

More than Mobile

Migration and Mobility Impacts from the 'Technologies of Change' for Aboriginal Communities in the Remote Northern Territory of Australia

Taylor, Andrew

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Author

Andrew Taylor
Senior Research Fellow
Charles Darwin University
Ellengowan Drive
Darwin, NT
AUSTRALIA 0909
andrew.taylor@cdu.edu.au
Ph. +61 (0) 8946 6692

More than mobile: Impacts of the ‘technologies of change’ on Aboriginal migration in the remote Northern Territory of Australia

Abstract

Information communication technologies have permeated new consumer markets at remarkable speeds with mobile devices like laptops and mobile phones diffusing rapidly to even the most remote and economically marginalised populations. In small and remote Aboriginal communities in the Northern Territory of Australia, residents have until recently been isolated from these symbols and facilitators of globalisation. But rapid diffusion there raises important questions about their possible impacts on migration as users develop aspirations to be engaged in the global world. Drawing on research into technology diffusion and use by Indigenous citizens, and migration research for the same, we critically review these ‘technologies of change’ for their propensity to globalise remote Aboriginal spatiality. From this a conceptualised model for the fourth Aboriginal migration transition is presented as an extension to current understandings about remote Aboriginal spatiality. Findings also question current research paradigms and implicit assumptions of policy where the potential for Aboriginal Australians to become global citizens and adopt migration practices accordingly is downplayed.

Keywords: Aboriginal migration, Information Communication Technologies, Globalisation, Aboriginal communities, Migration theory

Introduction

Information communication technologies (ICTs) targeted at the individual consumer market have engaged individuals with the globalised world on an immense scale. Mobile phones, for example, have diffused faster than almost any other technology in history, including to remote Indigenous populations where establishing the necessary infrastructure has long been problematic and rates of access have been low (Kalba, 2008). While governments in both developing and developed nations have articulated the importance of ICT for closing socio-economic gaps between Indigenous and other residents, there are mixed views amongst researchers about its capacity to do so. Nevertheless, in Australia improving ICT access for remote Aboriginal populations is enveloped within broader Australian and State and Territory Government programs for improving Indigenous wellbeing. Consequently more and more Aboriginal people in remote parts are being afforded access to a new generation of ICTs (and their required platforms) where previously they were not.

With this in mind, the aim of this paper is to critically analyse the potential for ICTs currently diffusing to remote Northern Territory (NT) Aboriginal communities to influence drivers of migration and subsequently enact new spatial flows and distributions. While the situation of rapid ICT diffusion is not unique to the NT, the remoteness and poor socio-economic status in communities make it an ideal case for drawing out conceptual issues around the topics of globalisation, spatiality and Aboriginal people.

For the purpose of this paper, a broad definition of migration is adopted:

A process of moving, either across an international border or within a State. It is a population movement, encompassing any kind of movement of people, whatever its length, composition and causes;

it includes migration of refugees, displaced persons, uprooted people, and economic migrants. (IOM, 2008, Pg.15)

This encompasses all types of movements notated in the literature on remote Aboriginal spatiality, (mainly short-term mobility and circular mobility) and those which generally not (residential migration, return migration, travel, and so on). The term ‘spatiality’ is taken to mean the locations at which Aboriginal people can be found (for whatever reason) and the places and paths they travel on and through.

Despite their cultural and social heterogeneity, Indigenous populations in remote areas across the globe have exhibited rapid ICT uptake rates for mobile ICTs including mobile phones and laptops. The introduction of mobile phones to Africa for example saw growth rates in subscriptions exceed anywhere else in the world during the 2000s (Brady et al., 2008). In Canada, Perley and O’Donnell (2006) describe the widespread use of applications and devices such as video phones, iPods, webcast music, and online games by First Nations youth in remote areas, and in Australia studies document very high ownership rates of Next G mobile phones within a short time period from their release into discrete Aboriginal communities (Dyson and Brady, 2009). These trends are by no means unique to Indigenous or remote populations with analysts describing similar outcomes in other emerging ICT markets such as Eastern Europe and India (Kalba, 2008). There is a sense of the ubiquitous therefore in the diffusion of mobile technologies and they remain symbolic of and implicit in the continued march of globalisation.

But rapidity in ICT diffusion to remote Indigenous populations has been suggested as indicative of more than a latent demand for reliable and affordable means of communications. In Burkina Faso, for example, early adopters are described in a study by Hahn and Kibora

(2008) as being driven by the status of owning a mobile phone, derived from its aesthetics and from their ability to determine when and how they choose to communicate within existing culturally derived power structures. Such examples of the cultural appropriation of technology are testament to the seemingly inexorable reach of globalisation, but also reveal wide-ranging and juxtaposed ideologies about its impacts, benefits and value in culturally specific contexts. Four main themes in regards to this emerge in the extant literature:

- **Access and cost.** The characteristics of remote settlements and their populations (including their physical disconnection from each other and with service centres, and the social and economic marginalisation of populations) have suppressed free market and thwarted government attempts to raise ICT access levels to approximating the general population (Dyson, 2004). Where infrastructure and services have been forthcoming, low incomes have been seen to inhibit widespread uptake. Consequently, in remote areas of Australia and Canada, for example, Aboriginal people in remote areas have long epitomised as symbolic of the ‘digital divide’ (Daly 2005; Perley and O’Donnell, 2005).
- **Local consultation and collaboration.** The introduction of ICT based services and programs is noted as having occurred largely without due diligence to the local context and culture (McLoughlin, 1999; McCallum & Papandrea, 2009). Moreover, content predominantly expresses Indigenous people in the third person (Dyson and Underwood, 2006) and has been seen as failing to engage the target audience sufficiently so as to ensure long-term benefits are realised.
- **Issues of gender.** Some studies document the role of ICT in strengthening existing gender-based sociological, cultural and economic divides. Authors such as Rakow and Navarro (1993) propose that females have not been afforded equal access to ICT and

others such as Smillie-Adjarkwa (2005) express concerns about other negative gender based consequences like exposure to pornography.

- **Impacts on culture.** Concerns are documented about the miss-representation, misappropriation and de-contextualisation of Indigenous cultures and knowledge in online or digital forms (Dyson and Underwood, 2006). Some authors propose the imposition of Western ideals, which is pervasive in the information delivered by ICTs, might threaten the very survival of individual cultures (Dugdale et al, 2005). More broadly, the new ICTs are criticised for enhancing individualism and creating and altering societal norms including detrimental effects on methods of communication (Hahn and Kibora (2008).

Collectively these themes articulate complex sociological concerns that technologies arrive embedded with the values of the society they originated from, creating space for negative outcomes and governing potential positive effects (Dyson, 2004). Layered onto pre-existing poor socio-economic conditions, the introduction of new technologies to remote Indigenous populations has been suggested as increasing, rather than abridging, the digital divide between urban and remote, and between Indigenous and non-Indigenous populations (for example, McCallum & Papandrea, 2009).

Nevertheless, many benefits from the provision and uptake of ICT by Indigenous peoples are identified in the academic literature. These are broadly summarised under three themes - developmental, cultural and individual outcomes. Developmental outcomes include the more efficient delivery of services and programs to target populations. There are many examples of initiatives aimed at delivering improved efficiencies for remote information access and dissemination (Daly, 2005), and in the delivery of government services to Aboriginal people

including education (Donovan, 2007) and health services (Smillie-Adjarkwa, 2005). The literature also points to potential business opportunities for remote Indigenous people through ICT facilitated access to new markets, for art and tourism products in particular (Hosein et al., 2005).

ICT is also heralded for its capacity to record, preserve and share Indigenous cultures and knowledge in digital format including recording languages, tacit knowledge and explicit cultural practices (for example, Chikonzo, 2006; Schräpel, 2010).). Thirdly, the potential for ICT to deliver individual benefits such as access to jobs markets and employment opportunities (Muto, 2009) is discussed along with it's facilitation of greater access to education and improved pedagogies (Donovan, 2007). In addition, ICT provides social connectivity by expanding personal networks (Wei & Lo, 2003). Proponents emphasise its capacity to enable individuals to achieve their goals within a non-hierarchical and flexible environment, and without encountering the limitations of prejudice (Brady et al, 2008).

For residents living in remote Aboriginal communities in the Northern Territory of Australia, widespread access to the new generation ICTs (high speed broadband, Internet enabled phones and so on) has only recently come about. This is largely because the networks on which these depend have only just, or are currently being rolled-out. There is a long history of programs and policies for redressing low levels of ICT access and uptake by remote Aboriginal residents in the NT and elsewhere in Australia but successive governments have faced major hurdles in establishing solutions to the high costs and servicing issues for provisioning and maintaining ICTs (Daly, 2001). Technology deficits (both in access and use) have been underscored as further evidence of the continued gaps in socio-economic status between remote Aboriginal and other Australians (ACMA, 2008; Daly, 2005).

Consequently, in 2006, only 12 percent of Indigenous households in remote NT had some form of Internet access compared to just 57% of others (ABS, 2010), and just 16 percent of remote Indigenous communities in the NT in 2007 had terrestrial mobile phone coverage (ACMA, 2008).

However, in a significant development, during 2008 remote telecommunications networks were switched over from the CDMA (Code Division Multiple Access) network to the newly installed and Internet-enabled 'Next G' (or '3G' for third generation) network. Next G is operated by Telstra (a partly nationalised Telco) using HSDPA (High-Speed Download Packet Access) which facilitates mobile broadband, Voice over Internet Protocol, picture TV and video-over-phone. It provides terrestrial mobile services for more communities and over wider areas than the prior network and uptake rates for Next G phones have been both high and rapid, particularly amongst young adults (Dyson & Brady, 2009). In further developments, Aboriginal school children in NT communities are each receiving a wireless-Internet enabled laptop at no cost, thanks to the One Child One Laptop (OLPC) philanthropic organisation. Other ICT initiatives are underway including the Australian Government's Digital Education Revolution (DER), which aims to "*...prepare students for further education, training and to live and work in a digital world*" (DEWR, 2009), and the National Broadband Network (NBN) which will deliver fibre to the home high speed Internet via "Regional Backbones" (DBCDE, 2010a). Populations not connected to the fibre network will receive expanded ADSL2 wireless and satellite services with 12 megabits per second service speeds (Conroy, 2009). These technologies will provide an information bridge, spanning distances, and a cultural bridge which spans societies. They will afford individuals with new and expanded information sets, new representations of the world, new abilities to 'do things'

(like Internet banking and video chat), access to new networks, and new experiences outside of their immediate spatial and cultural contexts.

A very limited number of studies have examined the role of ICTs in bridging the physical spaces between remote or marginalised populations and others by means of migration.

Muto's (2009) study in rural Uganda, for example, explicitly linked the uptake of mobile phones to greater rural to urban residential migration flows. Meanwhile, Paragas (2009) describes the possibilities for lives of 'spatial simultaneity' for transnational migrants thanks to mobile ICTs, and Hahn and Kibora (2008) discuss the important role of mobile technologies in easing the transition to urban life because they enable contact with family and friends to be maintained, thus making urban centres more 'sticky' for those who have moved from elsewhere.

With this in mind, critical questions are raised about possible impacts of heightened ICT access and adoption on the spatiality of residents in remote Aboriginal communities in the NT. ICT creates a window through which the individual can observe and participate in the global world. It facilitates greater choice sets, and expands economic and social opportunities for those who want to participate. Consequently, new migration patterns, which reflect individual aspirations for participation in the global economy, may emerge as fundamentally different from those portrayed as being dominant in the extant literature. These issues are of vital importance to forward planning for future settlement and demographic characteristic in all parts of the NT. In this study we take an interdisciplinary approach to conducting a critical analysis of the 'technologies of change' which have recently or are currently diffusing to remote Aboriginal communities to assess their potential to impact on Aboriginal spatiality. We draw primarily on research into technology uptake in remote Indigenous communities in

Australia and elsewhere, as well as extant theory on Aboriginal migration and spatiality, and particular the theory of Aboriginal transitional migration. We extend the current thinking in that field with a conceptualisation of a new transition which is led by the influence of ICT on migration drivers and spatiality.

Migration, technology and demographic change in remote Aboriginal communities

All of the 101,000 residents of the NT who live outside of its capital city Darwin (population 129,000) reside in regions which are classified as remote or very remote (ABS, 2010). More than half (51%) of the population there is Indigenous with most of these living in small communities of between 200 and 1500 people (Figure 1). These communities have featured extensively in the media, in research and in countless enquiries for the poor rates of educational achievement, high crime rates, terrible health outcomes and low employment rates amongst residents. Little progress has been made during recent decades in narrowing gaps in these areas between Aboriginal people and others in the population despite a raft of targeted policy and programs and a reconciliatory approach to Indigenous affairs (see, for example, Topsfield, 2009).

Insert Figure 1 here

Like Indigenous people across Australia and in developed nations elsewhere, Aboriginal people in the NT are urbanising, albeit at relatively slow rate (Taylor and Carson, 2009; Biddle, 2009; Prout, 2008). Positive net migration in either direction is usually the most powerful demographic force to act on small and remote communities because even small additions or subtractions to the population can impose major and rapid demographic change. This magnification of impacts where populations are small has been demonstrated in the

gendered differences (female dominated) in post-WWII residential out-migration from small Aboriginal communities in Greenland and other Nordic nations. Here substantial out-migration by females led to very high sex ratios in the communities they left behind with resultant negative social and economic issues following (Rasmussen, 2007). While no clear acceleration in residential migration away from remote areas in the NT is currently evident, shifts in Aboriginal settlement patterns have been observed in recent times. Census data shows that fewer proportions of Aboriginal people now live in small communities in favour of larger Aboriginal communities and the urban centres of Darwin and Alice Springs (Taylor & Carson, 2009). Despite the contention that land rights and reconciliation efforts have delivered opportunities for more Aboriginal people to return to ancestral lands, a smaller proportion are choosing to do so over time.

Aboriginal residents of remote Australia and in other developed nations have neither theoretically nor conceptually conformed to popular neo-classical models of migration (Kinfu, 2005; Petrov, 2007). The study of rural-to-urban migration has been greatly influenced by the ideas of Harris and Todaro who in the 1970s proposed that labour market conditions arising from the transition from agrarian to industrialised economies served as the driving force for internal migration. These structural models for explaining internal migration are built on the logic of economic (capitalist) theories about the role of peripheral areas as suppliers of labour to urban economies. These models and their derivatives have remained dominant in the field but nonetheless are criticised as being over-simplistic for reducing the forces of migration to ‘worker’s estimates of the probability of acquiring ... employment’ (Ranis & Stewart 1999: 286). It is clear in the context of most Aboriginal societies that a linear relationship between economic development and the migration of Aboriginal people has not been evident and is not prominent even today.

Instead, many theorists align with the transitional theory of migration for describing and researching Indigenous spatiality (for example, Bedford and Pool (2004) for the Maori people of New Zealand, and Taylor and Bell (2004) for Indigenous Australians). The transitional theory of migration depicts changed spatiality according to the social and economic contexts of populations in question. Taylor and Bell (2004) have described three such transitions for Australian Indigenous people:

1. An extension of circulatory movement, initially associated with hunting and gathering, to include all activities which seek to maintain customary kinship;
2. Spatial concentration (largely during the 1960s) from the forced settlement of Aboriginal people into reserves and mission stations, the *raison d'être* of which was the confinement of nomadic movements; and
3. De-concentration from the freeing of restrictions on movements and the granting of land rights.

None of these transitions signify or can be comfortably aligned with the developmental focus inherent in the Harris-Todaro models, and instead are more pertinently described as having been "...mediated by Indigenous agency" (Taylor and Bell, 2004, pg. 37).

It might also be argued in the remote NT context that movements between communities and other (largely) non-Indigenous settlements (service centres, towns and cities) are a contemporary addition to the transitions identified by Taylor and Bell. Often involving extended time periods away from communities without a change in residence, these movements dramatically affect the demography of both the source and receiving locations. There are trenchant and complex views about the causes and effects, although the phenomenon remains largely unquantified (Prout, 2008). Indigenous rights advocates view

such ‘urban drift’ as a manifestation of ill-conceived policy, with the more extreme citing the deliberate suppression of Aboriginal rights as a motive (for example, *The Australian*, 2008). Many such expressions were brought forward in response to the programs and policies of the Northern Territory Emergency Response (or ‘intervention’) which began in 2007 (for example, *The Age*, 2008a). Also tied to this debate are perspectives of the economic rationalist’s who highlight the problematic nature of short-term travel for the efficient and targeted delivery of services to what is essentially a constantly churning population (Prout, 2008). In both camps there appears to be disjuncture between the drivers of and purposes for this form of migration according to residents, and the perceptions held by other groups such as public servants, activists and researchers. The former are able to identify entrenched patterns of migration which are undertaken regularly and with purpose. In opposition to this, the discourse of the economic rationalists features the problematic effects, while those ascribing this as forced migration depict movements without a real purpose and along unplanned routes, as evident in the nonclementine ‘drift’ (Taylor and Carson, 2009).

Despite this debate and the intense policy focus on remote Aboriginal residents, little in the way of sophisticated analysis about the relationships between changed spatialities and demographic structures has been forthcoming. Signifying this is a dearth of research on the causes and consequences of Aboriginal residential migration, partly because numbers have been relatively small, but also because researchers have failed to consider and debate paradigms outside of those which posit spatiality as operational only within the three transitional migration types outlined above. The spread of the new generation ICTs into Aboriginal communities is engaging the younger generation in particular with the global world and provides them with opportunities to participate in it. This raises the question of whether technology might drive a new Aboriginal migration transition in the NT which

features increased residential migration to urban centres, and revised patterns of travel around remote areas and between communities and larger centres. More specifically, when they are exposed more fully to the globalised world, will Aboriginal people aspire to its 'fruits' and adopt migration and travel patterns accordingly? Equally, if the intentions espoused in a plethora of policy for reducing socio-economic gaps are realised, where can we expect the new middle class to apply their skills, be entertained, work, meet partners, bring up families and purchase houses? Inherent in both of these questions is the sub-text of stark contrasts in standards of living between remote communities and elsewhere. These considerations are particularly pertinent for the young generations currently residing in remote Aboriginal communities who may develop aspirations for a life away from their community which is built around perceptions of the available alternatives. The notion of remote youth aspiring to a better way of life was seen as an important driver of out-migration of First Nation Canadians from reserves to urban centres from the 1960s on (Cooke and Belanger, 2006).

There are many historical examples of technology's contribution to changes in pre-existing spatialities for Indigenous people in what is now remote Australia. Indeed, Butchmann (2000) contends that Aboriginal people in Australia have long been enthusiastic about adopting and adapting European technologies, particularly for hunting and gathering activities where guns and later motor vehicles were incorporated to improve yields. These practices are still commonplace in remote areas today (Bird et al., 2005). The arrival of the motor vehicle itself fundamentally altered spatial contexts for remote Aboriginals. During the 1960s, for example, the Toyota Land Cruiser became widely available, including the 'Troop Carrier' model which was capable of transporting large groups (Toyota, 2009). Its acquisition for traversing harsh terrain changed forever the nature and composition of travel there by enabling larger groups to travel, increasing the catchment areas over which trip participants

were drawn, and expanding the distances over which trips occurred (Petersen, 2004). The motor vehicle also opened up regular travel to urban centres and enhanced the ‘pull’ of these to people from communities (Altman, 1987). Collectively these examples demonstrate a vibrant (though not always positive) and innovative coexistence between technology and Aboriginal culture in remote Australia.

The technologies of change

We now turn to the modern context and to critically examining the new generation of ICTs recently and currently being rolled-out to remote Aboriginal communities in the NT. The focus is on describing possible impacts from their introduction and uptake for residential migration, but also for travel in and around the NT and elsewhere. Included in the analysis are the infrastructural platforms on which specific technologies do or will operate (such as high speed broadband networks), individual mobile ICTs (like mobile phones), and some of the common software applications (including Web 2.0 applications) which are popular and run on these. We also annotate the policies and programs which are driving their diffusion because these dictate how the relationships between modernity, closing socio-economic gaps and residential migration might evolve.

High Speed Broadband

In 2009 the Australian Government announced its ambition to roll out a fibre-to-premises high speed National Broadband Network (NBN), forming a company to install and run it (Conroy, 2010). Included are infrastructures to address ‘regional backbones’ (regional hubs from which rural and remote access to the high speed network will eventually be drawn). One of these, running North-South through the NT to Darwin, is already under construction. For

90% of the population, the NBN will deliver speeds of up to 100 megabits per second. For the remainder without access, next generation wireless and satellite technologies, with speeds of up to 12 megabits per second (DBCDE, 2010a), are promised using WiMax and additional ADSL2 sites (The Age, 2008b; TMCnet, 2007).

The Australian Government has signalled its intention to integrate its investments in the NBN with the future delivery of education. Its DER policy aims to improve student's ICT skills and to encourage the use of ICT for interactions between teachers and students as well as parents and schools (DEWR, 2010). This ethos is already on display through the 'My School' website (www.myschool.edu.au) where the performance of students at individual schools can be viewed and compared to similar schools. Similarly, the Digital Regions Initiative (co-funded by the Australian and State and Territory Governments) provides around \$60million (\$AUD) for initiatives which will deliver digital applications for rural and remote communities in education, health and emergency services (DBCDE, 2010b).

Collectively, these emergent broadband infrastructures will deliver higher bandwidth to remote communities and mean we can expect residents to have much improved access and at greatly improved speeds during the coming years. We are likely to see an increase in household and individual level access and devolution away from limited public access, traditionally provided at libraries and community centres (McCallum and Papandrea, 2009). Broadband infrastructure is the platform on which new ICTs will operate into the future and a precursor to more widespread engagement by remote Aboriginal residents with the digital and global economy. It's capacity for high-bandwidth Internet which supports broadband video may see it linking residents in remote areas with employers in regional and other areas of the country, in similarity to many nations in Africa and to the First Nations people in

Canada, where some community leaders have actively supported the expanded adoption and use of ICT specifically to engage people with the global community (as described by Perley, & O'Donnell, 2006).

Mobile Phones

The rollout of the Next G network to remote parts of Australia signified a new era for telecommunications there, and the market has responded. Dyson and Brady (2009), for example, found 80% of young people owned a Next G mobile phone just 9 months after their introduction to a remote North Queensland community. Figure 2 demonstrates that access to the Next G network is (according to Telstra at least) good at even the extremes of remoteness (here showing a zoom-in to North-Western Arnhem Land as an example). Most Next G phones come with standard features uncommon to those prior including a camera, video chat capabilities, MP3 player and, importantly, Internet capabilities. Studies on the use of mobile phones in Aboriginal communities in Australia are few and far between (the author could find only a handful of site specific studies) but in a survey in Central Australia, the Tangentyere Council and Central Land Council (2007) found that most people used them to keep in touch with friends and relatives. Interestingly, around a third used it to call family or friends who were interstate (p.39). Similarly, Brady, et al. (2008) discussed the use of mobiles in the Torres Strait Islands for communication with relatives who had moved away for school or work. Meanwhile, Sinanan's study in rural Victoria (2008) identifies how mobile phones are used to spread information about movements to and from the community including plans for weekend trips away.

Insert Figure 2 here

On the one hand, the rapid uptake of mobile phones in remote communities is unsurprising since the introduction of these to remote and economically depressed populations in Africa saw growth rates in subscriptions exceeded anywhere else in the world (Brady et al., 2008). This may be partially explainable by the absence of reliable legacy ICTs, especially fixed-line telephones, known to be an issue for remote Aboriginal communities in Australia (Kalba, 2008; ACMA, 2008) and also by the availability of pre-paid mobile phone plans at rates equivalent to non-remote areas. By contrast, rapid uptake rates belie the findings of many prior studies in Australia which underscore the influences of cost, poor literacy, numeracy and skills deficits for retarding the uptake of ICT in remote Aboriginal communities (ACMA, 2008; Smillie-Adjarkwa, 2005).

Meanwhile the mobile phone is widely touted as a facilitator for improving educational outcomes for remote Aboriginal students including in the areas of curriculum development, mathematical skills, and by general contributions to student's communication and information seeking skills (for example, Hartnell-Young and Frank, 2008). Improved educational outcomes have been positively correlated with urban migration from remote Aboriginal communities in Canada and the Arctic Circle amongst other places (for example, Rasmussen, 2002). The mobile phone has perhaps the greatest capacity to engage young people with the global world and should individuals increasingly opt to utilise its Internet related functionalities, as a means of obtaining information on activities and opportunities away from their communities, at least some migration effects will be realised.

But the mobile phone is far more than a piece of technology. It has mediated different distanciations for individuals, reflected in a re-organisation of space and time for mobile

phone users in general, as well as re-mediations of social relationships (DiMaggio & Hargittai, 2001). Text messaging, for example, has proven to be unexpectedly popular in Aboriginal communities where literacy skills are notoriously poor and where supposed barriers to the use of such forms of communication were previously seen as impervious and contrary to the needs of an oral based culture (Brady et al., 2008). An expansion of mobile phone use and its adoption in a more western form may see face-to-face contact, relied upon in the past for communicating information and conducting Indigenous 'business' (Petersen, 2004,) become less of a direct influence on spatiality, while the knowledge about specific events, jobs and so on gained via mobile phones may create new aspirations for migration. As virtual technologies are more widely adopted, remote lives will become increasingly organised around specific events, appointments and gatherings. Whereas Aboriginal travel itineraries now are depicted as group events occurring around flexible itineraries (compared to the diarised nature of travel for urban populations), travel itineraries for Aboriginal people may in the future condense across space and time with the composition of travel parties becoming more specific according to the purpose of the trip. The mobile phone may too become a tool for finding and accessing employment opportunities located away from communities, as has been recorded for populations in Africa (Muto, 2009).

Laptops

Throughout remote Australia, small and hardy "XO" laptops are being distributed to around 20,000 Indigenous children aged four to 15 years, in priority order according to communities with the lowest Socio-Economic Index for Areas score (See Australian Bureau of Statistics 2008 for definitions). Backed by three of Australia's largest companies, the XO has built-in wireless Internet and a screen designed to minimise sunlight glare. It is dustproof, waterproof

and uses minimal power. An array of features such as distance education, educational games, art and music design are supported and these encourage students to engage daily with the technology:

The XO laptop is best used as an agency for engaging children in constructing knowledge which is based upon their personal interests. Furthermore, it provides the tool for kids to share and critique these constructions. We believe that this will invariably lead them to become both learners and teachers –empowering them to solve the problems that are relevant to them and their community. (One Laptop Per Child Organisation, 2010)

Computers in general, and particularly portable laptops, are espoused for their capacity to contribute to improved educational outcomes amongst Indigenous populations especially (Roberts, et al., 2005; Wallace, 2006). Progress in educational outcomes from the diffusion of mobile computers has been recorded in many countries including Ethiopia and for the Navajo in the United States of America (Financial Times, 2006). In all cases, educators and researchers appear to be surprised at how swiftly students have taken to using the functions and features of the machinery. Most suggest it is the visual and oral nature of information delivery facilitated by computers which young Aboriginal people find appealing (Brady et al., 2008). Valid concerns are, however, expressed about an over-reliance on technology for individual development, at the subjugation of pre-conditions (for example, good teachers) at the local level for realising sustained contributions to educational outcomes (for example, Wallace, 2008).

For the student, laptops enable participation in e-learning, a key point given the difficulties faced by educators in delivering consistent and high quality teaching to remote children, and the difficulties in attracting and retaining teachers. Studies in Italy have noted that e-learning has the capacity to reduce the ‘tail’ of the bell curve of student outcomes (Roberts, et al.) and in northern Canada, e-learning is a widely used method, in general considered as a successful technique for teaching remote and marginalised students (Roberts, et al.). For teachers and parents the in-community infrastructures required for e-learning (essentially internet and videoconferencing) meant that teachers can receive online learning and support and that counselling and other online forums between education providers, schools and parents can be facilitated.

Insert Figure 3 here

While the purpose of the XO laptops is primarily to engage children in new processes of learning, inevitably they will also grow up more accustomed to global forms of communication and learning on offer via the technology. They will learn different ways of gathering information to generations prior and have access to a far greater amount of information. The current youth will also be able to conduct e-commerce using their machines. A whole generation will be familiar with using the Internet for everyday purposes and be exposed to mass consumerism through it. Predicting how this might affect lifestyle aspirations is difficult. At the very least, young people will become more situationally aware, will have the knowledge and means to travel to more distant places should they desire to do so. Clearly for some this may be push factor for residential migration at discrete points in their lives but there the potential is also real that others may find ways to use laptops to build

theirs and their community's capacity for engaging with the global world while remaining as residents of their community.

E-services and e-commerce

For some time now governments at all levels in Australia have been integrating business models with the Internet for service delivery to remote Aboriginal communities (Dugdale et al. 2005). Examples included multi-agency hubs like the Rural Transaction Centres and the community access centres described by Daly (2005) which provide 'one-stop-shop' access to the Internet, government services, government and NGO information, and to e-commerce. Video conferencing has also featured in plans to bridge distances between city based organisations and their clients on the ground and, importantly, to reduce service delivery costs. Technology in situ also supports local service providers in health, education and other areas (for example, Kildea et al. 2006). These community based technology touchpoints have improved the capacity for local engagement with ICTs of all types by encouraging skills development and familiarity.

But there are mixed findings on the uptake of e-commerce by people in Aboriginal communities. Brady (2007) found that, in spite of limited efforts from Internet banking providers to account for cultural and linguistic diversity amongst users, Aboriginal people have taken favourably to it. Many users in her study reported training and helping up to ten other individuals use the facilities, in a form of community-based training. Common tasks included checking balances, transferring money to family and purchasing goods from outside of the community. This is supported by McCallum & Papandrea's (2009) study in Central Australia where more Internet users reported using the Internet for banking than for email or

general browsing (p.1239). However, numerous studies point to failures in relation to e-commerce in remote communities, with most citing a lack of funding and support, and a lack of local input to the implementation, training and support of ICT initiatives (Daly, 2005).

With the Internet now available on mobile phones and with plans inclusive of data downloads becoming widely available, touchpoints with the Internet may shift from being largely community based to individual ICTs. How this influences spatial movements may vary according to demographic factors (age, gender and so on), ICT competence (also related to age) and many other factors. For some, ready access to information on how to move about and the ability to book transport and plan itineraries around events elsewhere will enhance their desire and capacity for travel. Mobile Internet also allows people on the move, such as family and friends, to keep in touch and report their locations. For others, however, the need to travel may be reduced by their capacity to access online services in a mobile fashion where otherwise they might have travelled to service centres. Internet banking is a prime example but increasingly we may see health and other services become more closely integrated with personal technologies like the telemedicine concept in Canada which provides online medical consultations to remote First Nations people.

Web 2.0 technologies (social enabling software)

Web 2.0 is a term commonly used to describe a group of Internet-based applications which facilitate active user generated content and social connectivity online. These include blogs (for example, blogger.com), social networking sites (Facebook), wikis (like Wikipedia), podcasts (audio recordings of talks, lectures, books), RSS feeds (information on updated website content delivered to the user), video and audio sharing (like YouTube) and tagging

and social bookmarking (for example librarything.com). These applications are essentially social enabling tools which introduce people to individuals and new networks. They are noted for reducing the uncertainty around developing friendships and acquaintances which is traditionally associated with face-to-face contact (Stern & Taylor, 2007). They also engage individuals in interests outside of the immediate social and physical domain and provide users with new forms of self-expression and with feedback from interactions with other users (Yurchisin et al, 2005).

Computer mediated networking has extended to personal relationships, as the boom in Internet dating suggests. Web 2.0 enhances opportunities for people in remote Australia to meet partners virtually and a matching site for Indigenous Australians already exists to enable members to "...make new friends, network or to find that special someone to spend your life that shares similar interests, values, traditions and beliefs." (The Black Match, 2010). The popularity of applications which narrow down partner searches to people with like values and beliefs has been witnessed amongst other marginal populations in developed nations like American Muslims, the majority of whom are African Americans (Lo and Aziz, 2009). Extending this, mixed partnered relationships are likely to increase as remote located Aboriginal people form relationships with people outside of their communities using Facebook, Internet dating and other digital media. Mixed partnering is most likely to generate moves away from remote communities when co-location occurs simply because of the distribution of the non-Indigenous population. Aboriginal women in mixed partnerships far outnumber men and even the loss of a handful from each remote community will signify changed fertility, age structures and social conditions.

At the same time, virtual communications have made possible the showcasing of Indigenous cultures, encouraging travel away from communities. In 2007, a video of the ‘Chooky Dancers’ of Elcho Island in the NT performing ‘Zorbas Dance’ became the most watched video on YouTube at the time (The Australian, 2007). The group was subsequently transported to southern Australia and to Greece to perform the dance. In addition, Indigenous art works and the stories behind individual pieces, their artists, and their communities can be viewed and purchased online from community art centres or collaborative art houses (for example, Aboriginal Art Online 2008). Similarly, Warren and Evit (2010) have described the experiences of two Aboriginal hip-hop artists from remote communities who used YouTube to overcome distance to disseminate their music. This led to opportunities to travel and perform their music, including to overseas. These small-scale contemporary means of ‘cultural outreach’ have the potential to engage remote Indigenous people (artists, musicians, web site designers, and so on) with mainstream business practices and to link them into business and social networks in distant places. Small groups of people may undertake travel or be located in urban centres as they seek to expand these activities with technologies linking virtually them back to home communities. Even now, there is a not insignificant cohort of Australian Rules Footballers living in southern states playing the sport professionally. But as with other technologies, the capacity to communicate online may in bypass the need for travel by connecting like minded people, family and friends online. For the older generation in particular, these applications may actually have a marginalising effect if a reluctance to use them sees them not engaging in global forms of communication.

Discussion and conclusions

In discussing just a few emergent technologies, we have demonstrated the inherent complexity of understanding migration as a force for population change. Migration is after all an expression of individual desires for changed spatiality, but is centred on a myriad of associated drivers. For researchers seeking to expand knowledge in the field, many questions surround the nature of demographic, settlement and social effects to be expected from new generation technologies. ICT diffusion further compounds the already multifarious character of modelling, forecasting and drawing conclusions about future migration patterns and resultant demographic change in the NT.

But what perhaps stands out most from the analysis of individual technologies presented here is that Indigenous peoples across the world appear to very quickly adapt and adopt specific ICTs, and often a mix of these, to suit their economic, social and cultural needs and in order to obtain benefits they have identified as desirable. This means there is no linear model by which we can assess the likely outcomes of ICT penetration in the context of remote Aboriginal people in the NT. The nature of the outcomes in terms of migration will vary, not only according to the types of technologies introduced and used, but also the starting demographic and economic conditions in individual communities. In the remote NT and across remote Australia, these are highly varied, in spite of the largely amorphous picture depicted in the media and literature.

It is important to note that the technologies featured here are not nascent by any means. Their ongoing introduction to remote Aboriginal communities is indicative not just of the tyranny of remoteness but of the role contemporary policy for closing socio-economic gaps between Indigenous and other Australians is playing in ICT diffusion. Under these policies, little no consideration has been given to the potential effects of the reach of the global world into

Australia's most remote and culturally specific spaces. The available knowledge about direct impacts from ICT diffusion into Indigenous populations is primarily from developing nations and is quite unambiguous about depicting increased migration to large population centres, especially in relation to mobile phones. The critical question in the NT is who and how many will be influenced? In turn, critical to answering this question is knowledge about the relationship of improved educational outcomes to wider ICT use. Better education outcomes, on the one hand, are likely to lead to increased rural to urban migration in line with the experience elsewhere (Norris et al., 2004). Under this situation, ICTs will facilitate migration to larger population centres. They will influence the decision to migrate, assist with the logistics of the process, and be a means to ease the emotional burden post-migration by helping individuals to remain in contact with family and friends. Conversely, ICTs may contribute directly to accelerated positive educational outcomes by engendering people with the necessary skills for engaging with the global world and by their direct role in new pedagogies and ways of learning. Early reports into the rollout of the XO laptops would certainly support this.

The very rapid uptake of mobile phones amongst the young in particular suggests ICT capability issues are less significant than the narratives of doom and gloom have suggested. While some will argue that this merely reflects latent demand from years of poor access, it could equally be argued that policy makers and researchers simply got it wrong in identifying the core reasons for the low uptake of prior technologies, instead persisting that it connotes a disjuncture between technology and culture:

The speed with which residents have adopted 3G phones runs counter to the argument that Indigenous people need careful initiation into

new technology and time to construct it in personal terms... This study indicates that, if Indigenous people want a technology and it is deemed affordable, they will adopt it.” (Dyson and Brady, 2009, pg172)

In the current generation of mobile phones at least, the ‘market’ has found a product it likes and can afford to use. The mobile phone is another example of Aboriginal Australians adapting technologies, and it is time we ceased to be convinced they are not capable of doing so and instead work towards harnessing their full potential for meeting individual aspirations. Ostensively, the ‘new’ technologies discussed here, so long as their reliability is proven, bypass the need to rectify the poor availability and the inadequacies of remnant technologies (fixed line services, dial up Internet and so on) in remote Aboriginal communities. Clearly social equity measures for those unwilling or unable to use the new ICTs must exist, but over time the size of this group will diminish.

A number of policy and demographic inferences can be drawn from this study. First, the participation by young Aboriginal people in technology assisted learning in remote NT communities today signifies that a change in how individuals communicate, gain information and see the world is forthcoming. This will be represented in the propensity for information delivered by mobile ICTs to influence and re-align daily processes and activities. As an example, we might expect daily activities to be increasingly organised around calendars and specific events. On this basis it is not difficult to envisage that at least some of the younger generation will not use or be influenced by information delivered by these technologies to re-

order in some way their spatialities. How many and how this transpires is the critical question and, until quantifications of the impacts (or not) from technological diffusion are forthcoming, these matters will add to the dilemmas of governments who must take into account servicing needs according to the share of the population which is Indigenous (Biddle, 2009). These needs are great and are hamstrung by the existing limitations of data and research for forward planning. The parsimonious advice for policy makers is that emerging technologies are likely to grow the size of the urbanising cohort and that the ‘new urbanites’ are likely to be those aged 20 to 30 years and more likely to be female. Consequently, absolute growth in the urban Aboriginal diaspora (for Darwin in particular) should be expected. But continued high fertility in remote areas should in the short term (over the next generation) mitigate net any re-distributive effects between remote and non-remote regions. Accounting for the housing, employment, health and education implications of the new urbanites is critical to the long-term outcomes from any such transition and to avoiding social and economic marginalization. However in the longer term (two or three generations), if the goals of closing socio-economic gaps are forthcoming, fertility rates will be driven down and we can expect the urban share of Aboriginal people to grow markedly.

For demographers, increased residential migration by young adults will bring into question the status quo their being a ‘flatter’ age migration curve for Indigenous Australians when compared to others. The respected works of Roger’s in this field proposes that several migration intensity curves can be modelled and fitted together to reflect the propensity for residential migration at different stages in life and in turn at specific ages (Rogers, 1990). For Indigenous Australians, the curve depicting the propensity to migrate over ages 20 to 30 (the ‘labour force curve’) lacks the spike observed in the non-Indigenous curve which is created by the migration of young adults to commence and further their careers. But when efforts to

close socio-economic gaps start succeeding, the question is raised as to whether the model migration schedule for Indigenous people will begin to more closely approximate the non-Indigenous curves. Indeed, this may be as good an indicator as any of progress in closing the gaps. Nevertheless, accounting for any such change in formal demographic projections modeling, and thus future planning for services and settlements will be a particularly difficult but necessary task.

If ICT use does stimulate larger numbers of people to move from remote to larger centres we can also expect greater numbers undertaking onward migration to places outside of the NT. Interstate and international migration is not commonly considered as part of the Aboriginal experience, but there are strong voices for overseas recounting these effects on marginalised populations (IOM, 2008). Greater flows to larger population centres can also be expected to generate larger numbers returning to communities on a residential basis. These may include groups of people who have spent time in urban centres becoming educated and developing careers but who desire a return to their community, akin to the 'tree change' movement. In line with this we may also see an increase in dual residency by Aboriginal people who were originally from communities, but this will be hard to identify (from a lack of data) and be a long-term outcome.

At the same time there are questions about how ICT will affect intra-regional migration (short-term travel within remote areas and between remote and other regions including interstate). While the arrival of the motor vehicle meant that travel for family, cultural and other occasions could be completed more rapidly, mobile phones and laptops mean that travel for at least some of these events is not necessarily required at all because people can communicate using video conferencing and video chat. Similarly, the e-commerce and

service delivery functionalities offered by ICTs may reduce the need for trips into towns. Counterbalancing this, information on localised events and gatherings will be more pervasive and this may stimulate additional travel (for example, for concerts, educational seminars, parties, fishing trips and so on) outside of their governing spatial context. The overall effect is likely to be a concentric widening of migratory paths as individuals visit progressively more distant people and places which they have become aware of and established networks within through the use of ICTs.

This concentric widening of migration from communities is proposed as the future fourth migratory transition for remote Aboriginal people in the NT. It will differ fundamentally from the third transition (de-concentration away from communities) described by Taylor and Bell (2004) because, while larger numbers of people can be expected to venture further away from their communities on both a permanent and temporary basis, a major net re-distribution (de-concentration) despite this is unlikely to result so long as birth rates in remote areas remain high. Should these reduce, spatial re-distribution of the remote population is likely, featuring dispersal further away from communities and increasingly on a residential basis.

An attempt to depict the proposed fourth transition is made in Figure 4. Each of the six drivers represents key elements of individual's lives affected by the ICTs discussed here. Starting from the centre, we can expect travel between communities in remote areas to continue as prominent in the overall system of Aboriginal migration. Included is the influence of ICTs in reducing the need for travel outside of communities for at least some people. But ICT will progressively push individuals across further distances from communities for the purposes of travel and recreation, partner formation, employment, to visit friends or relatives (VFR), attend events and access services. This is depicted in the arrows for each of the six

proposed drivers of the fourth transition. The initial arrow indicates the expected majority flow, while the arrow furthest from the community represents both the expected finishing zone (that is the reach of migration according to settlement types) and the relative distances within each spatial unit which the flows are anticipated to reach, for example, interstate versus overseas for travel and recreation. Hence, the extension of the travel and recreation arrow to mid way through the interstate and overseas spatial zone symbolises the expectation that this form of migration will propel people to places which are a large distances from their home communities. Conversely, we can expect migration driven by the need to access services to largely involve travel to nearby service centres. Lastly, some of the drivers are depicted to include substantial return migration, as indicated by arrows pointing to the centre of the diagram. Migration for partnering (especially mixed partnering), for example is not expected to generate significant return migration whereas VFR is.

Insert Figure 4 here

There is always a danger in contemplating and researching Aboriginal people in remote Australia of shutting off space for alternative paradigms which describe fundamentally different futures for individuals who no doubt want nothing more than to better their own and their families and friends lives. What is lost in the doomsayer's literature on technology and Indigenous culture is that dispossessed Indigenous people around the world have used both technology and migration as a coping strategy to deal with threats imposed by settling populations and resultant structural re-ordering of life according to Western norms (ecological migration provides some insights - see Poston and White, 1978, for example). But Indigenous peoples have also integrated and adapted technologies to affect positive benefits and improve their wellbeing. The technologies discussed here both appeal to and can help

facilitate individual 'success', according to Western notions about what that means (jobs, home ownership, consumerism, travel and so on). Substantial pressure is bearing down from the outside of communities for Aboriginal people to begin to realise such successes in greater numbers. The notion that technology and culture cannot be bedfellows, because the former symbolises the destruction of the latter, goes against the intent and rhetoric contemporary policy which aims to narrow existing socio-economic gaps. It is therefore naïve to suggest that Aboriginal people do not or will not want the trappings of globalisation. Many will first discover what these are through the virtual world, but subsequently enact changed spatialities to physically obtain them and to obtain the experiences which go hand in hand with it (shopping in a department store, travel, major concerts and so on).

Of course an immediate need for research which explores current practices in the use of use of the ICTs outlined here and their influences on migration to and from communities is apparent. Baseline knowledge about current use of technologies and applications in relation to decisions about migration and travel is required. The ideal starting point for such enquiries is young people given the indications of their thirst for ICT. But the more difficult task is to convey the interrelationships and relative importance of individual drivers of changed spatiality, something which the conceptualization above does not do. These are complex and long-term research goals which deserve attention for their capacity to assist with planning for the future human geography of the NT and other remote areas where there is a high Indigenous share in the population.

Finally, the issue of what consequences can we expect from the modernity of life in remote Aboriginal communities in the NT is at the heart of the debate on what benefits globalisation brings for humankind. While technologies are not a new construct in these spaces, access to

the new generations brings with it questions about ICTs capacity to truly deliver 'progress'. Fundamental to that consternation we cannot ignore the potential for individual aspirations to drive social and cultural transitioning, as it has elsewhere, and consequently demographic re-distributions. But like most discussions in the realm of Indigenous spatiality, more questions are raised than answered. And, disconcertingly, it is by no means clear how we will know that we have found, or by what measures we might construct answers to them. While the weight of evidence suggests that ICTs might generate a further migration transition, even the seemingly straightforward task of identifying and measuring changes invokes tangled and difficult debates about how the nation addresses Indigenous relations. The role of the researcher is to forewarn as well as to retrospectively analyse, and in the field of Indigenous migration, impacts from residential migration have largely been ignored. Nevertheless, if the rhetoric of policy is upheld, it would be hypocritical to cling to antiquated mindsets of Aboriginal Australians currently living in remote communities as without aspirations for engaging more fully with the globalised world. And if such aspirations are realised, policy must be forthcoming which deals with the servicing and social needs of the diaspora as well as those remaining as residents of remote Aboriginal communities.

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