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# INTEGRATED E-GOVERNMENT SYSTEMS: UNINTENDED IMPACTS FOR THOSE AT THE MARGINS

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## Abstract

*e-government involves the use of information and communication technologies (ICTs) in public administration to transform the delivery of public services. There has been much analysis of the application of e-government in developing countries. To date, however, the impacts of e-government upon those who are on the margins of society in developed countries remain unclear. This paper investigates the consequences of mandatory use of an integrated ICT-based licensing system on remote Indigenous communities in Australia. It notes that the system is not a major cause of social exclusion but that it further compounds the profound social, economic and cultural influences that alienate remote indigenous Australians. The paper concludes that 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. The paper contributes to our understanding of the impacts of e-government on marginalised groups in developed countries and difficulties in reversing these impacts. It also calls for application of socio-technical approaches when analysing complex social and technical problem situations*

*Keywords: e-government, digital divide, social exclusion, ensembles of technologies.*

## 1 INTRODUCTION

The benefits of shifting the provision of public services from face-to-face contact with public servants to interactions through computer-based information systems have been widely popularised. Building on commercial lessons, especially those arising from the acceptance of e-commerce, e-government now has widespread support from governments in both the developed and developing worlds (Navarra and Cornford 2004). Concerns have been expressed about possible negative consequences of e-government on those in developing countries including widening of the digital divide. This paper examines the consequences of e-government on another group: those at the margins of society in developed countries. It investigates some of the impacts of shifting provision of government services to integrated computer-based systems for those who are already excluded from mainstream society. The paper begins with a description of the background of e-government and its effects on citizens. Theoretical lenses for examining e-government are then presented. An ensemble view, as employed by Rob Kling, facilitates the analysis of the consequences of an e-government initiative on a profoundly marginalised community within a developed country. This analysis surfaces a number of issues that should be heeded when designing and testing interventions within the community in order to minimise further negative impacts. Given the fundamental governmental tenet of universality—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 and evaluating potential negative impacts of any e-government initiative. 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.

## 2 BACKGROUND

The success of e-commerce in the commercial sector has encouraged enthusiastic uptake of web-based, enterprise and inter-organisational systems in the public sector. Claimed benefits of these systems include lower costs and response times, greater effectiveness through improved diversity and accessibility of services and increased involvement of citizens in the government process (Burn and Robins 2003). There are, however, some fundamental differences between the commercial and public sectors. In the commercial sector, the customer has choices: to transact online or face-to-face, to choose between different providers both local and remote, and the decision to purchase is optional. In contrast, depending on the particular manifestation of e-government, citizens may lose the choice between electronic or face-to-face services, they may not have a choice between providers and often participation in the transaction is 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. E-government initiatives have not delivered expected cost savings nor improved social inclusion, innovation or participation (Taylor 2004). Analysis of nineteen studies shows that in half the impacts have been positive and one-third report negative impacts (Danziger and Andersen 2002). Positive impacts relate to service provision while negative impacts arise from a reduction in the level of flexibility available to “street-level” bureaucrats when dealing with citizens.

The reduction in flexibility of street-level bureaucrats is a common theme in studies of e-government. Such flexibility is important for upholding the traditional public administration value of *universalism* – the idea that administrative procedures can be fairly and equally applied to all people whatever their social identity or background. While government agencies aspire to universalism, the ideal has its limits because administrative and legislative rules are all social constructs and “*generally reflect the dominant social and economic circumstances of the time and place for which they were written*” (Sanders 2004:4). Therefore, when rules and procedures are applied to populations that have very different social and economic circumstances to the dominant population, it becomes necessary for the public servants implementing policy to interpret and adapt them.

Government-wide integrated systems 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 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. It is clear, however, that such transformations will decrease the ability of public servants to address the needs of all citizens.

Another potential negative impact of e-government relates to the ‘digital divide’, whereby the use of ICTs in the public sector could result in less equitable access to public services for some (Aulich et al. 2001). ICTs then become a source of social exclusion. Social inclusion and exclusion refer to the extent that individuals and communities are able to fully participate in society and control their own destinies. The relationship between ICTs and social exclusion is not just a simple matter of access to the technology (Warschauer 2003). ICTs are woven into the fabric of society and cannot be treated as an exogenous variable that some have and others do not (Dutton 2005). 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). Questions about the relationship between ICTs and social exclusion in the public sector are therefore not merely questions of access to technology during service delivery. They are part of a larger picture including public policy planning, determination and delivery.

### 3 THEORETICAL LENS

The complexity of this ‘larger picture’ indicates that analysis of e-government should examine the technology not in isolation but as a part of a complex interrelated web, ensemble or network of influences. Orlikowski and Iacono (2001) identify five broad conceptualisations of IT, “*each representing a common set of assumptions about and treatments of information technology in IS research*.” Two conceptualisations are contrasted here. The tool view sees technology as an “*engineered artifact, expected to do what its designers intend it to do*.” Technology is a stable, objective resource that is independent from the social or organisational contexts in which it is constructed or used. Technology as tool determines a range of impacts, thus epitomising technology determinism. In contrast, the ensemble view sees that technology is only one of the many elements in the development or use of information systems. Orlikowski and Iacono suggest that the ensemble view may examine how the technology *came to be* or how it *comes to be used*.

The tool view is frequently encountered in material advocating e-government. The justification of some e-government programs is that technology can provide defined benefits to governments (e.g. reduced costs and greater efficiencies) or citizens (e.g. empowerment through access to information) (Burn & Robins 2003; Navarra & Cornford 2004). These justifications ignore the effects of the emergent outcomes of technology use (Markus & Robey 1988; Carroll 2004). Such technology determinism can mislead governments so that they overlook potentially detrimental effects upon the interests of some citizens. In contrast, an ensemble approach may encourage public administrations to seek to analyse a range of possible outcomes that may emerge from e-government initiatives. Rob Kling drew our attention to the need to study not just the ICT artifact but also the network of social relationships that surround it. The socio-technical interaction network (STIN) modelling approach (Kling, McKim & King 2003) models a variety of heterogeneous actors participating in multiple, overlapping networks and aims to predict who the relevant participants will be and to understand the socio-technical networks in which they are embedded. This provides a rich alternative to the tool view.

## 4 RESEARCH METHOD

We were inspired by, and drew upon, Kling et al.'s (2003) recommended heuristics for developing STIN models. The authors 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). This view is particularly appropriate for studying the effects of e-government upon people at the margins. Of special interest is the focus on sustainability, as it is essential that any intervention in the system of interest endures beyond the short-term (see also Braa et al. 2004). Also, the STIN model is heuristic, to guide but not prescribe activities in analysing an extremely complex situation.

Our analysis of the effects of systems on marginalised sections of the community is informed by the Indigenous Licensing Project (ILP), managed by the Department for Planning and Infrastructure (DPI), an agency of the State Government of Western Australia (WA). The project aims to “*identity 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). It is focused on one marginalised community in WA. Given that the ILP has been specifically initiated to address a perceived mismatch between DPI's licensing system and the needs of remote Indigenous Australians, we used a STIN modelling approach to understand how the socio-technical network of licensing to remote indigenous communities has been constructed as well as exploring the role played by ICTs. 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 some of these steps to analyse a different type of problem. We also extended it by classifying stakeholders according to their ‘levels of interest and influence’.

To orient the analysis, our preliminary conceptualisation of the integration of ICTs in government services views the operational services as a designed socio-technical system which is delivered by line agencies within institutional and social contexts. These delivery systems are an ensemble of relationships, processes, procedures and technologies that represent the administrative interface with citizens. ICTs play a central role yet their design does not represent the entire system. The system of government service delivery is part of a wider cycle of public policy in which government departments respond to the changing needs of the community through the policy directions set by their political masters. As new policies are formulated, the infrastructure needed to deliver the services and administer the policy is set in place. Therefore, the (possibly separate) socio-technical networks involved in the genesis of the delivery system in which ICTs are integrated need to also be considered.

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 reluctance of the indigenous community “*to discuss issues with white people from the ‘city’*” had been noted (DPI Briefing Note). We were particularly mindful of the possible impacts of raising the hopes of indigenous people for effective improvements to the current licensing situation. Many well-intentioned agencies have failed to achieve enduring change and our approach is to analyse the current service delivery system (the focus of this paper) as a foundation for designing possible future interventions.

In-depth, semi-structured interviews were held with the key representatives of each stakeholder group. The seven informants included 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 Indigenous 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. The interviews and DPI documentation were used to build a step-by-step table for gaining a license. 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 Section 5 below, followed by a discussion of the analysis in Section 6.

## **5 CASE DESCRIPTION**

The licensing of driver and motor vehicles is one of the most common transaction services provided by government and appears to be a strong candidate for migration to web-based services. 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.

WA is Australia's largest state and comprises dense spots of population around the coastal fringe with the remaining vast tracts of unpopulated or 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 over \$AU20 million and incorporates thousands of complex business rules governing driver and vehicle licensing. While TRELIS acts as the fundamental ICT infrastructure for licensing, a recent policy 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. It is implemented via TRELIS and supplemented by two additional ICT-based 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 that is also used by other public sector agencies including the Police and the Department of Justice. Breaches of licensing rules can result in fines, licence suspension and even imprisonment - all of which are recorded in TRELIS. For most urban residents, the processes of gaining a driver's licence, updating address details and renewing licences are enhanced by making these services available online. In WA, the vast majority of people live within 100km of a large city or regional town, however providing an acceptable level of service to people who live in remote communities, is problematic (DPI Briefing Note). Underlying the GDT&L is the assumption that candidates for driver licences have a basic level of literacy in addition to access to internet resources. This model for obtaining a drivers licence begins to break down when applied to Indigenous Australians in remote communities.

### **5.1 Gaining a license for remote indigenous people**

Indigenous Australians are profoundly marginalised members of Australian society. They are over-represented in vehicle crash statistics as well as in prison incarceration rates. One study of 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. In addition, three times as many indigenous people as non-indigenous

people are killed in road crashes. 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 licensing 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 frequently tenuous. Apart from these difficulties, some aspects of licensing training programs may be culturally inappropriate.

Each phase of the new integrated licensing system poses particular challenges for indigenous people living in remote communities. Firstly, a person can apply for a learner’s permit and complete a computerised road rules test of 30 multiple choice questions (the DPI website has a page for practising this test). On gaining a learner’s permit, a learner record is created on TRELIS. However before an initial record for a learners’ license can be created, individuals need to justify their identity and age. This is a problem for many members of remote indigenous communities either because the registration records have never been lodged or they have never obtained other forms of identification such as credit cards. Exemptions to the requirement for proof of identity through alternative arrangements such as a recognised Aboriginal elder attesting to an individual’s identity and age have been endorsed but cannot be implemented “*until the required system changes have been made*” (DPI Briefing Note).

The GDT&L assumes that learners have a reasonable level of both English and literacy skills. However, the well-documented low levels of literacy among indigenous people are further complicated in those remote areas where English is a second language. People who cannot read and write find it difficult to obtain a driver’s licence under the GDT&L without appropriate support. 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.

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 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 passed, 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 but learners may not have access to a registered vehicle. 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.

Indigenous members of remote communities are not provided with the same facilities or service with respect to driver training and licensing 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 and alienation of indigenous people in remote communities.

## 5.2 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 in the Gibson Desert. We have called the community Ngaan to protect its identity when discussing the challenges it is currently facing. Ngaan is physically isolated – remote from any major town and the facilities associated with major population centres. It is also socially isolated – *“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 one 5km stretch of bitumen roadway. Lack of roadworthy cars is an issue: cars deteriorate quickly in this harsh environment, they often have no doors and people travel in the boot, leading to multiple fatalities in car crashes. People travel extensively through the bush; when they travel on 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. When people from Ngaan travel to larger towns, they face significant problems due to their unfamiliarity with the speed and complexity of road conditions.

At present there are powerful economic, social, health and political incentives to increase the licensing of people from Ngaan:

- WA is experiencing a mining boom and there is a shortage of drivers with ‘C’ class endorsement (i.e. licensed to drive heavy vehicles). There are initiatives to meet this labour shortage by engaging indigenous people living in remote communities.
- Imprisonment rates are high for people from Ngaan due to unpaid fines and road offences.
- 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.

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 (this is 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.

## 6 DISCUSSION

The new licensing system (including the policy, rules and procedures as well as ICTs) was implemented to cover all licensing within the state; it was intended to standardise practice and improve levels of driving. However, the new system removed flexibility from individual police and licensing personnel and replaced them with standard procedures and policy inscribed in, and enforced by, the integrated TRELIS system. 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. The state has ‘three strikes and you are out’ legislation, whereby any individual found guilty of three similar offences (however minor) is imprisoned for a significant term. 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 estimated that there would be no adult males remaining in Ngaan soon, due to imprisonment for traffic and minor theft offences).

The licensing problem for the Ngaan community is just one dimension of severe, ongoing social and economic exclusion. This is a wicked problem. Wicked problems (Rittel & Webber 1984) are situations where the problem cannot be clearly stated, solutions cannot be evaluated as successful or unsuccessful and where positive effects on one part of the problem might occur with negative effects on another part. Unlike a hard or engineering type of problem, we cannot isolate a discrete number of 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 the actions of a local policeman who set up a driving training program for 34 of the community's women in the belief that training the women would improve the driving skills within the community and provide a pool of experienced drivers over time. Women were selected for this program as they are viewed as having fewer problems with alcohol abuse and they take responsibility for their families. But there have been unanticipated consequences. Initiated men will not be supervised by women. Women have been coerced to drive (by their partners). The 'repeat offence' legislation means that anyone convicted of three (similar) offences faces a mandatory jail offence. One mother of five failed to pay driving fines on three occasions and was sentenced to 9 months jail; the sentence must be served in a town very far removed from Ngaan. The effects on her family cannot be imagined. Similarly, the well-intentioned aim of addressing the current shortage of truck drivers by licensing remote indigenous people could have unexpected results. The mining towns are over 1000km from Ngaan so that any members gaining employment would be isolated from their families and community. Also, Ngaan is an alcohol-free community whereas those working in mining towns would be exposed to alcohol and other aspects of a western lifestyle. Isolation, alienation and alcohol abuse are acknowledged consequences of indigenous exposure to 'white man's world'.

## 6.1 STIN analysis

Identification of the licensing system as a wicked problem supports the selection of the STIN approach to explore the socio-technical networks involved in delivering licensing services at Ngaan. The preliminary heuristics for developing STIN models focus on identifying relationships among a relevant population of system interactors. It became clear that the ILP project could 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 engaged with or distant to the community being studied and having more direct (through day-to-day interactions with the licensing system and its customers) or indirect (through the ability to create policy/provide resources/determine strategic direction) power. 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/direct power shown at the bottom, rising to lesser engagement/more indirect power at the top of the figure.

The group of actors with the most immediate interaction with the Ngaan community members is at what we have termed the grassroots level. At this level are those people dealing face-to-face with members of the community to provide service delivery including 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, the DPI's Licensing Manager for the region who has implemented several local initiatives to improve licensing services in the community, and the Department of Education's Roadwise team who provide educational programs in relation to vehicle and road safety. In the past these actors were able to exercise a significant level of judgement in implementing the licensing system at Ngaan.

The licensing system itself is treated as separate grouping of actors and includes the various technologies associated with TRELIS 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. 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 whose interests in the Ngaan community are related to the conduct of the ILP. This group includes two private sector consultants who have expertise and experience in consulting with Indigenous communities and have developed a variety of specialist programs for Indigenous communities; one was born in Ngaan and has family ties to the community. The ILP project 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 Justice. All have good intentions (incentives) in working to identify and address some of the problems that remote indigenous people face 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.

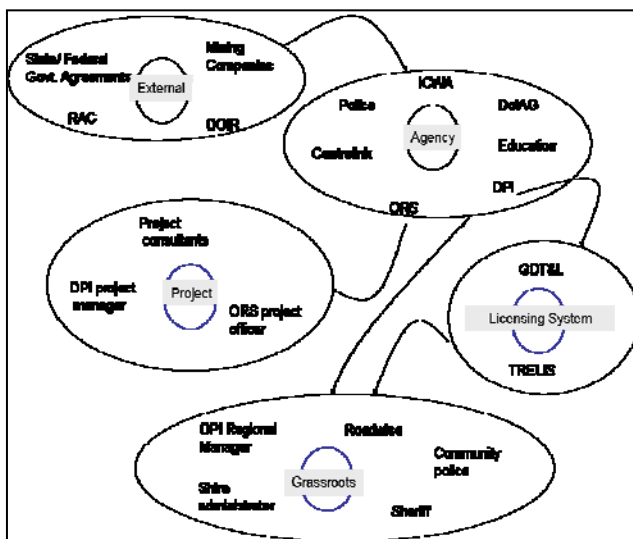


Figure 1: Ngaan Community Licensing STIN

We have identified two further groupings of actors having 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 their interests in the licensing system for the Ngaan Community are not their *primary* concern. These agencies include DPI, the Office of Road Safety, Centrelink (social security), the Department of Indigenous Affairs, Police, the Department of Education and ICWA (Insurance Commission of WA). The second grouping of External actors is included in recognition of organisations in the wider economic and political environment that influence the activities of the agencies that do have responsibility for providing licensing services in the Ngaan Community.

Following the identification of the core system interactors, Kling et al. recommend the identification of incentives. They liken this 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 that are meaningless to them). It is clear that the current, punitive system is not effective. For some community members, dealing with the licensing system is one of the first encounters that they have with administrative bureaucracy and they may 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. It is likely that remote indigenous people would be encouraged to continue to

participate in the licensing system through an educational program (how to retain your license; how to avoid offending) and rewards for retaining a license for short periods without infringements.

Another of Kling et al's heuristics involves identifying excluded actors and undesirable interactions. They believe that this step 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. There are many public servants and other interested parties but no indigenous people from Ngaan. 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 (possibly multiple) interventions.

A further STIN heuristic compares the new or projected system with the existing system. The licensing system prior to the introduction of TRELIS and the GDT&L 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. Prior to introduction of TRELIS the lack of identification coupled with a highly mobile way of life allowed them to avoid the 'three strikes' mandatory jail sentences. The integration provided by TRELIS means that enforcement of the rules for gaining a licence are more stringent, monitoring of traffic offences is much more effective and opportunities for escaping punishment by changing names or location are reduced.

Kling et al. suggest that resource flows be identified. How do the effects of money, power, political interests and special interest groups flow through the network? It is striking that all groups directly involved in working with the Ngaan people have good intentions and a great drive to try to rectify their social, economic and political exclusion. The 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 pursued as inadequate resourcing led to lack of consultation with local stakeholder groups (DPI Briefing Note) and changes relating to proof of identity await changes to TRELIS to be implemented. 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.

## **7 CONCLUSIONS**

This paper has contributed to our understanding of the possible effects of e-government on those at the margins of developed countries, as well as methods that are 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 the existing profound social, economic and cultural influences of alienation. 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.

One of the major negative impacts of ICT use in public administration is reduced flexibility available to public officials at the interface with citizens. 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. 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 licensing problems.

The STIN analysis provides the foundation for designing interventions in the licensing system. 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. Our recommendation for future intervention is aimed at stronger coordination between the grassroots agencies and delegation of such engagement to those already accepted at Ngaan (such as the Ngaan-born consultant working on the ILP). Greater coordination between the grassroots agencies will provide them with critical mass for pushing for a voice in higher-level policy processes. Also, efforts to change the licensing system should go beyond the point at which a license is granted and include support for community members keeping their licences in the longer term. 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.

More generally, reflections on the findings indicate that much more care should be given to forecasting and evaluating potential negative impacts of any e-government initiative. In particular, any application of ICT-based systems as part of e-government should be carefully designed and rigorously evaluated to ensure that it does not reinforce the exclusion of any already-marginalised group of citizens. 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). It also recognises that implementing e-government does not invariably lead to predictable and positive impacts for all stakeholder groups.

Secondly, 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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