Targeted Messages on TV Screens in Remote Indigenous Communities

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Abstract
This paper describes a research project to enhance the viability of remote Indigenous communities through culturally-appropriate use of information and communications technologies (ICT). The project investigated the use of community rebroadcast TV infrastructure for new low cost communications services. A key part of the project was establishment of trusting relationships with the Ngaanyatjaara Lands communities of Irrunytju and Kanpa. Community members, administrative staff, and external service providers were involved in investigations into current communication problems and potential solutions. A working prototype of a messaging system using satellite broadcasting infrastructure to send multimedia messages to TV sets within remote communities was developed and evaluated. Such a system could be used by government agencies or remote communities themselves to deliver messages about visitors to the community (e.g. health workers), emergencies (e.g. bushfire); cultural business, sporting events, etc. The expected outcomes of such a system are increased social capital within the region, developed through more efficient and effective communication, leading to enhanced viability and sustainability of remote communities.

Keywords
digital television, Indigenous remote communities, messaging, viability, sustainability

BACKGROUND

There are hundreds of remote communities in Australia, mostly Indigenous and ranging in size from a couple of hundred people to very small, sometimes temporary, communities of a few families. Access to services is very difficult for residents of these communities and communication (especially with respect to health, education and economic activities) is a key aspect of community viability (C of A , 2002). For example, it can take a few days and a few thousand dollars to send a doctor to a remote community; so it is very important that as many people as possible are aware of the visit. There is also considerable need for messages to be sent between communities and within larger communities, for example, to arrange cultural "business".

The Desert Interactive Remote Television (DIRT) project, carried out through the Desert Knowledge Cooperative Research Centre (DKCRC), sought to address current problems in sending effective messages. It represents an effort to foster innovation by bringing together: market needs and resources; new technologies and infrastructure; and interdisciplinary research and development expertise. The goal of the project was to combine and apply these elements to address the question: *Can new satellite TV broadcasting and broadband access technologies be used to increase the sustainability of remote Australian desert communities?*

METHODOLOGY

The research started from the premise that TVs are more common in remote communities than computers, and hence could be a more available and more easily used messaging medium. The work comprised three main streams: i) Consultation & Requirements Determination; ii) Data Collection & Analysis; and iii) Solution Design & Prototype Evaluation. These aspects were carried out concurrently

and iteratively, with output from each stream serving as input to others. A fourth aspect, Administration, occupied a share of project resources comparable to the other streams.

Community Consultation & Requirements Determination. The Community Consultation and Requirements Determination stream included an external agency stakeholder workshop, a community selection process, an ongoing process of community consultation, and three trials to evaluate system prototypes. A workshop was held in Alice Springs in June 2004 with interested external agencies to explore communication issues related to delivery of services to remote Indigenous communities. It produced several ideas regarding the potential of digital interactive TV (iTV) to contribute to remote community sustainability. The need for better cooperation between agencies was also identified as an important issue that might be addressed by a TV-based messaging system.

The community selection process took more than 12 months. Communities were identified and approached for involvement in the project according to the following (unprioritised) criteria: i) Balance of communities using the Direct to Home (DTH) and the community wide (analog) rebroadcast methods for receiving TV in individual homes; ii) Balance of large/small, near/distant communities (and networks between them); iii) Potential links to the Sparse Adhoc Networks in Desert Environments (SAND) project (also under the DKCRC) to provide possible future backchannels; iv) Potential links to MARVIN project, run out of the NT Health Department, to provide one type of community generated content for transmission over the DIRT system; v) Potential links to other DKCRC projects; vi) Possibility of engaging WA communities, as well as, or instead of, those in NT (due to previous research activity in WA – e.g. Turk, 2003; Turk and Trees, 2000); vii) Individuals in communities enthusiastic about DIRT; viii) Opportunities to provide some clear and practical benefits to the communities involved.

Two suitable communities in the Ngaanyatjarra Lands area of the Eastern part of Western Australia were keen to be involved. Irrunytju is a larger community (about two hundred people) where the Ngaanyatjarra Media operations are located and in-community rebroadcasts are used for TV. Kanpa is a much smaller community, utilising DTH TV reception. Working with these two communities would thus provide a balance of circumstances for review of the DIRT application prototypes. Approval from the Ngaanyatjarra Council was obtained for this research collaboration.

Researchers in the DIRT project visited the communities in June, July, August and November 2005, and in March 2006. In addition, one of the authors of this paper (Featherstone) lives at Irrunytju, and works as Media Coordinator for the Ngaanyatjarra Lands. During the initial trip in June 2005 researchers (Turk and McGinley) met with community leaders. Research collaboration proposals were explained to them and other community members, and approval was obtained for the project to proceed. An emulation (prototype in Powerpoint) of the proposed application, based on ideas generated from the external stakeholders meeting, was shown at each community as a tool to elicit community feedback and guidance. On the whole, the feedback was positive. Discussions were also held regarding proposals for a pilot study later in the year. Community facilities (especially ICT) were reviewed and documented.

In July 2005 one of the researchers (Turk) visited Irrunytju, Wanarn and Blackstone to gain a better understanding of the operation of different sorts of communities in the Ngaanyatjarra Lands. Detailed discussions were held with the Ngaanyatjarra Media Coordinator (Featherstone), regarding arrangements for the proposed survey of messaging needs and TV usage/preferences and the pilot study. In August 2005, researchers (Turk and McGinley) visited Irrunytju and Kanpa to trial the survey questionnaire regarding use of TV (and radio) in the communities. The survey instrument was used during interviews with four community members at Kanpa and ten at Irrunytju. The survey was revised and subsequently carried out in Irrunytju by Ngaanyatjarra Media staff. In November 2005, researchers (Turk, Eyers, and McGinley) visited Irrunytju to conduct trials of a functioning messaging system using hardware prototypes developed for the purpose by the University of Wollongong. A further trial of the prototype messaging system was conducted in March 2006 at both Irrunytju and Kanpa.

Research Difficulties. Developing innovative technology is a difficult endeavor in any context. The nature of the project, involving iTV and remote communities brought further challenges. These included:

- Conflicts in Stakeholder Expectations: There is a fundamental conflict in the attempt to respect both the prescribed project management and scheduling demands of research funding bodies and the need for community members to dictate their own pace of participation. The research project may not be a high priority for community members with numerous other demands on their time.
- Foreignness of the Subject of Research to the Communities: Community members have little or no context to help them understand the technological concepts the researchers were proposing and discussing with them.
- Cultural Differences: Communication is impeded at a basic level by language differences, more subtly by cultural differences in values and expectations, and insidiously by suspicions accumulated over years of often unhappy interactions between mainstream and Indigenous cultures. This means small, unintentional, actions have potential for large disruptive effects, this however is often balanced by the tolerance of community members.
- Distance and Isolation: The infrequency, short duration, and tight schedules of our visits, dictated by the isolation of the communities, meant there was limited scope for recovery in the case of a neglected or unanticipated detail in planning, equipment breakdown, missed appointments, cultural business, or even adverse weather (all of which occured). Small details could impact the results of an entire trip. Also people travel regularly for social and cultural activities and community populations can vary dramatically, affecting the potential for interaction and feedback.

The team's response to these challenges was to plan for flexibility, with multiple alternate layers of action. Even so, field trips never unfurled as expected. However, the unpredictability has led to unexpected perspectives and insights.

Data Collection and Analysis. An approach of triangulation was taken to data collection and analysis. Data gathering methods included: direct observation of community members viewing the system prototypes; formal and informal interviews with community members and staff regarding specific aspects of interaction and the overall utility of the system; community responses to specific broadcast messages – e.g. coming to the media office for a reward; and detailed discussions with telecommunications/media personnel at Irrunytju.

Communication Methods and Television Use Survey. The key objectives of this survey were to: understand current communication practices and problems; understand existing TV viewing practices and preferences; gain a deeper appreciation of relevant cultural issues (including language) applicable within the communities; establish relationships of trust with members of the community; and raise the profile and level of interest in the community of the DIRT project. A total of 24 people participated in 18 survey interviews: 19 participants in Irrunytju, and 5 participants in Kanpa. When judging the significance of this number of respondents, it should be noted that that qualitative data of this nature is very rare, primarily due to cultural barriers.

Solution Design Prototype Development and Evaluation. A series of prototypes were used to validate and consolidate understanding of technical and social system requirements. Initial low-cost PC-based emulations based on ideas from the stakeholder workshop proved an effective tool to communicate and validate our ideas to community members and to elicit suggestions and new ideas. Using a laptop, a remote control, and (in Irrunytju) a data projector, researchers were able to convey a sense of the possibilities of iTV to community members, and to elicit constructive guidance on how these possibilities might prove useful (or not) to communities.

Community feedback informed the design of more sophisticated functional prototypes, capable of integrating with the existing community rebroadcast infrastructure to enable functional community trials. Two rounds of trials in Irrunytju and one in Kanpa were conducted.

USE OF COMMUNICATION MEDIA IN NGAANYATJARRA LANDS

There are a wide variety of modes of delivering messages in the Ngaanyatjarra Lands, including : word-of-mouth; voice phone; UHF radio; Fax; e-mail; letter; radio; videoconferencing (Irrunytju only at present) and broadcast TV. However, messages do not always reach the intended recipient in a timely fashion, or the audience (e.g. for radio or broadcast TV) is so wide that it would be inappropriate to send some message types via these means.

Existing TV Infrastructure. Remote Australian desert communities receive television in three ways. The first is Direct to Home (DTH), sent over the Optus Aurora platform and received via individual satellite dishes and Set Top Boxes (STBs). DTH is used in very small communities, e.g. eight houses or less. The second method is community re-broadcast (CRB), used in larger communities. Here satellite TV programs are received at one central satellite dish, then re-broadcast over analog channels by low power transmitters. CRB is by far the most common method for TV reception in remote communities. Community re-broadcast viewers use analog receivers, and hence cannot access interactive content (in the usual way). The third method is satellite pay TV, which provides Foxtel programming. In this research we have focussed on DTH and CRB (see Figure 1).

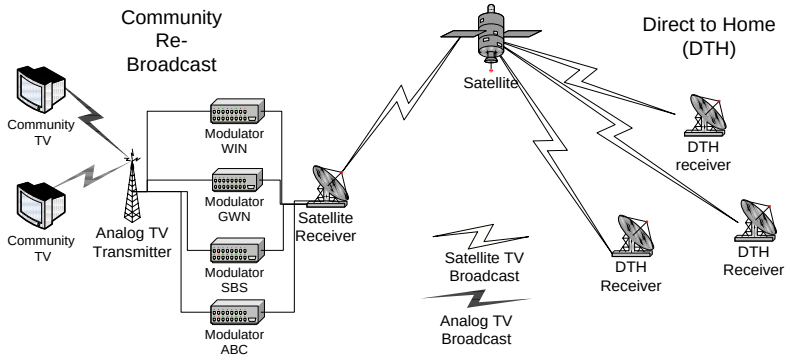

Figure 1 - Direct To Home and Community Re-broadcast Infrastructure

Media Use. Of crucial importance to the DIRT project was the survey finding that, although respondents enjoy a diverse range of programs, content featuring local people and activities rates most highly. TVs are often left on for most of the day, and people often watch in groups of five or more. However, TV viewers receive almost no information on the topics identified in stakeholder consultations as the most relevant to community messaging needs. Figure 2 shows the range of relevant message topics (out of a total of 8) communicated over each potential messaging channel.

In remote communities, the proposed television-based messaging system may have significant advantages over internet, fax, and community notice boards, because: TV is in people's dwellings, while other means of communication are not; TV is familiar, alternatives less so; TV is immediate, increasing impact; TV may be more suited to oral cultures because it can deliver messages in spoken voice format, along with relevant images/video; TV messages are delivered to groups of people (those watching a given television set), whereas email and fax tend to be delivered to individuals (although faxes are sometimes displayed on community notice boards); Notification of TV messages occurs in the course of daily activities (watching TV or activities in the house with the TV on) whereas other mediums need development of new habits of activity for checking information outlets; TV messages can be coordinated

with TV content in order to target specific audiences (e.g. people interested in football, people interested in culture, people interested in music, etc).

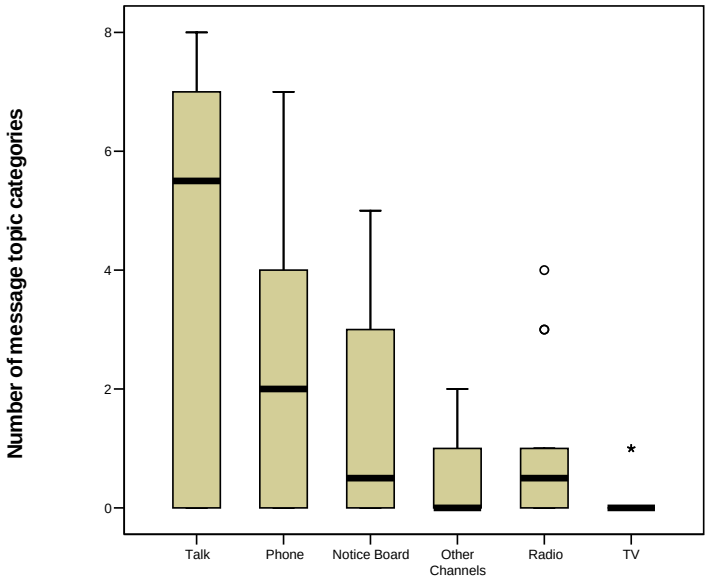

Figure 2 - Communication Channel Use for Range of Message Topics

THE GoDot SYSTEM

In response to the identified messaging needs, the researchers developed a prototype system called "GoDot," the key aim of which is to provide a low-cost messaging service viewed on remote community TV sets. Messages can be generated locally, within communities, or remotely by government agencies or service providers, then delivered to television broadcast points via satellite broadband (or terrestrial broadband, where available). A range of potential GoDot applications have emerged from consultations with stakeholders. The messages are of four basic types, as follows:

- Emergency Messages: These messages would be generated by emergency management organisations to alert remote communities of potentially dangerous situations (e.g. severe storms ; bush fires).
- Agency Messages: These messages would originate from government agencies or other organisations. They would relate to the delivery of services to particular communities (e.g. providing details about a forthcoming visit by health workers or legal case managers; etc).
- Sports and Culture Messages: These messages may come from sporting associations or could be generated by a community group wishing to advise others about a cultural or other type of community event (e.g. concert; funeral).
- Targeted Advertisements: These could be government advertising messages, ideally community or language group specific - using appropriate language and featuring people and places familiar to the community. The impact is further improved if the community participants are involved in the creation of these messages.

Functionality. Interactive TV generally assumes digital reception. This allows a given program to have multiple components, which are presented selectively, under the control of the iTV application. Clearly this type of interactivity is not possible with a CRB (analog) TV situation. Given the high cost of conversion to digital television in very remote areas, this is unlikely to happen for many years. Hence we have chosen a simpler approach, with two key elements: an incoming message alert system, comprising transparent icons (or "bugs", similar to station IDs) overlaid on to the broadcast channels.

The format and timing of these icons will be controlled by the DIRT system; a separate analog channel, which carries the actual messages, in a continuous loop.

To view the messages, users switch to the separate messaging channel, wait until the desired message has been played, before returning to the previously viewed channel. This provides a basic level of interactivity, where the users view messages in response to prompting from the overlaid icons on the broadcast channel. The audio/video content of these messages is a big improvement on text only messaging, as many Aboriginal people understand spoken English much better than written, and audio can also be in the local language. A set of 4 or 5 main languages should cover the majority of people in the central Australian region, although there are many more local languages (at least 15), since most people are multi-lingual, at least to some extent. The dynamics of this type of iTV use was a key part of the pilot study evaluation.

The capability of combining icons and other message alerts, delivered via the Internet, with off-air satellite TV broadcast, is not provided by standard TV broadcast equipment. Hence custom infrastructure to do this has been designed and built at the University of Wollongong (Eyers, 2003; 2004; Eyers and Abolhasan, 2005). The key component of this equipment is the Hauppauge Nexus satellite receiver card, which provides the required reception, conditional access, MPEG decoding and TV signal generation capabilities. These cards fit with standard PC infrastructure, thereby allowing a relatively low cost implementation.

Within a community rebroadcast context, however, the overlay of icons on to existing broadcast channels raises significant licensing issues, as the community rebroadcast license (currently) specifically prohibits changes to content. Hence we have also developed a simpler approach, where messages are seen on the Indigenous Community TV (ICTV) channel only. This channel is covered by a community license, which allows this local message insertion. The timing of message insertion is determined by the communities, not the ICTV broadcaster. The proposal is that actual ICTV broadcast would be delayed locally (i.e. stored in a similar manner to a Personal Video Recorder) while messages are played out, resuming after the messages are finished. As a result, viewers do not miss ICTV content. There would be a once per day correction to the local ICTV broadcast, done when viewers are unlikely to be affected (e.g. 3 am), to return the receiver to real time reception.

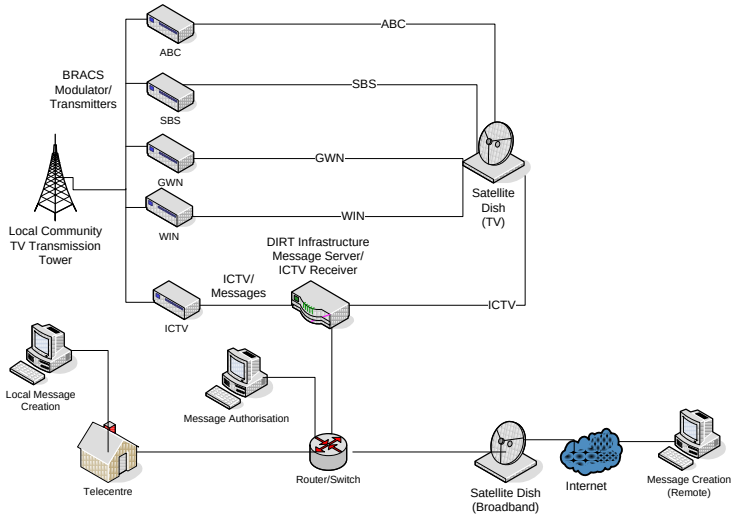

Figure 3 - Infrastructure used for message insertion

The infrastructure required for this ICTV single channel approach is shown in Figure 3. The DIRT message server/ICTV receiver is located with the other community rebroadcast infrastructure. This device receives the satellite ICTV broadcast (using a Hauppauge satellite receiver card), and passes the resulting video to the local analog TV transmitter, similar to the other channels. The device also sends the

message video to the transmitter at predetermined intervals, interrupting the ICTV broadcast to do so. The device is also connected to the local data network, and can hence be reached via the Internet. This allows messages to be delivered to the server, either from computers within the community or in other locations (e.g. Alice Springs or neighbouring remote communities). As shown in the figure, received messages must be authorized, over a separate interface, before local transmission occurs.

The generation and co-ordination of messages from external agencies will be facilitated by a shared easy-to-use communication 'clearing-house'. The 'GoDot' system proposal was developed by the researchers to assist such collaborative messaging by incorporating standard message formats and data entry via a website. The proposed message composition and distribution facility is called "GoDot Central".

Examples of Typical Scenarios of Use

The following hypothetical scenarios illustrate ideas originating from conversations with stakeholders:

Finding the Refrigerator Man. The Kanpa shop's second freezer is broken. Deliah says she passed the plumber's truck at the roadhouse. Adison sends a message over the television to local communities asking people to send the plumber. Many people leave their TVs on in the afternoons and notice when the message is broadcast in local language. Other communities, alerted to his presence on the Lands find more work for the plumber. The plumber decides to stay an extra couple of days in the area, and the communities get their repairs earlier. (source: Kanpa, March 2006)

Closing the Road. A teacher plans a training trip to a local community a day's drive away. The evening before he leaves he sees a notice on TV that the road will be closed for "cultural business". He decides to delay the trip a day. A fax announcing the road closure has arrived in the community administration office but it's closed for the weekend. (source: Irrunytju, March 2006)

The Warburton Mini-cyclone. A mini-cyclone is headed for the community. The network broadcaster doesn't mention it. A message is played out at News time warning people of the local hazard. After the storm messages on the TV reassure people in other communities that their friends and families are safe, although the roof came off an administration building. Some people are waiting to get on one of the 2-way UHF radios to talk about the mini-cyclone, but the batteries in the UHF repeaters are malfunctioning, so the TV keeps them informed. (source: Irrunytju Nov 2005)

Arranging a Funeral. Family and friends from across the lands need to know when and where a funeral will take place. People in the communities pass faxes around or post them on the notice board and many people find out by word of mouth. People fill up cars and trucks and drive all day to be there. Sometimes plans change and it's difficult to let everyone know. Some people may miss the funeral. However people notice the TV messages about the changes and then tell other people. They know the information is up to date. (source: Kanpa, June 2005)

Council Meeting Announcements. Attendance has improved since the Council began putting notices of upcoming meetings on the TV. If someone hasn't seen the fax, or is busy with something else when they should be going to the meeting, someone who sees the message on TV usually tells them. And everyone knows if they don't go then their opinion may not be heard. (source: Kanpa, June 2005)

Planning a Doctor Visit. It wasn't unusual for the Health team to arrive after two-days travel to find that the people they expect to see aren't there. Faxes duly sent and posted on notice boards seem to make little difference. More people notice the Television messages. The messages are repeated as the day of the visit approaches. Now, even if not all the people turn up in the morning, at least they can send a new message to everyone in the community, such as: "If you have eye problems come to the clinic now". (source: Alice Springs, June 2004)

Footy Matches. Nobody needs to be told about plans for football matches. Everyone already knows when and where and who because there is such a high level of interest (usually this is conveyed by fax and word of mouth). But announcing the winner (in local language plus images) in a TV message adds to the fun. (source: Alice Springs, June 2004)

CONCLUSIONS

The messaging system proposed by this research project has the potential to improve the viability and sustainability of remote communities, especially those composed predominately of Indigenous people. Effective messaging can assist in a wide range of practical activities from cultural meetings and sport to education, work and governance.

Development and maintenance of Social Capital is a crucial aspect of traditional Indigenous culture and is the key to sustaining culture, and harmonious communities, and providing a basis for economic development. Communication is essential to maintaining and developing relationships that comprise Social Capital. The Australian Indigenous kinship system (of "skins") is much more complex than the familiar system of grandparent, parent, sibling, uncle, aunt, niece, nephew, cousin, in-laws, etc. More people are formally related to each other in more ways. So someone watching a local video in an aboriginal community is more likely to see someone formally related to them. We suggest that this may make the experience more personally relevant and engaging. The proposed GoDot messaging system would provide a 'trellis' for Social Capital to flourish in remote Indigenous communities.

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