<table>
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<tr>
<th><strong>Title</strong></th>
<th>Interactivity and diversity through digital TV.</th>
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<tr>
<td><strong>Author(s)</strong></td>
<td>Lee, Kenneth.</td>
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<td>1999</td>
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Paper No. 8
What is Digital TV?

- **Consumer**
  - TV set that receives and displays digital TV signals
- **Consumer Electronics Manufacturers**
  - TV set with digital signal processing within
- **Broadcasters**
  - Digital transmission of video, audio and data

Digital Transmission

- Source Coding
- MPEG Compression
- Channel Coding
  - Reed-Solomon Coding, Convolutional Coding
- Modulation
  - OFDM
- Broadcast

Benefits of Digital TV

- More efficient
- More robust
- Better picture quality
- Crystal clear digital quality sound
- More choice (programmes & applications)
- Greater interaction with TV
2nd Regional Symposium On New Media & Learning Technologies
8 – 10 September 1999, Singapore
INTERACTIVITY & DIVERSITY THROUGH DIGITAL TV
Kenneth Lee, TCS

Scope
- Introduction on DTV
- Diversity through DTV
- Interactivity through DTV
- The Road Ahead
- Conclusion

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Block Diagram of Digital TV System

Benefits of Digital TV
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- More robust
- Better picture quality
- Crystal clear digital quality sound
- More choice (programmes & applications)
- Greater interaction with TV
How can I receive Digital TV?
- Set-top box
- Integrated Digital TV set
- PC plug-in card

Diversity through Digital TV
- Digital TV Standards
- Delivery Platforms
- Applications
- Content

Digital TV Standards
- Advanced Television Systems Committee, USA
- Digital Video Broadcasting, Europe
- Digital Broadcasting Experts Group, Japan

Comparison of DTV Standards

<table>
<thead>
<tr>
<th></th>
<th>ATSC</th>
<th>DVB</th>
<th>DIBEG</th>
</tr>
</thead>
<tbody>
<tr>
<td>Video</td>
<td>MPEG-2</td>
<td>MPEG-2</td>
<td>MPEG-2</td>
</tr>
<tr>
<td>Audio</td>
<td>Dolby AC-3</td>
<td>MPEG-2</td>
<td>AAC</td>
</tr>
<tr>
<td>Transport</td>
<td>MPEG-2</td>
<td>MPEG-2</td>
<td>MPEG-2</td>
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<tr>
<td>System</td>
<td>PSIP</td>
<td>DVB SI</td>
<td>Not finalized</td>
</tr>
<tr>
<td>Information</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Transmission</td>
<td>8VSB</td>
<td>COFDM</td>
<td>BST-OFDM</td>
</tr>
</tbody>
</table>

World Adoption of Digital TV Standards

Delivery Platforms
DTV Applications
- TV Mobile
- Single Frequency Network (SFN)
- High Definition TV (HDTV)
- Multi-Channel Surround Sound
- Data Broadcasting
  - Multi-lingual Subtitling/Multi-language Audio
  - Digital Video Recording
  - Interactive Services

TV Mobile
- Concept of TV anytime, anywhere with updated information on the move
- Successfully tested on MRT trains, SBS buses and LRT trains
- Possible launch in other public transportations

Single Frequency Network (SFN)
- Multiple transmitters are deployed for effective coverage
- Same frequency is used for these multiple transmitters
- Frequency spectrum is conserved

Data Broadcasting
- Data can either be programme related or otherwise
- Examples include Digital Teletext, Web pages etc
  
Multi-Lingual Subtitling/Multi-Language Audio
- More than one language can be carried in the digital bitstream simultaneously

High Definition TV (HDTV)
- Widescreen (16:9)
- 1920 x 1080 \( \rightarrow \) > 2 million pixels
- Superior picture quality

Multi-Channel Surround Sound
- Recreate cinematic experience at home
  - 5.1 speaker system
  - Dolby AC-3

Digital Video Recording
- Quality as good as the source
- Either on tape or on hard disk

Interactive Services
- Interactive applications can be enhanced with local storage (hard disk)
- Further details to be provided later
Digital TV Content (1)
- Video
  - Standard Definition TV (SDTV)
  - Enhanced Definition TV (EDTV)
  - High Definition TV (HDTV)
- Audio
  - Multi-Channel Surround Sound
  - Multi-Language Audio

Digital TV Content (2)
- Data
  - Multi-lingual Subtitles/ Closed Captions
  - Interactive content
  - Programme associated data
  - Web pages/ Multimedia content
  - Digital Teletext
  - File transfer/ Software download

Interactive Digital Broadcasting
- Merges mass appeal of traditional TV with rich, interactive power of Internet
- TV is pervasive and easy to use
- May or may not require a return/ back channel
  - telephone lines
  - cable
  - wireless

Degree of Interactivity
- Proto-interactivity
  - return path is not required
  - eg Teletext
- Full interactivity
  - return path is required
  - eg E-commerce

Medium of Interactive Content
- Broadcast
  - Audio, video and data streaming
- Walled Garden
  - Cached content
- Internet
  - Web browsing/ searching

Interactive Services
- Electronic Programme Guide (EPG)
- E-commerce/ Home Banking
- Personalized TV
- Interactive Advertisement
- On-demand Information/ Digital Teletext
- Polling/ Quiz
- Online Education
- Internet
- Games
<table>
<thead>
<tr>
<th><strong>Electronic Programme Guide (EPG)</strong></th>
<th><strong>E-Commerce/ Home Banking</strong></th>
</tr>
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</table>
| • Programme guide for the multi-channel services  
• Navigation tool  
• Provide descriptions of programmes  
• Allows sorting, searching, querying  
• Gateway to interactive services  
• Set user preference | • Pay Bills  
• Purchase Merchandise  
• Book Airline Tickets/ Travel Packages  
• Order Groceries  
• Check Bank Statements  
• Transfer of Funds |

<table>
<thead>
<tr>
<th><strong>Personalized TV</strong></th>
<th><strong>Interactive Advertisement</strong></th>
</tr>
</thead>
</table>
| • Requires hard disk  
• Based on user profile  
• Creates your own channel  
• Automatically records your favourite programmes  
• Control over viewing  
• Watch when you want, what you want and how you want | • Can be based on user profile  
• Direct marketing channel  
• Banner ads  
• Special ad content  
• Provide detailed product information |

<table>
<thead>
<tr>
<th><strong>On-demand Information/ Digital Teletext</strong></th>
<th><strong>Polling/ Quiz</strong></th>
</tr>
</thead>
</table>
| • Data broadcast  
• Could be programme related or otherwise  
• Real-time information  
  • Weather  
  • Traffic  
  • Stock market | • Feedback from viewers through polling  
• Simple home viewers' quiz |
**Online Education/ Course**
- Course material is broadcast
- Interactive exercises/ tests
- Enhance learning experience
- Programme may be repeated with the help of local storage

**Internet**
- Web browsing
- Email
- Internet Chat
- File Transfer/ Software Download
- Simultaneously while watching the TV

**Games**
- Online gaming
- Interactive games

**Benefits of Interactive Digital Broadcasting**
- Viewers
  - convenience
  - value-added services
- Advertisers
  - capture consumers' feedback
  - targeted advertising
- Broadcasters
  - new revenue opportunities

**Technologies & Standards of Interactive Digital Broadcasting**

---

**Who has started Interactive TV?**
- ATVEF
- Open
- MoreCom
- DVB-IP
- ATSC
- Eureka 147
- DAVIC
- Media Highway
- CANAL+
- TPS
- CNN
- NBC
- QVC
- sky
- ABC
- FOX
- NBC
- MTV
- ESPN
- CNN
- BBC
- Al Jazeera
- Sky TV
Issues to Interactive Digital Broadcasting
- Interactive platform
- Return channel platform
- Conditional access/ Security
- Business Model
- Privacy

Factors to Successful Interactive Services
- Relevant content
- Value-added
- Ease of use
- Instant access
- Secure network
- Local storage
- Built-in safety checks

The Road Ahead......

Future Trends
- Set-top boxes will have increasing power and storage capacity
- Voice technology
- Home networking
- More converging products
- Ubiquitous wireless and net access
- Bumper bandwidth

TCS' Direction
- Exploit latest technology to provide quality picture and sound
- Provide value-added programmes and services to our viewers
- Continue to enrich and delight the world

Conclusion
- DTV is here to stay
- New and wide range of services
- Change the lifestyle of people
- Evolve and converge with the Internet and telecommunications