



## **Leveraging Existing Television Infrastructure - Enabling Broadcasting and Printing Documents via TVPrintCast**

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### **Abstract:**

Access to information is one of the key objectives of an e-governance initiative. Countries and governments are trying to achieve this through setting up various e-governance programmes whose success, scalability and sustainability are most often based on the availability of adequate communication infrastructure. Communication infrastructure is the backbone and prerequisite for success of an ICT initiative. However in most developing countries the internet and broadband infrastructure are often inadequate and expensive thus becoming an obstacle to the scaling up and sustainability of ICT. Technologies that leverage the existing infrastructure, and are easy to use may provide a viable alternative. Simple technologies that require little training, are easy to operate, assimilate seamlessly into existing behaviour patterns and are able to surmount barriers of language and literacy are worthy of consideration. One such experiment is the use of the existing more pervasive television broadcast networks to broadcast printable data that can be printed off the television with a simple device that interfaces between the television and the printer. In this paper we describe the technology and the field trial of the technology prototype that indicates the success of the technology



# Leveraging Existing Television Infrastructure – Enabling Broadcasting and Printing Documents via TVPrintCast

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## Abstract

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## 1. OVERVIEW:

Information and Communication Technology (ICT) has had a significant role in the way communities and societies have started on a process of transformation. Across countries like India the key objectives of ICT initiatives have been towards encouraging wider participation in governance and bringing about transparency in the system. However, a review of the various ICT initiatives across a country like India reveal that one of the major challenges faced towards scalability and sustainability has been the lack of adequate bandwidth, lack of appropriate and affordable technology and the requirement for an adequate and intensive training to use and operate the systems efficiently (Rat04).

The wait of the internet and affordable and adequate bandwidth may be too long and may result in a loss of precious time. This is more apparent when you look at the existing penetration of television (TV), telephones, the Personal computer and the internet (Table 1).

### Information Age

Data for 2004	Brazil	China	India	Russia
Population in millions	184	1296	1080	144
% HH with Television	90	91	37	98
Fixed mainlines per 1000 people	230	241	41	256
Mobile subscribers per 1000 people	357	258	44	517
% pop covered by mobile	68	73	41	78
PCs per 1000 people	105	41	12	132
Internet users per 1000 people	120	73	32	111
International internet bandwidth per capita	149	57	11	100

Table 1: Source: 2006 World Development Indicators - World Bank

### 1.1. TVPrintCast technology, Infrastructure setup

TVPrintCast or Print Augmented Broadcasting is a technology which is simultaneously able to broadcast data – that can be printed at the consumer end, without disrupting the TV viewing experience. It enables the viewer to receive additional or supplementary information, of interest related to the audio-video content telecast on TV that can be printed, stored and retrieved. It enables the broadcaster to pass on information to the end user through a new medium with the complementary qualities of hard copy document. TVPrintCast enhances TV viewing experience by providing associated print content, while leveraging and increasing the utility of the bandwidth of existing broadcast networks by enabling simultaneous data transmission. It requires no changes to broadcast technology and requires minimal additions both the data transmission and reception end (Figure 1).

The TVPrintCast experience is easily enabled with the following additions:

- Broadcaster End: Print ready non-stream data and Tele text Inserter
- Receiver End: Print ready Set Top Box (Data Decoder) and Printer

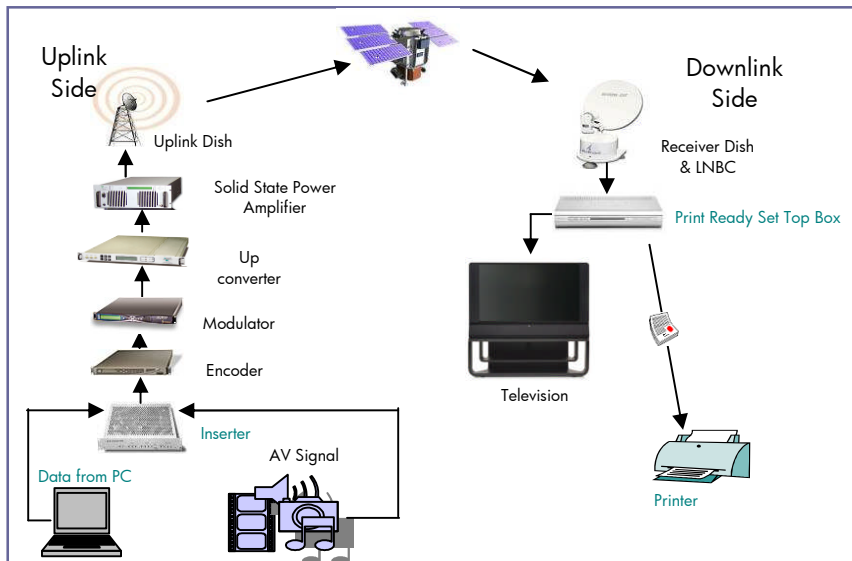


Figure 1 Uplink & Downlink with TVPrintCast Equipment Integration

Transmit (Uplink) End: The insertion of the data into the audio/video signal is done using a standard device called an inserter at the television network head-end. After insertion, the signal is encoded (to MPEG) and transmitted using standard equipment. The PrintCast document is created on a standard personal computer using a content creation and insertion software. It is designed to be appropriate for printing from mobile devices to low-cost printers that might not have a full-page buffer and that generally print from top-to-bottom and left-to-right with the paper in a portrait orientation. XHTML-Print is also targeted at printing in environments where it is not feasible or desirable to install a printer-specific driver and where some variability in the formatting of the output is acceptable

Receive (Downlink) End: At the receiver end, the data is extracted from the VBI part of the signal using the PrintCast decoder (PCD in Figure 1). The PrintCast Decoder is similar in design to standard set top boxes but has some additional capabilities such as a USB port to connect to a printer. The XHTML-Print part of the document is extracted. This document is then sent to a printer when a user sends a print command to the PrintCast decoder using a TV remote.

## 1.2. Evaluating the Role for TVPrintCast

TVPrintCast has evoked tremendous interest in its ability to enhance the viewers' television viewing experience especially in Behaviour Change Communication of the Government and NGOs engaged in working on developmental Issues. The low penetration of PC and internet in these semi-urban and rural markets also provides the need for an integrated technology that provides for interactive or discerning use and request for information. The significance of this interest is further enhanced by the ease of use and interaction with the technology. A pilot study to evaluate the user experience with TVPrintCast also established the validity of such a deployment in the e-governance scenario.

## 1.3. Methodology:

TVPrintCast solution was integrated into this Sat COM based training set up for a trial run. Of the 176 receive centres (Jav04) in the state of Karnataka, India, 7 were augmented with the TVPrintCast setup. The trials were aimed at testing the effectiveness of the TVPrintCast through the Training and Development Communication Channel (TDCC) network of Abdul Nasir Sab State Institute of Rural Development (ANSSIRD), Karnataka, India. The trial also aims to validate the end user experience, and understand how the presence of a new medium impacts training for local self governance and the use-case at hand also provided an environment to study the impact of access to information had in the e-governance scenario.

A comparative study between experimental (with TVPrintCast) and control locations (without TVPrintCast) was carried out to measure the extent of utilization and effectiveness. While interactions with the various user groups was spread over more than a year, focused field work with the installation in place was carried out over a period of 3-4 months in early 2006. During the course of study, observations – participatory and passive, structured interviews, focus group discussion and depth interviews were conducted, log books and diaries were kept; with the help of team members, external agencies and ANSSIRD resource persons, staff and faculty. Extensive video-taping and voice recordings were carried out to document and substantiate the findings.

#### 1.4. Technology Familiarization and Operation Training

Since this was a technology prototype, the identified user groups were exposed to the technology at its various stages, from concept to field trial prototype. This periodic exposure not only helped familiarise the users to the technology but also enabled us to take in user inputs into improving the technology prototype towards its final stages.

**Familiarisation:** The TVPrintCast concept was exposed to the various interested parties (Fig 2) and identified user groups (Fig 3) to obtain and ascertain their interest in, acceptance and relevance of the proposed technology concept. This was done by demonstrating the lab prototype over its various stages of development and improvement.

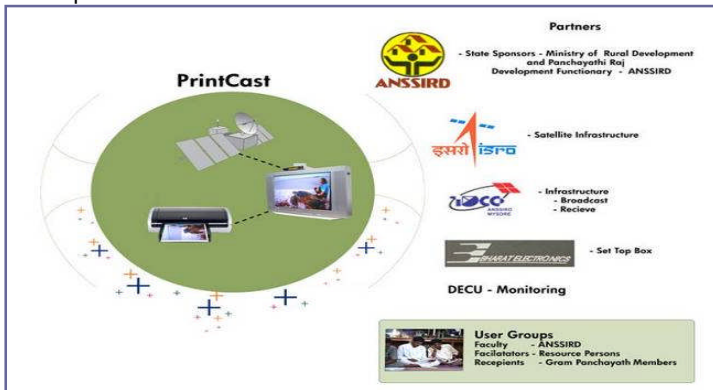


Fig 2 Partner Network

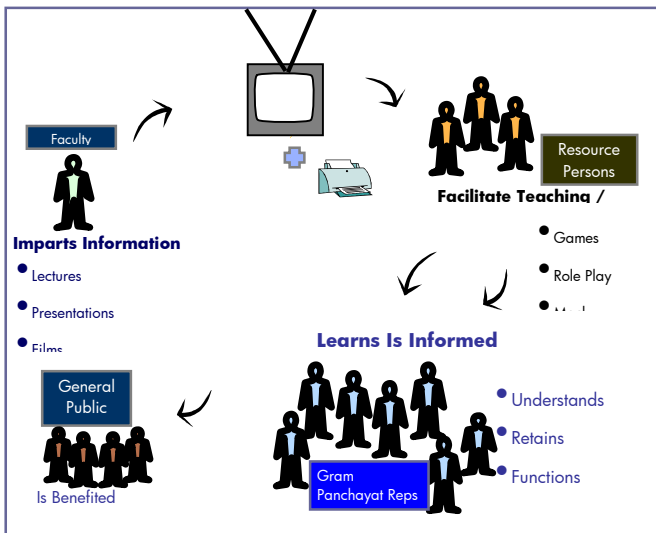


Fig 3 Depicts the Dynamics between the User Groups

**Reece and Dry Run:** Once the prototype was approved for further production, the various test centres were equipped with the technology and a dry run was conducted with the specific user groups to identify location specific problems, like quality of receive end equipment, power stability etc, and possible solutions. This stage was crucial as it also provided the user groups an opportunity to see the technology perform in their familiar settings.

**Hands on Training:** In an approach to the trial the various user groups were trained at the broadcast and receive ends to use the equipment and run the whole cycle with the experts and trainers being available at various proximity and distance levels. This was followed by another dry run where the users were left to operate the entire setup on their own and report issues if any, with no experts or trainers available. This was crucial to instil

confidence among the user groups. User manuals in the local language and charts were made available at each of the locations which were equipped with a dedicated mobile phone helpline number.

**Trials:** The finals trials were conducted for a period of 4 months. Below is some data to indicate the duration and the scope of the study and its key findings

- Transmit End :Mysore
- Receive Ends :7 sites in Tumkur District
- Field Trials Duration : Jan – April 2006
- TVPrintCast broadcast for :33 Days (11\*3 days)
- GP Members who experienced TVPrintCast :2000 (approx) 3 days each
- No of pages TVPrintCast pages broadcast : 880 (100 MB of data)
- No of TVPrintCast pages copied & distributed : 22,000 (approx)

Specific numbers of participants that were interviewed on observation days is as follows (Jos06):

PHASES	NUMBER OF					
	TOTAL PARTICIPANTS	PARTICIPANTS INTERVIEWED	R.P.S INTERVIEWED	FGDs	PARTICIPANTS IN FGDs	OBSERVATION SCHEDULES
<b>EXPERIMENTAL CENTRES</b>						
FIRST	157	75	16	15	75	15
INTERIM	130	60	12	12	60	12
SECOND	115	61	12	12	60	12
THIRD	134	75	15	10	50	10
<b>CONTROL CENTRES</b>						
FIRST	105	60	12	12	60	12
SECOND	094	62	11	12	60	12
<b>TOTAL</b>	<b>735</b>	<b>393</b>	<b>78</b>	<b>73</b>	<b>365</b>	<b>73</b>

Table 2 Sample at Receiving Ends

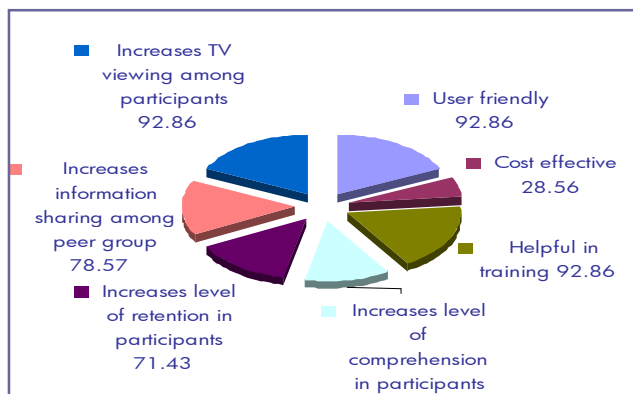


Figure 4: Impact of TVPrintCast

## 1.5. Conclusion:

It is evident that technologies that leverage existing infrastructure and require little learning and expertise to operate are more likely to integrate into existing behaviour patterns. These not only will act as a ready vehicle towards leapfrogging on to the information superhighway but also go a long way towards bridging the digital divide. Efforts and resources earmarked for infrastructure roll out can be used more efficiently towards providing the right kind of information and building sustainability over time.

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