

T-Learning: An Interactive Learning Services Framework for Indian Educational Broadcasts

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Abstract

The digitization of television broadcasting in India has opened newer vistas for Technology Enhanced Learning, The cable digitization mandate 2012 and the Digitization of Doordarshan Terrestrial network by 2017 [2] coupled with the advancement in set-top box technology is all what is needed as a platform for technology enhanced learning on Television known as T-Learning. In this paper we will present with the current status in India while demonstrate the prototype of T-Learning Framework for Indian Interactive educational broadcasts.

Keywords

Educational Broadcasting, Interactive TV (iTV), Digital Video Broadcasting (DVB), Multimedia Home Platform (MHP), Educational Framework, Integrated Digital Television (IDTV), Digital Switchover, Analogue Switch Off (ASO).

1. Introduction

Utilization of television medium for dissemination of learning content is not a really novel to India; there have been quantifiable efforts in the past and are still counting. Every technological progression opens up newer opportunities; one such opportunity that lies ahead in India is to exploit the potential of learning services on Integrated Digital Television (IDTV).

Television was first introduced in India in the year 1959 [1] since then the viewers have grown exponentially and its penetration deepened in the Indian homes. Today there are more than 800 [2] registered channels and an estimated 148 million [2] viewers. Television; world over is seen as a very powerful medium for connecting to the masses. There have been multiple attempts to tap this power to educate the society with varying levels of success and are still counting. In India Ministry of Human Resources Development (MHRD) with other government agencies have been conducting various experiments to utilize this medium as an end platform

for the dissemination of knowledge and hence educate India; recently MHRD has commissioned the launch of another 50 Educational DTH channels [3] with the vision of setting up a virtual university. The major Indian Educational initiatives via Television: [4]

1. Secondary School television project (1961).
2. Delhi Agriculture Television (DATV) Project (Krishi Darshan) (1966).
3. Satellite Instructional Television Experiment (SITE) (1975-76).
4. Post-SITE project (1977).
5. Indian National Satellite project (INSAT) (1982).
6. UGC-Higher Education Television Project (HETV) (1984).
7. IGNOU-Doordarshan Telecast (1991).
8. Gyan-Darshan-1 Educational Channel (2000).
9. Gyan-Darshan-2 Educational Channel. [3]
10. Gyan-Darshan-3 Eklavya Technological Channel (2003). [5]
11. Gyan-Darshan-4 VYAS TV Educational Channel for Higher Education (2004). [5]
12. Gyan Vani Educational Radio Broadcast on DTH. [6]
13. Commissioning of 50 Educational DTH Channels. [3]

Govt. of India is majorly focusing on the "Technology Enhanced Learning" in its 12th Five Year Plan (2012-2017) as it provides universal access to information and services to the masses in their own language. [7]

Digital television in India

Digital Television (DTV) in India is based on the European Digital Video Broadcasting (DVB) [8] Standards irrespective of the programme is Beamed (DVB-S \ S2), Cabled (DVB-C \ C2) or Transmitted (DVB-T \ T2). In India the terrestrial network is run by Doordarshan wing of PRASAR BHARTI, the state run broadcasting agency of India. Doordarshan also runs a Free-To-Air (FTA) Direct-To-Home

(DTH) service with 59 channels having nationwide coverage and has a planned upgrade to 200 channels.

Table 1: DVB DTV standards used in India

Sr. No.	Network	DVB Standard	Service Type
1.	Doordarshan	DVB-T/T2	Terrestrial
2.	DD Direct+ DTH	DVB-S	Satellite
3.	Videocon d2h	DVB-S2	Satellite
4.	Tata Sky	DVB-S	Satellite
5.	Dish TV	DVB-S	Satellite
6.	Big TV	DVB-S2	Satellite
7.	Airtel Digital	DVB-S2	Satellite
8.	Sun Direct	DVB-S	Satellite
9.	Siti Digital	DVB-C	Cable
10.	Hathway	DVB-C	Cable
11.	You Broadband	DVB-C	Cable
12.	DEN Digital ^[9]	DVB-C	Cable

2. Television Learning Services in India

In a diverse country like India with multi-cultural population separated by geographical distances remote terrains having 22 official Indian Languages, it is near impossible to come up with a single solution to address the educational needs of the society while maintaining the quality of learning. The problem thus is universalization of education and one of the possible solutions is television as an educational medium. There are some initiatives and programs by Doordarshan, the National Broadcaster, University Grants Commission and Indira Gandhi National Open University (IGNOU), in the form of countrywide classroom and edutainment channel Gyandarshan. These edutainment programs are used for learning purposes on analog television for years. However, this poses a serious limitation; the students having a passive role and interaction not possible, thus the current system is not close to formal learning. Small though, this however was a step towards engaged learning.

The interaction with television is the basic of what a modern interactive digital television provides. Would it not be interesting if a child watching a Quiz contest on the television is able to remotely participate with a few key selections on his television remote, what if this participation is rewarded by the sponsors as

well? In fact, participation in a television program is interesting people do participate via SMS and other mediums but the participation with the television remote is what we can call the natural way of interacting with television, as everyone has been doing since childhood. This method of interaction also encourages impulsive participation.

There are no free public services for iTV based learning in India till date however the partial list of initiatives have been in progress by some of the private operators like TATA SKY DTH [10], DISH TV DTH [11], BIG TV DTH [12]. They provide unidirectional iTV learning services like Active Stories, Whiz Kids, and Topper etc. However the proposed T-Learning framework suits end-to-end needs for enabling interactivity of educational broadcasts.

3. Need of the T-Learning framework

The four Indian educational broadcasts and upcoming ones will feel the need to be an active learning medium on the lines of the private services in near future. They will have to be present on the Cable, Satellite and Terrestrial Platform. At this moment of time such framework will act at the central point where all the interactive services developed by various agencies for their audio-visual content will need to be stored, scheduled and broadcasted. Such framework will encourage the smooth management of the learning services like National Council of Educational Research and Training (NCERT) sample papers, mock examinations, National Olympiad quizzes etc. In the current scenario such framework can be deployed at University Grants Commission of India - Consortium for Educational Communication (UGC-CEC), Delhi which currently acts as central agency for educational broadcasts.

4. The Set-top box Middleware

Set-top box (STB) Middleware is a software layer on top of STB hardware native hardware platform and operating system that provides an abstraction. It allows content developers to write complex applications without having to consider low level issues.

Multimedia Home Platform (MHP) ^[13] is an open standard for interactive digital television, defined by the DVB consortium and an extension to existing

open standards - DVB, MPEG, and Java TV [14]. It defines a generic interface between interactive digital applications and the terminals on which those applications execute [15]. It is an enabling technology for compelling interactive contents; can be also called as **New Television Programming**. An open standard gives broadcasters high availability and reliability as well as enabling them to deliver engaging forms of television programming and interactive content. It also gives STB manufacturers an opportunity to offer solution for multiple broadcasters rather than developing broadcaster specific products. [13] MHP technology is already successful in Spain, Italy, Germany, Finland, and Sweden and on trails in Norway, China, Austria, and Australia.

5. The T-Learning Framework

The framework caters to the need to enable interactivity on public educational broadcasts while maintaining the interoperability on the Cable, Satellite and Terrestrial broadcast networks and allow seamless reuse of existing eLearning contents of Indian agencies. We would like to achieve this interactivity in Indian television sets through STBs and IDTV and the MHP middleware at its core. The prerequisites for this framework are the Bandwidth and Middleware Standardization.

The framework is designed keeping in the mind that India is yet to standardize its middleware however the MHP open standard remains our choice as the licensing terms incurs no royalty payments to the broadcasters for non-commercial broadcasts like our educational broadcasts. Moreover non-commercial services like learning should not be built around proprietary technologies.

The framework caters to the following broad application classifications as defined by MHP.

1. Enhanced Broadcasting:

Broadcast only applications that the user interacts with but no communication is initiated from the STB, such as Interactive Games.

2. Unidirectional Interactive:

Unidirectional interactive applications are that make use of return channel as simplex communication from the STB to the response management server (RMS), such as Online Quiz.

3. Bi-Directional Interactive:

Bi-directional interactive applications are that make use of return channel as full-duplex communication from the STB to the RMS such as online gaming, Virtual Classroom etc.

The major components of T-Learning Framework are as follows:

1. Authoring Station:
2. Learning Content Management System :
3. Headend System:
4. Response Management System:

1. Authoring Station:

Authoring station has a software tool for developing television specific Xlet^[16] applications with Indian language components and fonts to support multilingual applications. New / existing e-learning contents can be reused to develop applications that can be decoded by the interactivity enabled STB receivers.

We propose to achieve Sharable Content Object Reference Model (SCORM)^[17] compliance at the authoring stage to reuse the standardized educational contents and to adapt, extend and carry T-Learning specific parts of SCORM.^[18]

Applications are stored into local repository during authoring and later uploaded into T-Learning Server via Internet with broadcasting schedule and metadata.

2. Learning Content Management system:

The Learning Content Management System (LCMS) coordinates with Authoring Stations and Response Management Server (RMS) for managing subscription and learning that includes registration, course records, authorization, authentication, schedule, personalization, performance assessment, notifications and managing user responses.

3. Headend System:

This module is responsible for the generation of MPEG-2 compliant Transport Stream (TS) with embedded application in the DSMCC [19] Object Carousel (OC), PSI Signalling and corresponding Stream Events updates.

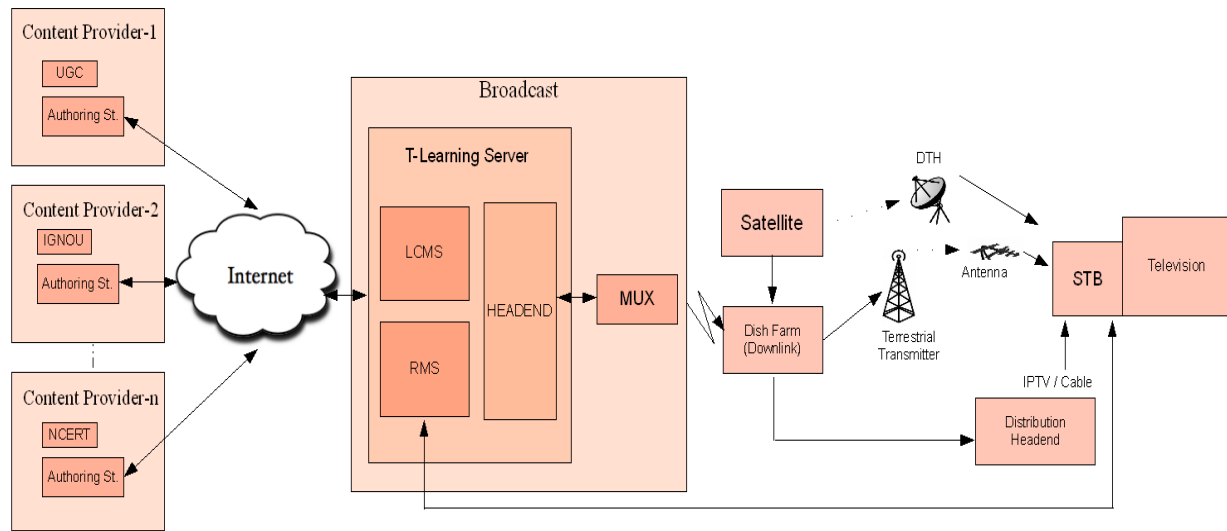


Figure 1: End-to-end T-Learning Framework for digital TV platform

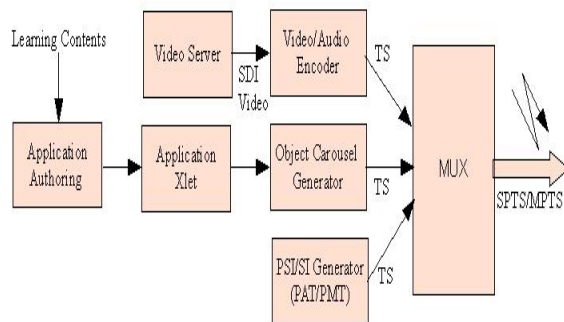


Figure 2: T-Learning Headend System

Figure 2 shows the typical use case of the system to generate the single program TS (SPTS) or multiple program TS (MPTS) multiplex of Digital TV services that can be uplinked to a satellite, cabled or transmitted on terrestrial.

Response Management System

RMS handles the data received on the return path and feeds back the end user. It is required to achieve bi-directional interactivity and is required by Response Handling System. The framework intends to utilize the existing home broadband connections and on Mobile GPRS as specified by DVB for rural areas where the Internet at home is almost non-existent.

6. The Framework Frontend Application

The framework iTV application is based on the UGC-CEC National Mission on Education through Information and Communication Technology (NME-ICT) initiative and is redesigned and developed by C-DAC for Television broadcast, it reuses the eLearning content being developed by Educational Multimedia Research Center (EM²RC) and brings them to television.

The educational application could be used either to supplement curriculum or as enrichment material to learner /viewer about the current lecture programmes.



Figure 3: The Learning Application

7. Conclusion and Future Work

The proposed framework will enrich the educational broadcasts with interactive learning applications, keep the viewer engaged, generate learner's interest and thereby enhance learning. This will also cater to the needs of educational content providers to create, store and broadcast the interactive content. We believe that the natural course of future research is to enable support for remote participation via chat interface, downloading of tutorials on PVR, Pen Drives and extend the framework to include HbbTV, GEM^[13] based IPTV, and Mobile TV broadcasts.

Appendix

Technical standards involved in the framework:

1. ISO/IEC13818-1 MPEG-2 Systems Standard. [20]
2. ISO/IEC13818-6 DSMCC (Digital storage media command & control protocol) Standard. [19]
3. ETSI TS 102 727 Multimedia Home Platform (MHP) Specification.
4. ETSI EN 300 468 PSI Signalling Descriptors.
5. ETSI TS 101 812 MHP Specification.
6. ETSI TR 101 202 DVB Implementation Guidelines for Data Broadcasting.

ETSI EN 301 192 DVB Implementation Guidelines for Data Broadcasting.

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