutions established at the time of the telegraph invariably proved resilient and prevented alternative models of deployment being considered. The chapter also offered an explanation for divergent communication technology outcomes in Canada and Australia: Canada's decentralised, bottom-up approach (the mosaic) to the deployment of new communications technologies facilitates faster take-up by enabling local solutions to address the varieties of particularism that exist at the local level. Time and again, the Canadian mosaic has established local networks which can then be interconnected quickly and, for the most part, all levels of government and the major firms have demonstrated a willingness to cooperate in interconnection projects.

On the other hand, Australia's top-down, centrally-controlled approach (the monolith) combined with a punitive culture of regulating communications technologies has favoured single national solutions to deploying communications infrastructure. Invariably, this approach has prevented participation by regional and local authorities, businesses, community groups and citizens, in the deployment of communications technologies. Rather than establishing local networks, communications policy in Australia often becomes embroiled in political issues at the federal level while communities wait for access to new communications technologies. As a consequence, the Australian monolith has failed to harness its cultural capacity in communications technology deployment and has, over time, created an industrial culture where firms and citizens are reluctant to innovate due to prolonged industry uncertainty. In particular, government control of the industry discourages industry players from acting before government: history demonstrates that first-mover strategies are too risky in Australia's government-controlled communications sectors.

The remainder of the chapter presents some propositions about divergent communications technology outcomes in Canada and Australia, outlines theoretical developments, offers lessons for policy makers, and provides recommendations for future research.

8.1 Propositions about Divergent Outcomes in Canada and Australia

In explaining the divergent outcomes in communications technologies in Canada and Australia, the research supports the following propositions:

- Institutions reflect historical path dependencies in the telecommunications industries in Canada and Australia, in particular those stemming from the constitutional allocation of legislative powers.

- Canadian governments are more willing to enable businesses and community groups to deploy infrastructure, particularly on a regional/provincial level.

- As a result of decentralised network development, and the need to interconnect provincial and local networks, greater cooperation exists among market players in Canada and the players are more willing to focus on competing in the market (rather than on the regulatory system).

- In addressing the varieties of particularism that exist at the nexus of government, business and communications technologies, a local or regional policy focus is more effective than a national policy focus in deploying communications infrastructure.

- As a result of the above, Canada's institutional and regulatory framework is better organised to accommodate converging communications technologies/industries.

In addition, other key findings of this thesis include the following:

- Compared with Canada, Australia has been slower to adopt new communications technologies. Choices made at the adoption stage of each new technology set Canada and Australia on self-reinforcing trajectories which explain the different broadband outcomes in Canada and Australia today.

- The processes which lead to the adoption of new communications technologies often represent critical junctures which disrupt (relatively) long periods of stability in communications industries. Moreover, the institutional arrangements which govern the respective communications industries tend to be path dependent and marked by periods of punctuated stability.

- The path dependent nature of institutions tends to reinforce a peculiar policy regime which influences the available policy choices. Institutions reflect the historical practices of the communications industries in Canada and Australia, and in light of technological convergence, the sectoral policy subsystems help or hinder the development of communications markets and cross-platform competition.

- Mobile telephony in Australia is the only communications technology where Australia not only outperforms Canada, but does so by more than double.

- During the present-day period of technological and institutional convergence, Canada's sectoral policy style has enabled faster deployment of broadband technologies and is more amenable to collaboration and innovative practices.

- Canadian governments (at all levels) facilitate cooperation between businesses and civil society organisations, particularly on a regional/provincial level, in deploying broadband technologies.

- As a result of communications policy being largely decentralised, national approaches demand greater cooperation among governments and market players in Canada. Hence, cooperation is an essential feature of Canadian industrial culture and communications industry participants are more willing to focus on competing in the market (rather than focusing on the regulatory system).

- To achieve greater penetration, a regional/local policy focus is more important than a national policy focus in deploying communications technologies.

- Particularism persists: pursuing a 'single business model solution' is unlikely to meet the particular needs of institutional, societal and individual users of communications technologies. Therefore, a system which meets the particular needs of particular groups is more likely to produce greater penetration of communications technologies.

- Compared with Australia, Canada's integrated regulatory framework combined greater provincial, municipal and community involvement in the adoption and deployment of communications technologies has contributed significantly to Canada's higher rates of broadband access and speed of the services.

- In Australia, the entrenched ideas which have dominated the institutional arrangements for governing the adoption, deployment and take-up of communications technologies have existed largely since the time of the telegraph. Nevertheless, Australia's 'monolith' provider model is becoming increasingly irrelevant in the broadband era.

- Communications technology has been a major political issue for federal governments in Australia, creating the 'centralisation' of interests around the traditionally diverged communications industries combined with a clear preference for state monopoly provision. Diverged interest groups have hindered the federal government's ability to address institutional issues associated with technological convergence. Canada's decentralised approach, on the other hand, has serendipitously avoided this centralised political effect, providing policy-makers with a diverse range of interests to take into account when addressing issues relating to technological convergence. Consequently, Canada's policy regime is better equipped to enable greater citizen participation in the digital economy.

- In addressing the varieties of particularism that exist at the nexus of government, business and communications technologies, a local or regional policy focus is more effective than a national policy focus in deploying communications infrastructure.

8.2 Theoretical Developments

Results of comparative studies that adopt a large-N approach to communications technologies tend to support the theory of technological determinism. Such comparisons lend themselves to viewing differences in national communications technology outcomes as simply ranked positions along an inevitable trajectory towards one hundred per cent penetration of a given communications technology. The explanations provided by such observations tend to relate to the amount of focus or investment in deploying infrastructure and providing services at snapshots in time. While these studies are useful in identifying differences in national communications technology outcomes, there is an underlying assumption that what works in one country will work in another, and it is only a matter of time before nation-states 'catch-up' to the leaders. However, these assumptions deny the importance of legacies created by historical institutions and the impact of the varieties of particularism which vary from country to country and indeed region to region.

Technological momentum (or 'soft-determinism') provides a more appropriate theoretical lens to analyse the impact of technology *and* the impact of institutions on the types of technologies that are deployed. For instance, Australia's reliance on ADSL for broadband services is a direct result of a single public monopoly provider in the absence of cable television; whereas Canada's ability to provide broadband services via cable is a direct result of bottom-up approaches to television services provision that would later provide an alternative infrastructure platform for the delivery of these services. While it is unlikely that policy makers could have predicted how television services delivery systems would later influence broadband services delivery, it is clear that decisions made in the past influence the available policy options in the present and indeed the future.

Given the historical experience, Australia's decision to implement the NBN as a single national solution will likely influence policy decisions when new technologies are developed in the future. As has been seen in the past, today's 'best' technological solutions can influence the decisions policy makers will make in the future, often with unintended consequences and without the benefit of hindsight. Nonetheless, technological momentum provides a conceptual viewpoint that overcomes the problems of viewing communications technology outcomes as simply a matter of 'catching up'. Indeed, Australia's mature mobile telephone market is already proving to overcome some of the problems stemming from the focus on fixed-line solutions. On the other hand, Canada's bottom-up deployment of local and regional Wi-Fi systems is likely to enable solutions to mobile broadband congestion problems which are yet to surface in Australia.

What is clear from the research is that Australia's preference for single national solutions keeps communications technology policy firmly within the arena of federal politics, whereas Canada's industry politics is more easily influenced by provincial and local concerns. Given the demise of the traditional telecommunications provider model and the increasing importance of addressing the varieties of particularism at the regional and local levels, Canada's diverse communications technology delivery systems provide more opportunities for innovation as new technologies emerge. For now, Australia's fibre optic NBN represents the contemporary 'best' technology, but the system leaves little room for innovation beyond the investment in a single technology. Moreover, the current delays in deploying the NBN, for the most part created by political pressures on the federal government, leave little room for regional or local innovation. Indeed, the establishment of a public monopoly provider in light of the numerous varieties of particularism leaves little room for innovation beyond the current system and carries with it many of the same problems created by the market dominance of the former monopoly provider, Telstra.

8.3 Lessons for Policy-Makers: Communications Policy by Default or Design?

In his analysis of electricity systems, Hughes (1993: 420) identified how the varieties of particularism influenced the infrastructure used to deploy electricity networks. Hughes found that regional system growth occurred via a process of 'evolution rather than planning'. Further, he argued that planned networks:

> take into account only the circumstances that exist or are conceivable when the plans are formalized; therefore, they fail to provide for the technology and circumstances for the future. Plans... become especially constraining blueprints in new, rapidly evolving fields of technology.

Hughes' use of technological momentum enabled him to identify the process whereby network technologies evolve and to argue that selecting particular technologies can limit the options available in the future. This problem is further exacerbated where design initiatives, especially single national solutions, are not the result of deliberate strategies to address the varieties of particularism but are the result of a default response dictated by a particular policy regime.

This author agrees with Hughes' (1993) major findings which provide a major lesson for policy-makers: attempting to plan the use of particular technologies limits the available options for deploying future technologies. Whereas Canada's institutional environment has focused on functionality, and indeed, Canada's regulatory system has not, for the most part, restricted the use of various technologies to deliver similar functionality, Australia's single national solution approach has restricted the available options for service delivery. Time and again, Australian governments have not enabled certain technologies, such as wireless telegraphy, FM radio, microwave pay-TV, VoIP (as a substitute for landlines) and more recently privately-owned wholesale fibre optic networks (to compete with the NBN), to facilitate diverse approaches to providing functionality. Throughout the history of communications technologies in Australia, the Australian government has used its constitutional powers to keep communications services under its control and as a policy lever for electioneering purposes. Indeed, the NBN was conceived as a major component of Labor's 2007 election campaign.

Canada's institutional framework allows for greater provincial and municipal involvement in the deployment of communications networks that are immediately relevant to citizens. As there is no over-arching federal imperative to ensure standardised national systems beyond the interconnection of provincial networks, there is much more room for innovation to occur. Indeed, the CRTC's approach to forebear from regulation has enabled cross-platform competition and special arrangements that allow smaller providers to challenge the wholesale network owners through fast-tracked regulatory decision-making procedures (based on discussions with industry experts, see also Martin 2003).

8.4 Future Research

One of the major limitations of the present study is that it generates mid-range generalisations and explanations which are only relevant to the particular cases at hand. Nonetheless, the approach is useful in addressing the shortcomings of large-N case studies, particularly when communications technologies are viewed from the perspective of technological momentum. The present study also takes into account temporal issues and examines recurring patterns of policy preferences to demonstrate the impact of path dependencies on contemporary communications technology policy issues. The focus on institutions in a most-similar comparison provides the quasi-experimental means to develop a plausible (as opposed to falsifiable) explanation for the divergent communications outcomes observed in Canada and Australia over time. However, future research may develop further the concepts and approaches adopted here.

Future research stemming from the present research might apply the approach adopted in this thesis to study additional cases to develop a large-N comparison. This might include a least-similar comparison to investigate jurisdictions, particularly developing nations, where path dependencies are absent, such as in cases where technology 'leap-frogging' might occur. In particular, such research would confirm the impact of path dependencies in the present cases should the absence of institutional constraints lead to faster penetration rates of new technologies. Further, additional cases would enable the development of generalisations which are more broadly applicable and would address the shortcomings of the present small-N research. Nonetheless, such a study would be an expensive undertaking for an individual scholar as it would require travel to each jurisdiction to interview industry elites.

While many international organisations such as the ITU, OECD, World Bank and the World Economic Forum conduct individual case studies on communications technology penetration, path dependencies have not been a major focus. Indeed, such studies tend to adopt technological determinism as a theoretical lens while ignoring the varieties of particularism and the relevant path dependencies that exist in each jurisdiction. Future studies conducted using the approach developed in this thesis will likely produce interesting insights into the interaction between governments, businesses and communications technologies. Finally, studies which compare centrally controlled with decentralised policy and regulatory systems may prove useful in determining the ability of decentralised systems to address the regional and local varieties of particularism which reside at the nexus of government, business and communications technology.

8.5 Conclusion

An historical institutionalist approach provides an interesting explanatory perspective for viewing communications technology outcomes in Canada and Australia. Far from Australia's broadband crisis being a new development in an otherwise effective policy regime, it is clear that Australia's top-down, centralised single national solution approach creates national political issues out of what are essentially regional and local varieties of particularism which are best addressed at the regional and local levels. The benefits of decentralised systems seem to work best to avoid communications technology policy issues becoming the focus of national political issues which tend to hinder the deployment and take-up of new technologies.

In light of the comparison of the Australian and Canadian experiences, this thesis presents a plausible explanation for the divergent communications technology outcomes in both countries. Given the historical experience, Australia's single national solution does not auger well for the NBN and current issues surrounding the deployment of a centrally-controlled national fibre optic network. Nevertheless, despite Canada's clear focus on being a communications technology leader, the advantage appears to be more serendipitous than planned. Given the varieties of particularism that exist at the nexus of government, business and communications technology, Canada's decentralised approach appears, significantly, to be more effective in enabling faster penetration and take-up of new communications technologies. Not that Canada is advanced in the take-up of mobile technologies when compared with Australia, but what is clear is that the only communications technology where Australia leads Canada happens to be a technology that has been largely left to market forces. Indeed, in the absence of political objectives which would otherwise encourage the Australian government to exert its constitutional powers, the Australian mobile industry is an outlier in a long history of slow penetration and take-up in the hands of government.

Overall, this thesis sheds some light on a complex industry which is undergoing a major transformation as communications technologies converge. What is clear from the present study is that governments have not been successful in planning communications technology adoption and deployment: indeed, where governments have intervened, they have tended to set industries along trajectories which are inherently tied to the starting point – that is, path dependent – which makes it difficult for businesses and community groups to take advantage of emerging communications technologies. As the infrastructure which supports the digital economy becomes more complex and driven by user demand, the public monopoly models which were believed to be useful in the past tend to restrict the options available in the future. The impact of the past, then, cannot be overlooked in understanding contemporary communications technology policy issues.

While it is unlikely that either Canada or Australia could realistically address – in the short term at least – the path dependencies that were established at the time of the telegraph, the present study highlights the significance of decisions made in the past and how these can restrict the policy options available in the future. With this in mind, it is appropriate that policy-makers look beyond immediate political issues regarding communications technology outcomes before opting for the default policy position. Given the important role of communications technologies in enabling the digital economy, divergent communications technology outcomes are not simply a matter of 'catching up', but a case of enabling the institutional arrangements to address the varieties of particularism that reside at the nexus of government, business and communications technology. Clearly, single national solutions are risky approaches to ensure the necessary penetration of communications technologies to enable nations to reap the benefits of the digital economy.

Appendix 1: Broadband Statistics: Canada and Australia

Statistical Comparison of Broadband in Canada and Australia as at June 2008			
Item	**Canada**	**Australia**	**Notes**
Total subscribers and population information			1
Total number of broadband subscribers as at June 2008	9,201,998	4,981,656	
Total Population Estimate June 2008	33,311,400	21,374,000	2, 3
% of population subscribing at June 2008	27.62%	23.31%	
Relevant OECD Ranking	8	12	
Subscribers by technology per 100 inhabitants:			1
DSL	12.6	18.6	
Cable	14.9	4.2	
Fibre/LAN	0.0	0.0	
Other	0.4	0.8	
Total	27.9	23.5	
Relevant OECD Ranking	10	16	
Households with broadband access, % by year			1
2004	44.1%	16.3%	
2005	50.1%	28.3%	
2006	57.9%	43.0%	
2007	64.0%	52.0%	
Business Use - 2007 - by number of employees			1
10-49	93.7%	95.4%	
50-249	98.9%	99.6%	
250+	99.6%	100.0%	
Population density, land mass and coverage			1
Population density/km2	3.3	2.8	
Total land mass km2	9,976,100	7,686,800	
Percentage of landmass used by cumulative 50% of the population	15.91	10.36	
DSL Coverage % of access to population	75.4%	81.0%	
Pricing in comparative perspective			1
Average Subscription Price, USD	59.76	61.14	
Average Subscription Price	51.07	52.26	
Minimum Subscription Price, USD	25.71	25.34	
Minimum Subscription Price, USD, PPP	21.98	21.66	
Maximum Subscription Price, USD	114.23	126.88	
Maximum Subscription Price, USD, PPP	97.63	108.45	
Big Mac Index as at January 2009, best plan Bell/Telstra advertised 4 May 2009	AUD 75.21	AUD 149.95	4
Bell/Telstra fastest advertised plan speed	16mbps	16mbps	5
Bell/Telstra download limits on best plan	95GB	60GB	5
Akamai State of the Internet Report			
Av Speed kbps	3786	2499	6
% subs >5mbps	20.00	9.20	
% subs >2mbps	74.00	49.00	
Notes:			
1. OECD Statistics as at June 2008 from the OECD Broadband Portal			
2. Canada population estimate as at June 2008 from Statistics Canada			
3. Australia population estimate as at June 2008 from Australian Bureau of Statistics			
4. Calculated using The Economist's 'Big Mac Index' as at January 2009 and advertised fastest plan as at 4 May 2009			
5. Based on advertised fastest plan limits at 4 May 2009			
6. Based on Aikima 'State of the Internet Report', Quarter 4, 2008			

Table A1-1: Statistical Comparison of Broadband in Canada and Australia

Appendix 2: Interview Questions: Elite Interviews

Interview Questions

1. Introduction 5-10 minutes:
   a. Introduction
   b. Introduce the background of the project
   c. Ask the interviewee to briefly talk about themselves and their experience
2. In-depth, semi-structured interview (themes and broad questions to start conversation flow):1 hour
   a. State of the industry:
      - What are the major challenges facing the industry?
      - How are you/your organization dealing with these challenges?
      - How are emerging and merging technologies affecting the industry?
   b. Broadband infrastructure deployment:
      - What aspects of government policy help the deployment of broadband infrastructure?
      - What aspects of government regulation help the deployment of broadband infrastructure?
      - What aspects of government policy hinder the deployment of broadband infrastructure?
      - What aspects of government regulation hinder the deployment of broadband infrastructure?
   c. Government-business relations:
      - How would you describe the relationships between governments and businesses in the industry?
      - How would you describe the culture of the industry?
   d. Specific cases of sound or poor outcomes:
      - Government?
      - Business?
      - Technology?
      - International institutions?
      - Australia and Canada and the current broadband outcomes?
   e. Do you have any other thoughts on broadband infrastructure and the speed of the services?
3. Conclusion and thanks.

Appendix 3: List of Interviewees

Canadian Interviewees:

- 3 July 2007: Marita Moll, Canadian Research Alliance for Community Innovation and Networking (CRACIN)
- 3 July 2007: Leslie Shade, Associate Professor in communication studies from Concordia University in Montreal
- 5 July 2007: Kathy Fisher, Information Highway Applications Branch, Industry Canada
- 6 July 2007: François Ménard, Project Manager, Xittel Telecommunications
- 6 July 2007: Robert Proulx, Managing Director, Xittel Telecommunications
- 9 July 2007: Brian Beaton, K-Net
- 9 July 2007: Dr Pabir Neogi, Industry Canada
- 9 July 2007: Lynda Leonard, Information Technology Association of Canada
- 9 July 2007: Dr Phillipa Lawson, CIPPIC
- 10 July 2007: Professor Michael Geist, University of Ottawa
- 10 July 2007: Michael Janigan, Public Interest Advocacy Centre (PIAC)
- 10 July 2007: Bill St Arnaud, CANARIE
- 11 July 2007: David Teal, Competition Bureau
- 11 July 2007: Pam Dinsmore, Rogers Communications
- 13 July 2007: Michael Tanglao, Bell Canada
- 13 July 2007: Tom Moss, Telecom Ottawa

Australian Interviewees:

- 9 May 2005: Professor Andrew Cheetham, Telecommunications Engineer, University of Canberra
- 2005-2006 (various discussions): Andrew Carter, Network Engineer, NetSpeed Internet Communications
- 2 November 2007: Kevin Cox, Gungahlin Community Council
- 2 November 2007: Diane O'Hara, TransACT
- 2 November 2007: Dr Tony Warren, Telstra
- 28 November 2008: Lynda Summers, Murray Regional Development Board
- 28 November 2008: Kris Funston, Access Economics
- 10 May 2012: Phil Herrick, General Manager, Southern Phone Company

Appendix 4: Canada's Regions Explained

Canada's regions are known by a variety of informal names (see, for example, Transport Canada 2010). The five regions outlined in the map below have been identified to assist with the description of the historical story of the deployment of communications technologies. The five regions, from left to right, are as follows:

- Pacific Region: The province of British Columbia.
- Northern Region: The Yukon, Nunavut and Northwest Territories
- Prairies Region: The provinces of Alberta, Saskatchewan, Manitoba,.
- Central Region: The province of Ontario and Quebec.
- Atlantic Region: The provinces of New Brunswick, Prince Edward Island, Nova Scotia and Newfoundland and Labrador. The provinces of New Brunswick, Nova Scotia and Prince Edward Island are also referred to as "The Maritimes." When the province of Newfoundland and Labrador joined the confederation, the term "Atlantic Region" or "Atlantic Provinces" was adopted due to some reluctance to include Newfoundland and Labrador as part of "The Maritimes" (Maritimes.biz 2011; Jackman 2010).

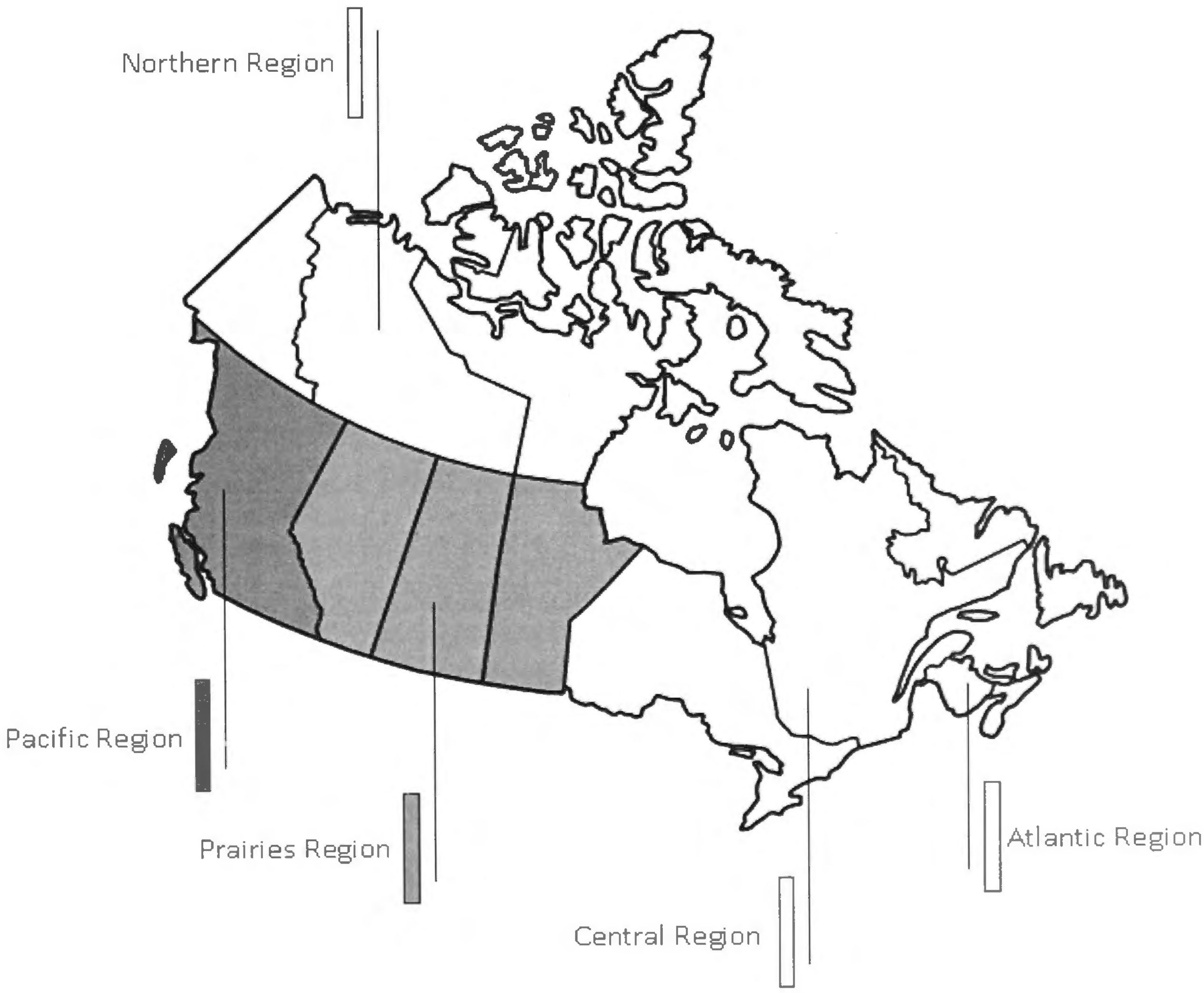

Figure A4.1: Canada's Regions

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