

EXCLUDED AGAIN: IMPLICATIONS OF INTEGRATED E-GOVERNMENT SYSTEMS  
FOR THOSE AT THE MARGINS<sup>1</sup>

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**Abstract**

**Purpose:** This paper highlights a poorly-understood dimension of digital exclusion that is not related to access to Information and Communication Technologies (ICTs) but rather to the reduction in flexibility for providing and administering public services following the implementation of an integrated e-government system.

**Methodology/approach:** A case study of a project focused on reducing barriers to the delivery of driver licensing services to a remote indigenous community in Australia was undertaken and the data were analysed using Kling et al.'s (2003) STIN modelling approach.

**Findings:** The paper makes four recommendations to improve the licensing situation for the community that are induced from the findings. In particular the paper draws attention to the need to carefully analyse possible negative impacts of any e-government initiative for those at the margins of society.

**Research limitations/implications:** The paper aims to analyse the current situation as the foundation for recommending future actions. These can form the basis for subsequent interventions in the licensing situation.

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<sup>1</sup> An earlier version of this paper was presented at ECIS 2007 in St Gallen, Switzerland.

**Practical implications:** This research provides an outsiders' overview of the licensing situation and recommendations for change that take account of a diversity of viewpoints and interests.

**Originality:** The paper contributes to our understanding of the relationship between ICTs and social exclusion in three ways. It provides a rich narrative describing the secondary impacts of integrated e-government systems, a theoretically grounded analysis of the situation and some recommendations for addressing some of the implications at both the community level as well as calling for more careful evaluation of possible negative consequences about shifting service provision to integrated systems.

**Keywords:** digital exclusion, e-government, integrated information systems, ensembles of technologies, socio-technical analysis

**Paper Type:** Research paper

## INTRODUCTION

The uptake of e-commerce in the commercial sector encouraged the application of computer-based systems in the public sector and widespread support for e-government initiatives in both the developed and developing worlds (Navarra and Cornford, 2004). One dimension of e-government is the capacity to provide public services electronically 24x7 (Carter and Belanger, 2005), and the associated benefits of shifting the provision of public services from face-to-face contact with public servants to interactions through information and communication technologies (ICTs) have been widely espoused. However, the implementation of e-government, has also indicated possible negative consequences. There has been much debate about the 'digital divide' and the related widening of the gap between

the 'haves' and 'have nots' of the digital world (Hargittai, 1999; DiMaggio et al., 2001). More recently this debate has broadened from the concept of access to ICTs as part of the digital divide to examine social exclusion and the role played by ICTs in the process whereby people are included in or actively excluded from the mainstream (Warschauer, 2003; Dutton, 2005; Cushman and Klecun, 2006). This paper contributes to debate around the role of ICTs in social exclusion with a slightly different focus and investigates the situation where the ICTs are part of an e-government initiative. The paper examines the consequences of e-government on a group of people at the margins of society in a developed country. Unlike research studying the issue of marginalised groups' access and use of ICTs, this research examines some of the implications of shifting provision of government services to integrated ICT-based systems for those who are already excluded from mainstream society.

The paper makes three contributions to information systems research. Firstly, it provides rich, empirical data about a poorly-understood group, the marginalised in the developed world, and the unintended consequences of e-government initiatives. Secondly, it provides a theoretically-grounded analysis of the larger social, political, economic and technical web of which these marginalised people are only one element. A socio-technical interaction network (STIN) modelling approach (Kling et al., 2003) is applied and extended as part of this analysis. Thirdly, it highlights the need for careful design and rigorous evaluation of e-government initiatives in order to ensure that they do not further exclude already-marginalised groups of citizens. Given the fundamental governmental tenet of universalism—to nurture the interests of *all* citizens not just majority groups—and the difficulty of reversing negative consequences on already-excluded groups, much more care should be given to forecasting potential negative impacts of e-government initiatives.

The research sits at the intersection of two principal areas of interest: e-government (broadly defined as the use of ICTs in the public sector) and social exclusion (the process through which some individuals or groups exist at the margins of mainstream society), especially digital exclusion (the role played by ICTs in social exclusion). The paper begins with a discussion of these areas, highlighting some of the identified shortcomings of e-government and measures taken in the UK and USA to address social and digital exclusion. Theoretical lenses for examining e-government are then presented. An ensemble view, characterised by the STIN approach proposed by Rob Kling and colleagues (Kling et al., 2003), facilitates the analysis of the consequences of an e-government system on a marginalised community within a developed country. This analysis surfaces a number of issues that should be heeded when designing interventions within the community in order to minimise further negative impacts. The paper concludes that efforts to address the consequences of e-government must focus not just on the ICT system but the whole ensemble of socio-technical relations associated with the delivery of public policy.

## BACKGROUND

### E-government

E-government had its genesis in the widespread hype and acclaimed benefits of e-Commerce during the late 1990s and early 2000s. Initial e-government initiatives aimed to reproduce improvements in efficiency, integration and customer satisfaction claimed by the commercial sector from investments in sophisticated ICT-based systems. Subsequent uptake of web-based, enterprise and inter-organisational systems in the public sector aimed to achieve greater efficiency, diversity and accessibility of government services (Burn and Robins, 2003; Carter and Belanger, 2005).

Although ICT-based systems have brought significant benefits to commercial operations, there are some fundamental differences between the commercial and public sectors. Whereas in the commercial sector the customer has choices (eg to transact online or face-to-face, or to choose between different providers), under e-government citizens may lose the choice between electronic or face-to-face services, they may not have a choice between providers and participation in the transaction may be mandatory. This suggests that care should be taken when applying the lessons from commercial operations to provision of public sector services. Research into e-government supports this caveat. In general e-government initiatives have not delivered expected cost savings nor improved social inclusion, innovation or participation (Taylor, 2004). Analysis of nineteen studies of information systems in public administration shows that in half the impacts have been positive and one-third report negative impacts (Danziger and Andersen, 2002). Positive impacts largely relate to improved service delivery while negative impacts tend to be associated with a reduction in the level of flexibility available to “street-level” bureaucrats when dealing with citizens. These findings reflect the inherent tension in service delivery initiatives where the efficiency benefits that accrue from the standardisation of processes across agencies must be balanced against the need for local knowledge and expertise held by individual providers (Ellingsen et al., 2007). Flexibility in decision-making is important for upholding the traditional public administration value of universalism, so that administrative procedures are fairly applied to all people whatever their social identity or background. This ideal has its limits because administrative and legislative rules are social constructs that “*generally reflect the dominant social and economic circumstances of the time and place for which they were written*” (Sanders, 2004:4). Therefore, public servants may need to interpret and adapt rules and procedures for

populations that have very different social and economic circumstances to the dominant population.

Government-wide integrated ICT systems such as those that pursue “joined-up government” (Chadwick and May, 2003) may decrease this flexibility to interpret and adapt policy. Some view this reduced flexibility in a positive light. For example Bovens and Zourdis (2002) describe this as an essential step in transforming public administration from “*noisy disorganized decision-making factories populated by fickle officials*” toward “*quiet information refineries, in which nearly all decisions are pre-programmed by algorithms and digital decision trees*”. Consequently policy staff, system designers and IT experts are seen as the new interpreters of policy through their power to convert legislative frameworks into “*concrete algorithms, decision trees and modules.*” This view recognises the crucial role that policy and systems designers play when developing and implementing ICT-based systems in the delivery of public sector services. This perspective however, does not take into account that such standardisation and integration of services decreases the ability of public servants to address the needs of *all* citizens.

### Social exclusion

Early discussions of the potential negative impact of e-government relate to the ‘digital divide’ that reflects a state where some groups have access to computers and the internet while others do not. Lack of access to ICTs, however, is a characteristic of a larger situation of inclusion and exclusion. The terms social inclusion and social exclusion refer to the extent that individuals, families and communities are able to fully participate in society and control their own destinies, taking into account a variety of socio-economic factors such as employment, health, education, housing, culture, and civic engagement. Social exclusion is a process whereby there is a disconnect in the social bond between the individual and

mainstream society (Milbourne, 2006). The cause of this disconnect may be attributed to the individual through lack of initiative, resources or skills (Veit-Wilson, 1998), society and its structures (Walker and Walker, 1997; Berghman, 1995) or as emerging from interaction of the two. The processes of exclusion operate differentially in different areas, and research in the UK notes that remoter rural areas – those located away from main population areas – record higher levels of low income and poverty (Milbourne, 2006). In Australia the situation is more complex, where there is not merely an urban/rural divide. Remote rural areas are at a significant remove from cities and towns, often measured in thousands rather than tens or hundreds of kilometres. There is an absence of labour or housing markets and services such as mobile phone coverage, public transport, health and education are limited. Further, a large proportion of those living in remote areas are indigenous Australians. Here ‘remoter rural areas’ has quite a different connotation to that in the UK.

The UK and US have taken similar approaches to social exclusion in rural areas over the last decade. Both countries have tackled barriers to inclusion by providing a range of public services in rural areas including housing, transport, health and education and by retaining retail facilities such as the Post Office (Milbourne, 2006). At the same time, there was devolution of authority and service provision from centralised, government departments to local public and private sector agencies. Subsequently, some of the risks of devolved authority and resulting fragmentation of responsibility and resources were addressed by efforts to coordinate policy across local government and other agencies (Milbourne, 2006; Shucksmith, 2003). More importantly, the UK government made a commitment to consider the impacts of all domestic policy on rural areas under the label of ‘rural proofing’. As yet there are no such holistic policy initiatives in Australia to tackle the problems of exclusion in remote areas.

One aspect of social exclusion relates to ICTs. Cushman and Klecun (2006) note the small but growing literature on intersection of the digital divide, social exclusion and ICTs and examine the role of ICTs in social exclusion under the label of 'digital exclusion'. This reflects the paradoxical role played by ICTs. For many marginalised groups in developed countries, there are powerful arguments that ICTs can provide greater choices – in everyday life, in informational and communicative interactions and in inclusion into mainstream activities. At the same time, ICTs can act as a barrier, intervening between individuals and public sector services in a way that limits their choices and abilities to join the mainstream. One of the leading challenges for e-government is to find ways of integrating ICT-based systems into communities in ways that strengthen social inclusion and counter the emergence and deepening of social and economic divides (Dugdale et al., 2005). The concept of digital exclusion facilitates investigation of both micro-level forces relating to access to computers, resources to learn and support to maintain skills as well as macro-level forces around the pervasiveness of technology and ICT-related policy and infrastructure. This 'larger picture' helps in designing, implementing and sustaining change at both levels in order to achieve enduring improvements.

### THEORETICAL LENS

The complexity of this 'larger picture' indicates that our analysis should examine the technology not in isolation but as a part of what has been variously described as a complex interrelated web, ensemble or network of influences. Such a view depicts technology as only one of the many elements in the development or use of information systems. Orlikowski and Iacono (2001) for example suggest that the ensemble view may examine how the technology *came to be*, illustrated by the Social Construction of Technology (Bijker et al., 1987) and

Actor-Network Theory (Callon, 1986; Latour, 1987) approaches *or how it comes to be used*, as seen in the web model of Kling and Scacchi (1982) that describes an ensemble of “*equipment, techniques, applications, and people that define a social context*” as well as the infrastructure, social relations, policies and processes around technology in use. Viewing ICTs as part of an ensemble transcends the view of technology as a tool that can provide defined benefits to governments (e.g. reduced costs and greater efficiencies) or citizens (e.g. empowerment through access to information). It acknowledges the emergent outcomes of technology use (Markus and Robey, 1988) and may encourage public administrations to seek to analyse a range of possible outcomes that may emerge from e-government initiatives.

Faced with studying the complex set of relationships that surround the effects of e-government on people at the margins we chose to base our analysis on the socio-technical interaction network (STIN) modelling approach (Kling et al., 2003). A major influence in selecting the STIN approach, rather than alternatives such as Soft Systems Methodology (SSM) (Checkland, 1981), was our intention to unpack the complex network of relationships in the “as-is” system rather than to intervene in the human activity system under analysis. Further, the STIN approach is heuristic to guide but not prescribe analysis activities and can be applied without reliance on gaining the full commitment of actors over the various stages of an SSM study.

Kling et al. define a STIN as “*a network that includes people (including organizations), equipment, data, diverse resources ..., documents and messages, legal arrangements and enforcement mechanisms, and resource flows.*” The relationships between each of these elements of a STIN may be social, economic and political. The focus of Kling et al.’s paper was e-forums but they indicated there were broader applications because “*STIN models help*

*us to understand human behaviours in the use of technology-mediated social settings*” (Kling et al., 2003:48).

We used a STIN modelling approach to understand the role of ICTs embedded in a socio-technical network of government policy and services for a marginalised community. The STIN modelling approach is described by its authors in terms of nine heuristics but in line with the suggestion that the steps for developing STIN models “*should be taken as illustrative, rather than strictly enumerative*” (Kling et al., 2003:57), we aggregated the nine recommended steps into three analytical phases: a stakeholder/actor analysis; a network relationship analysis; and a network trajectory analysis. In doing so, we modify and extend the STIN concept by classifying stakeholders according to their levels of interest and influence.

## RESEARCH METHOD

We selected the Indigenous Licensing Project (ILP) to investigate the effects of e-government systems on marginalised sections of the community. The ILP is managed by the Department for Planning and Infrastructure (DPI), an agency of the State Government of Western Australia (WA). The project aims to “*identify and document the barriers to service delivery in Indigenous communities*” in order to provide “*improved access to licensing services for Indigenous people, particularly those living in remote communities*” (DPI Briefing Note). The ILP is focused on one marginalised community in WA that we have called Ngaan. Preliminary discussions and examination of documents relating to the charter of the ILP identified three stakeholder groups involved in the project: those responsible for the conduct of the ILP, those involved in the delivery of licensing services to the Indigenous community, and those involved in the design, development and delivery of the wider licensing system.

The data collection was intentionally limited to those involved in the ILP and licensing service delivery. The reticence of the indigenous community “*to discuss issues with white people from the ‘city’*” had been noted (DPI Briefing Note). More importantly, we were particularly mindful of a long history of well-intentioned people and agencies promising improvements to indigenous communities which ultimately failed to deliver enduring change. Our approach is to analyse the current service delivery system (the focus of this paper) as a foundation for designing possible future interventions and so we relied on the accounts of intermediaries who work directly with the members of the community. Thus, this paper presents an outsiders’ view of the ILP project and the WA licensing system more generally.

In-depth, semi-structured interviews were held with the key representatives of each stakeholder group. The seven informants were the ILP project manager and the manager overseeing the project (and other projects related to indigenous communities), a consultant engaged by the ILP to interact with the community, the manager of licensing service delivery, the regional manager and licensing branch manager responsible for services to the community in question, and an officer responsible for liaising with the indigenous community in cases of breaches to licensing-related laws. The interviews started in an unstructured way: ‘tell us about the ILP project’. As they replied, each participant was probed for greater detail about specific issues and their sources of information were sought. The interviews lasted for between 1.5 and 2 hours. Some participants provided additional documents either at, or after, the interviews. Uncertain issues were clarified by follow-up telephone and face-to-face conversations. In addition to interviews with stakeholder representatives, one author participated in a two-day national forum which considered many aspects of indigenous road safety. The interviews and documentation were used to build a step-by-step table for gaining a license and to tease out issues relevant to the analysis. A case narrative was then written of the

'story' of the ILP project from the interviews and related documents including policy documentation, consultancy reports, and educational publications; informants were anonymised to protect their identities. The researchers then analysed the different views of the system, identified themes and iteratively mapped these. The case narrative is presented in the next section, followed by a discussion of the analysis.

### CASE DESCRIPTION

The licensing of drivers is one of the most common transaction services provided by government and is a strong candidate for migration to ICT-based systems. The transaction services of driver licensing and renewal are, however, only one aspect of the overall policy cycle. The formulation of policy governing the training and testing of drivers, the application of various license classes and associated conditions, and recording of infringements add complexity to a process which appears on the surface to be relatively straightforward (Ciborra, 2005).

WA is Australia's largest state and comprises dense spots of population around the coastal fringe with the remaining vast tracts of sparsely-populated land, much of it desert. In WA, DPI is responsible for policy and legislation regulating driver licensing. Central to DPI's licensing operations is an integrated database that provides a single view of data about the licensing of drivers and vehicles. This recently introduced licensing database (called TRELIS) was developed over ten years at a cost of well in excess of \$AUD20.5 million (€12 million) and incorporates thousands of complex business rules governing driver and vehicle licensing. With TRELIS acting as the fundamental ICT infrastructure for licensing, a new policy initiative has been implemented to reduce high levels of road trauma among novice drivers. This policy, the Graduated Driver Training and Licensing policy (GDT&L), covers issuing of

learners' permits, driver testing and issuing and renewing licenses. In addition to TRELIS, the operational aspects of the GDT&L policy are supplemented by two ICT systems: a computer-based road rules test and a computer-based hazard perception test (a packaged application containing many scenarios featuring likely driving hazards).

Under the GDT&L, there are six phases in gaining a license. Progression through the driver training process cumulatively adds detail to the driver licence record on TRELIS which is also used by other public sector agencies including the Police and the Department of the Attorney General. Breaches of licensing rules can result in fines, licence suspension and even imprisonment (the state has 'three strikes and you are out' legislation whereby anyone found guilty of three similar offences, however minor, is imprisoned). The Fines Enforcement Registry (FER) within the Department of the Attorney General acts as a repository for all court-imposed fines. Where fines are imposed for vehicle and driving related offences, FER and TRELIS exchange data that enables fine notices to be sent to licence holders, as well as the recording of licence suspension when necessary.

In WA, the vast majority of people live within 100km of a large city or regional town. For most urban residents, the processes of gaining a driver's licence, updating address details, renewing licences and even the payment of licence infringement notices are enhanced by making these services available online. Providing an acceptable level of service is problematic, however, to people who live in remote communities (DPI Briefing Note) and the GDT&L model for obtaining a drivers licence begins to break down when applied to indigenous Australians in remote communities.

## Driver licensing for remote indigenous people

Indigenous Australians are profoundly marginalised members of Australian society. Land transport was the second highest cause of death (after self-harm) of indigenous Australians between 1997 and 2000 (Styles and Edmonston, 2006). Indigenous Australians are over-represented in car accident statistics, with a road fatality rate estimated to be about three times that of non-indigenous people. They are also over-represented in motor vehicle offences, especially unlicensed driving; in the Northern Territory almost 70% of the indigenous vehicle occupants or motor cyclists killed between 1996 and 1999 were either unlicensed or in a vehicle driven by an unlicensed person (ATSB, 2003). A study of indigenous prisoners in northern WA showed that only 8 per cent held a valid driver's licence and 73 per cent of them had never had a driver's licence. The increased rates of death among indigenous people are apparent across all age groups, but young people are at even higher risk than older indigenous road users. It is considered that a lack of appropriate driver training contributes to the unacceptably high rate of death and injury among indigenous people as result of road crashes (Fanciulli et al., 2004).

For some remote communities the nearest regional centre may be over five hundred kilometres away and therefore many public sector services are facilitated by third parties such as the police and the local shire. While the police do provide licence testing in some communities, they do not consider these activities as part of their 'core functions'. Furthermore, the relationship between the police and members of the indigenous communities is often antagonistic.

Each phase of the new integrated licensing system poses particular challenges for indigenous people living in remote communities. Firstly, a person applies for a learner's permit, completes a computerised road rules test of 30 multiple choice questions (the DPI website has

a page for practising this test) and then a learner record is created on TRELIS. Individuals must certify their identity and age so that the initial record on TRELIS can be created. This is a problem for many members of remote indigenous communities because either birth registration records have not been lodged or they have never obtained other forms of identification. Alternative arrangements such as a recognised Aboriginal elder attesting to an individual's identity and age were used in the past, but these arrangements cannot be implemented in TRELIS "*until the required system changes have been made*" (DPI Briefing Note).

The GDT&L assumes that learners have proficient English and literacy skills. However, the low levels of literacy among indigenous people are further complicated in those remote areas where English is a second language. In metropolitan locations, applicants with literacy or language issues have access to licensing staff who can deliver an oral version of the written tests but this is often not available in remote locations. Finally, the road rules test required to gain a learners' licence is computer based but due to lack of computers in remote locations, a paper-based test is offered as an alternative.

Having obtained a learner's permit, learning to drive involves lessons with an experienced driver prior to taking a practical driving test. The learner driver must record at least 25 hours of on-the-road practice with an experienced driver who has held a license for at least 4 years; this is documented in a learner's Log Book. It is recommended that learners practise on 'freeways, highways and/or major roads' and 'driving at speeds between 80km/h and 100km/h' (GDT&L Learner Phase II Log Book). Once completed, TRELIS is updated to reflect the change in the learner-driver's status. This phase poses significant problems for learners in remote communities: there may be few licensed drivers, let alone those having retained a license for more than four years; the registration number of the vehicle must be

recorded in the Log Book but learners may not have access to a registered vehicle. Cars may not be roadworthy and their lack of maintenance by rural indigenous drivers (through lack of knowhow or access to skilled mechanics) is another symptom of social exclusion (Styles and Edmonston, 2006). The recommendation that experience is gained on freeways and highways is unattainable as many people in remote communities have never seen such roads.

Once the learner turns 17 and sufficient driving experience is recorded in the Log Book, the computer-based Hazard Perception Test (see [www.learners.wa.gov.au](http://www.learners.wa.gov.au)) is taken. The test assesses the learner's responses to traffic situations; the response time to each situation is recorded on TRELIS and determines whether the test is passed. At present, even though the test is one of the fundamental components of driver licensing, members of remote communities are exempt due to their lack of access to computers.

### The Ngaan Community

In order to draw out the effects of the new licensing system, we focus on people in one remote Indigenous Community located near the Gibson Desert. We have called the community Ngaan to protect its identity. Ngaan is physically isolated – remote from any major town and the facilities associated with major population centres. It is also socially isolated as noted by one informant - *“the most recent arrival of people who ‘came in from the desert’ occurred only twenty years ago”*. It is a ‘dry’ community where the sale and consumption of alcohol is prohibited.

Car accidents with multiple injuries/fatalities are too common at Ngaan. The state of roads and cars contribute to this. Most roads in vicinity of Ngaan are made from pebbles or sand; there is only one 5km stretch of bitumen roadway. Vehicles deteriorate quickly in this harsh environment, they often have no doors and people travel in open load spaces which

contributes to serious injuries in car crashes. People travel extensively through the bush; when they travel on public tracks or roads they risk detection (unlicensed drivers, unroadworthy vehicles) by the police.

One interviewee noted that “*there is no culture of having a driver’s license*”. He estimated that about 16 of the 1600 members of the Ngaan community currently have a license. If people from Ngaan travel to larger towns, they face significant problems due to their unfamiliarity with the speed and complexity of traffic and road conditions. At present there are powerful incentives to increase the number of drivers’ licenses held by people from Ngaan:

- There are high injury and death rates arising from road accidents.
- Social implications of shortcomings in providing government services to indigenous people were noted by the recent Gordon Inquiry into Family Violence in Aboriginal Communities.
- Imprisonment rates are high for people from Ngaan due to unpaid fines and road offences.
- WA is experiencing a mining boom and there is a shortage of drivers who are licensed to drive heavy vehicles; there is pressure to meet this labour shortage by engaging indigenous people living in remote communities.

The Indigenous Licensing Project (ILP) was set up to examine the barriers to licensing for members of the Ngaan community. While focused on Ngaan, the ILP aims to improve access to licensing services for indigenous people, especially those living in remote communities; address the difference in delivery standards for indigenous and non-indigenous people (a political promise by the WA government); and to address the indigenous people’s poverty cycle by removing one of the barriers to sustained employment i.e. the lack of a driver’s

license. A secondary objective is to provide a strategy for improving access to services, including modifying key aspects of the GDT&L.

## DISCUSSION

The new licensing system (including the policy, rules, procedures and ICTs) was implemented to cover all licensing within WA; it was intended to standardise practice and improve levels of driving. Indigenous members of remote communities, however, are not provided with the same driver training and licensing facilities as those in cities. While the new computer-based licensing system may have enhanced the delivery of licensing services in metropolitan and regional centres, it has compounded the profound exclusion of indigenous people in remote communities. The new system has removed flexibility from individual police and licensing personnel and replaced them with the standard procedures and policy inscribed in, and enforced by, the integrated TRELIS system. Thus the effects of the new computer-based licensing system are twofold:

- it has failed to address the existing safety and driving issues within the Ngaan community, such as inexperienced and unlicensed drivers and unroadworthy and unregistered vehicles, that result in high injury and death rates from car accidents.
- it has led to deterioration in the life experience of many of the Ngaan people through increased fines and prison incarceration rates as a result of the ‘three strikes and you are out’ legislation in WA. TRELIS provides accurate and integrated data to police and other officials leading to increased enforcement of this legislation. Incarceration rates for repeat traffic offences is high: one informant even suggested that there would soon be no adult males remaining in Ngaan due to imprisonment for traffic and minor theft offences.

The licensing problem for the Ngaan community is just one dimension of severe, ongoing social exclusion. This is a wicked problem (Rittel and Webber, 1984) where the problem cannot be clearly stated, solutions cannot be evaluated as successful or unsuccessful and where interventions having positive effects on one part of the problem might occur with negative effects on another part. We cannot isolate discrete influences that might be seen to 'cause' the problem and so action to improve the situation will always be provisional and contested by different stakeholders. Unpredictable outcomes from well-intentioned interventions at Ngaan are illustrated by a driving training program set up by a local policeman for 34 of the community's women to improve the driving skills within the community and provide a pool of experienced drivers over time. Women were selected for this program because they tend to have fewer problems with alcohol abuse and have one-half the hospitalisation and one-third the fatality rates of indigenous males as a result of car accidents (Styles and Edmonston, 2006). But there have been unanticipated consequences. Initiated men refuse to be supervised by women and women have been coerced to drive by their partners. One mother of five failed to pay driving fines on three occasions and (given the 'three strikes' legislation) was consequently sentenced to 9 months jail in a town approximately 1000 kilometres from Ngaan; the absence of public transport or communication infrastructure suggests that the effects on her family will be devastating. Similarly, other initiatives that tie heavy-vehicle licensing of Ngaan people to the mining boom would require any licensed drivers to move to distant mining towns, where they would be isolated from their families and exposed to alcohol and other aspects of western lifestyle. Isolation, alienation and alcohol abuse are acknowledged symptoms of indigenous exposure to 'white man's world'.

## Socio-Technical Interaction Network Analysis

Kling et al.'s heuristics for developing STIN models focus on identifying relationships among a relevant population of system interactors. It became clear that the ILP project should be viewed not just as a network of influences at the one level (as shown in Kling et al., 2003) but as a series of interacting networks that were more direct in relation to Ngaan (through day-to-day interactions with the licensing system and its customers) or indirect (through the ability to create policy/provide resources and determine strategic direction). Thus we extend the work of Kling et al. and differentiate the interactors in terms of their levels of engagement and influence. This is pictured in Figure 1 with networks having greater engagement shown at the bottom, rising to lesser engagement at the top of the figure.

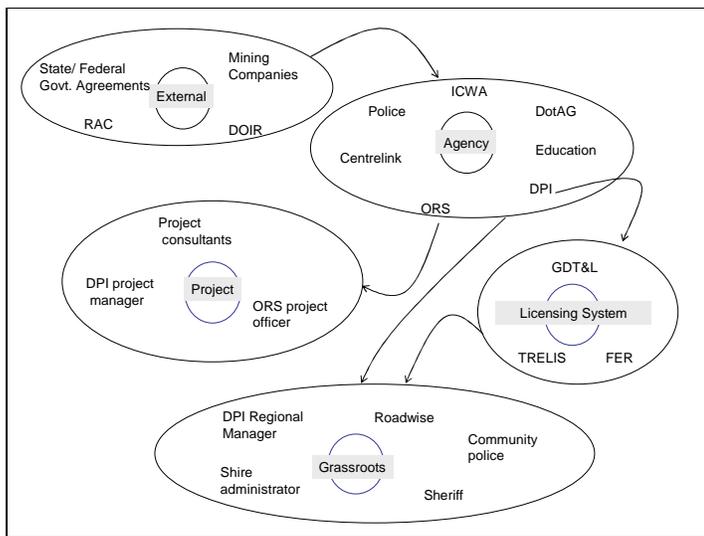


Figure 1: Ngaan Community Licensing STIN

The group of actors with the most engaged interaction with the Ngaan community members is at the grassroots level. They are dealing face-to-face with members of the community to provide services and include the local police officer, the Department of the Attorney General's Sheriff who is responsible for enforcing fine payments and licensing breaches, the

Shire administrator who acts as DPI's agent in the delivery of some licensing services, DPI's Licensing Manager for the region and the Department of Education's Roadwise team who provide educational programs on vehicle and road safety. In the past these actors were able to exercise a significant level of judgement in the delivery of licensing services at Ngaan.

The licensing system itself is treated as separate group of actors and includes the various technologies associated with TRELIS, the Fines Enforcement Registry and the GDT&L policy. There are two reasons for this. Firstly, Ngaan community members interact with the system indirectly through the activities of grassroots actors. The technologies which underpin the infrastructure of the licensing service are invisible to community members. Secondly, the licensing system artefacts are inscribed with the interests of policy and technical design objectives that are determined in isolation to the implementation of the system at Ngaan.

A third group of actors are those related to the ILP project. This group includes two private sector consultants who have expertise in consulting with Indigenous communities; one was born in Ngaan and has family ties to the community. The ILP is managed by a policy officer located in DPI's head office who liaises with representatives of Police, ORS (Office of Road Safety) and the Department of the Attorney General. All are working on problems faced by remote indigenous people in gaining and maintaining the drivers' licenses. However, the immensity of problems at Ngaan was acknowledged by all participants, leading to considerable uncertainty about what should be done.

Two further groupings of actors have significant power over the licensing system as a whole but more tangential interactions within the Ngaan Licensing STIN. At the level of Agency are those government agencies that have an interest in licensing or indigenous issues, but the licensing system for the Ngaan Community is not their *primary* concern. These agencies include DPI, the Office of Road Safety, Centrelink (social security), the Department of

Indigenous Affairs, and Police. The second grouping of External actors, including the State and federal governments and the mining companies, are part of the wider economic and political environment that influences the provision of licensing services in the Ngaan Community.

Following the identification of actors in a STIN, Kling et al.'s heuristics address analysing their relationships and interactions. As part of this analysis is the identification of incentives, that can be likened to a business model – how will the system add value to the core interactors? What would energise interaction and use of system so that it is sustainable? Applying these questions to the Ngaan situation highlights the contradiction between the process of gaining a license (that is educational and supportive of the learner) and the difficulties faced by remote indigenous people in retaining their licenses (as the probationary period is characterised by punitive measures and is embedded with values have little meaning to them). It is clear that the current, punitive system is not effective and some community members find it hard to appreciate why they need to conform to licensing requirements. Given their remote location and the lack of alternative modes of transport, travelling by car is something that is fundamental to their existence and driving is something that they have done since a young age – without a license and in unroadworthy vehicles.

Another aspect of the relationship analysis involves identifying excluded actors and undesirable interactions – a step that Kling et al. believe is crucial for achieving sustainability of the system. It is clear from the groupings of actors presented in Figure 1 that, even though the STIN is concerned with licensing services for the Ngaan Community, community members are not present in the model. Community members interact with the system via intermediaries: the system is applied to them. The reluctance of Ngaan people to engage with the ILP was noted above. However, any changes at Ngaan are unlikely to be sustained if there

is an absence of representatives from the Ngaan community (Braa et al., 2004; Kling et al., 2003). Enduring change will require active engagement and leadership by the Ngaan people in devising, trialling, modifying and evaluating a range of interventions.

Analysing relationships among actors requires that resource flows are identified. How do the effects of money, power, political interests and special interest groups flow through the network? It is striking that all individuals and groups directly involved in working with the Ngaan people have a great drive to try to rectify their social, economic and political exclusion. These grassroots groups interact directly with the Ngaan people but have little power to work around or change the system or the policies expressed in the system. For example, draft changes to the GDT&L have not been implemented due to inadequate resourcing (DPI Briefing Note). Also, the lack of coordination between the various systems interactors is clear. The DPI licensing system is only concerned with granting and renewing licenses. When community members lose their license due to traffic breaches or fines suspension, these penalties are enforced by other interested agencies. TRELIS provides the common point of interaction and documentation whereas co-ordination of strategies and interventions is required: resources need to flow across these groups to achieve such cooperation. Most efforts to alleviate the situation are directed at a single issue, by a single agency, for a short time period. Given the characteristics of a wicked problem, these are unlikely to provide sustained change in the situation.

As a means to examine the trajectory of the STIN construction, a further heuristic compares the new or projected system with the existing system. The licensing system prior to the introduction of the GDT&L and TRELIS , provided much more flexibility for the grassroots actors in applying their judgement and more opportunities for Ngaan people to avoid detection for repeat traffic offences. An inability to identify individuals coupled with a highly

mobile way of life allowed them to avoid the ‘three strikes’ mandatory jail sentences. The integration of TRELIS and FER means that enforcement of licensing rules is more stringent, monitoring of traffic offences is much more effective and opportunities for escaping punishment by changing names or location are reduced. The new integrated system allows more efficient administration (and by and large improved access to citizens) across two separate policy areas, Driver Licensing (DPI’s responsibility) and Fines Enforcement (Department of Attorney General’s responsibility). For the Ngaan community where driver training and licensing are critical community issues, the two policy areas come into conflict and the outcomes for the people of Ngaan are unsatisfactory.

## CONCLUSIONS

This paper contributes to our understanding of the possible effects of e-government on those at the margins of developed countries, as well as illustrating a method that is appropriate for investigating the complex, intractable problem situations that characterise the marginalised.

The ICT-based licensing system is not a major cause of social exclusion for the Ngaan Community. It has, however, both failed to alleviate the community’s licensing problems and further compounded their existing social exclusion. These issues arise not just because of ‘lack of access’ to computing facilities but because of shortcomings in the policy, planning and systems development cycles that preceded the introduction of the GDT&L and TRELIS as well as the rules and procedures that are inscribed within the implemented licensing system. In studying the ILP, we noted its limited brief: to “*identify and document the barriers..*” in order to provide “*improved access*” to licensing services, driven by a combination of economic, social and political issues. It is clear that lack of access, as a part of the exclusion process, is just one face of larger, structural or macro-level forces that lead to

serious injury, death and imprisonment. The situation at Ngaan has arisen from a persistent and active array of forces that work against any enduring improvements.

One of the major negative impacts of ICT use in public administration is reduced flexibility available to public officials at the interface with citizens (Danziger and Andersen, 2002). Flexibility to deal with situations outside the norm is precisely what is required for those on the margins of society. Thus, efforts to address this alienation must focus not just on the ICT system but the whole ensemble of socio-technical relations associated with the delivery of public policy. Furthermore, the networks that develop government policy and the networks that develop administrative infrastructure (including the design of ICT-based systems) may occur in relative isolation. Understanding the effects of ICT-based systems that are embedded in the service delivery networks therefore requires attention to be paid to socio-technical networks that *precede* implementation within the service delivery network. Given the complexity and inter-related nature of this wicked problem, there are significant difficulties in reversing the impacts of the new licensing system let alone intervening to have positive effects on the Ngaan Community's driving problems.

The STIN analysis provides the foundation for designing interventions in the licensing system. We have four specific recommendations arising from our analysis. Firstly, in constructing this analysis, we intentionally limited the interviews to those involved in service delivery agencies. We note that any interventions designed from this analysis must be grounded in active engagement and leadership by the Ngaan community but acknowledge the difficulties in achieving this. We recommend that future intervention aims to achieve stronger coordination between the grassroots agencies and delegation of such engagement to those already accepted at Ngaan. Greater coordination between the grassroots agencies will provide them with critical mass for pushing for a voice in higher-level policy processes. This is in line

with policy to social exclusion in rural areas of the UK to implement “more co-ordinated, inclusionary and flexible approaches” (Milbourne, 2006). Secondly, efforts to change the licensing system should go beyond the point at which a license is granted and include support for community members in keeping their licences in the longer term. It is likely that remote indigenous people would be encouraged to continue to participate in the licensing system through an educational program directed at how to retain your license or how to avoid offending, and rewards for retaining a license for short periods without infringements.

This recognises that indigenous people are enmeshed in a system of policy and practice in which little choice exists (to access ICTs or not, or to gain a license or not are not issues for choice: they do not have the former and must conform with the latter else risk imprisonment). In order to sustain change, the people of Ngaan need to be licensed and kept out of jail. Gathering the Ngaan people’s views of effective interventions in the licensing system and co-ordinating the expertise of both the Ngaan and the service delivery agencies will assist in designing appropriate interventions that are sustainable and effective throughout the licensing lifecycle. Such an approach is well-suited for a wicked problem, particularly if implemented through a staged introduction with close monitoring and adjustments in case of unintended negative effects.

Thirdly, reflections on the findings indicate that much more care should be given to forecasting potential negative impacts of any e-government initiative. Integrated e-government systems should be carefully designed and rigorously evaluated to ensure that they do not reinforce the exclusion of any already-marginalised group of citizens. The example of the UK ‘rural proofing’ policy seems an approach that is well-suited to the situation of remote indigenous people in Australia.

This leads to the fourth recommendation, that particular care is needed when e-government initiatives decrease flexibility of front-line public servants to adapt policy in order to meet the needs of the marginalised (whether indigenous, aged, disabled or infirm). This indicates that perhaps a middle-out approach where clear responsibility and resource governance is applied at the highest level to oversee relevant agencies, and government departments are coordinated in their interactions with a cross-section of the excluded rather than just existing power-holders or local elites.

In conclusion, Orlikowski and Iacono (2001:129) state that “there is still much opportunity for the IS field to move beyond relatively simple black-boxed views of technology towards more powerful conceptualizations of the role of IT artefacts.” We have heeded their call for “more work to be done from an ensemble view” (p. 130). This is particularly important in complex situations such as that described in this paper. The licensing problem is a wicked problem needing appropriate tools to analyse the interests and influences at play and to identify likely areas for intervention. STIN was one candidate for such analysis and we have applied it to a new domain. As a result, we have extended the method and refined the modelling to capture the diversity and intensity of interactors as the basis of analysing and diagnosing the licensing system. The application of STIN in this paper demonstrates one way in which complex socio-technical systems can be analysed and areas for possible interventions identified. This project has provided a foundation for imagining, designing and evaluating areas for intervention in the Ngaan community’s experience of the licensing system.

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