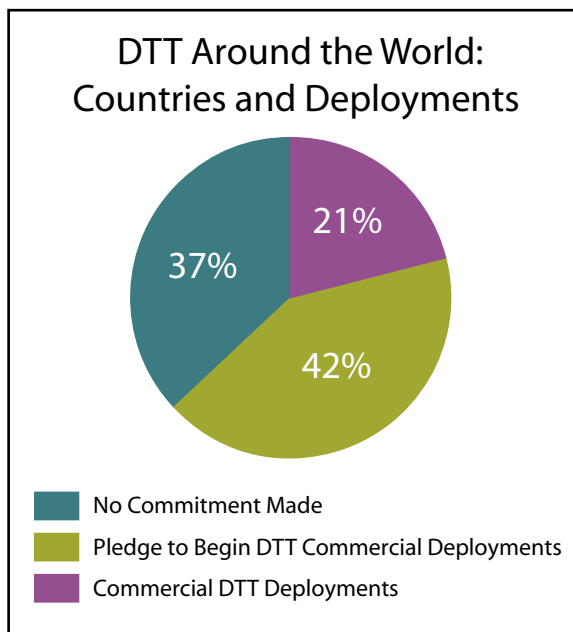


From Analog to Digital TV: The Essential Guide to Planning a Digital Terrestrial TV System and Analog Shut Off

Television reception is viewed as a right by most people around the world. Not only does it provide entertainment and education but it also provides mass communication during critical national events and emergencies. Spectrum allocated for terrestrial TV transmissions is one of a nation's most precious resources. When embarking on digital terrestrial TV (DTT) transition, proper planning is critical. A misstep in a digital TV transition can have serious and disastrous consequence for a nation's spectrum management and TV infrastructure.

That is why this guide is essential for any government agency or national or private broadcaster starting a digital terrestrial TV system, or planning an analog shut-off. Analog TV shut-offs in the United States, Germany, Sweden, Finland and other Western European countries have received significant attention. There are more than 260 million TV households that can receive a DTT signal (with a proper receiver) today. But despite that considerable penetration, DTT has really only made it to early adolescence. Only 21% of all countries have commercial DTT transmissions (see chart).

From Eastern Europe to Latin America and the Middle East and Africa, most countries have either not built their DTT systems or are years away from shutting off their analog systems that are operating alongside digital transmissions.



Source: Digital Tech Consulting

This second and third wave of activity will not mimic the DTT programs in the first-wave nations where auctioning of shut-off analog spectrum brought in millions, or sometimes billions, in government revenue. The political will, the ability to partially subsidize Analog to Digital (AtD) transitions, and the large numbers of consumers using terrestrial TV created a framework that these transition programs were built around.

That framework is not the same for most countries/territories now starting their DTT programs. Many are relatively small and have different requirements when selecting transmission standards, content and receiver specifications, and building the infrastructure. In countries where large segments of the population are solely dependent on over-the-air (OTA) broadcasts for their TV reception, making

the right decisions can be even more critical than it is for more developed countries where there are many other TV-watching options.

Essential factors for planning a successful transition

This DTT planning guide is designed around a broad framework from which a plan can be built. Because “a one size fits all” approach is not possible, each country/broadcaster/government agency plan must be highly customized. Through DTC’s years of experience in measuring the DTT market and involvement in advising those planning analog-to-digital transitions, we are able to share with you essential insights into the planning of a DTT transition.

Does it make sense to build a DTT system?

For many countries, the answer to this question is undeniably, yes. If spectrum is a valuable commodity and the more efficient use of it allows for additional uses (or makes more TV services available within existing spectrum), then you’ve at least established that further consideration is warranted.

Making more efficient use of spectrum is a worthy goal, but in countries where the government operates all or part of the broadcast infrastructure, or where private industry is unable to fund a new system, the government will pay for the new infrastructure. But in countries where basic human needs, such as access to safe drinking water and medical care, are not adequately met, building a DTT system may not be the best use of a government’s resources.

In this case, countries with limited resources may believe that they must adopt the most basic innovation so as not to be left behind in an antiquated analog world. Although this is an important consideration, analog broadcast equipment and consumer receivers continue to be built in significant quantities. DTC believes that servicing current analog TV systems and their customers can be accomplished in the near- to mid-term future.

How Do You Begin Building a Plan and Timetable?

Whether you are starting from the beginning or have already begun DTT tests and/or commercial services, there are multiple *fundamental* issues to address in forming a plan and timetable. They encompass technical, political, fiscal, market, and government policy realities. Every country’s or broadcaster’s plan and timetable will be vastly different. But every fundamental issue outlined below should be considered when developing a plan.

Should integrating a DTT system with other digital platforms, such as mobile TV or radio be considered? If yes, how will that affect standards and specifications selection? How will an integrated infrastructure be built?



For many countries with relatively small populations and geographic areas, existing OTA analog systems are centralized. The need to build on an incumbent system, or a desire to incorporate greater efficiency, will warrant considering the advantages of integrating multiple digital transmissions into a single system. This may make the most sense in areas where transmission of multiple “channels” can be done from a central head end or transmission point.

The infrastructure cost savings are obvious, but mixing of content ingestion, work flow, transmission and reception can be complicated. Some fixed DTT, mobile DTT and digital radio standards are built on common platforms that can technically mix media, transmission and reception. The practical application, however, depends on equipment availability, receiver form factors and the need for engineering expertise to put together such a system.

Those who have already chosen, or built, a DTT system may be considering a slightly different question: Is it possible to integrate another digital platform, say mobile digital TV, with an existing DTT system? Again, there are theoretical solutions but implementation can be tricky. If, for example, you’re operating a fixed DTT system based on the DVB-T standard, choosing DVB’s mobile TV standard, DVB-H, may seem like a logical choice. But before making that choice, a study of spectrum use, receiver availability and general market conditions must be considered. The same applies for ATSC’s and ISDB-T’s mobile TV solutions.

Choosing a Transmission Standard

How do you select transmission standards and technical specifications?

For the purposes of this guide we’ll divide the standard selection and technical specification selection into two areas, but the two are intertwined on a fundamental level. A desire to use a particular video compression scheme, for example, may dictate the type of transmission standard chosen. Here are the basics:

- There are three major DTT transmission standards – DVB-T & second-generation DVB-T2, ATSC, and ISDB-T & its Brazilian implementation, SBDTV – from which to choose. And there are a number of criteria that should be considered.
 - Transmission standards selected by neighboring countries or territories may have an impact on the standards decision. Potential synergies between countries and territories for producing content and building infrastructure should be considered.
 - The pan European approach of implementing one transmission standard has brought economies of scale to

the roll out of DTT across Europe. Countries with thousands of broadcasters and television viewers, such as in the United States, can more successfully adopt a transmission standard that isn't as widely used in other parts of the world.

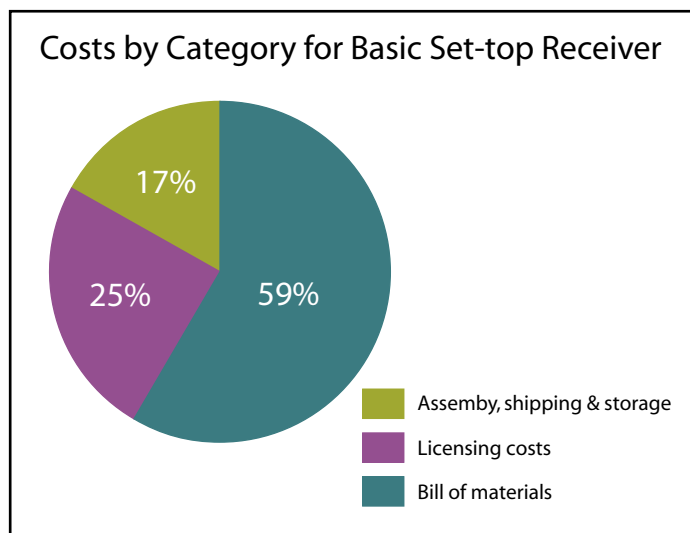
- The number of borders and the amount of viewership on other sides of those borders must be considered carefully for each country. In addition, a thorough understanding of a country's spectrum policy as it relates to its neighbors must be considered.

Choosing Technical Specifications

- The cost and availability of infrastructure equipment and consumer receivers must be carefully weighed. This step will require broadcast equipment and receiver equipment cost analyses.
 - It is important to conduct cost analyses whether it's done by broadcasters, content owners, or other stakeholders. In the cases where the government will have any involvement in financing/subsidizing the system and/or consumer receivers (see Government Involvement section) it is vital.
 - Important warning: The potential size of your market for either professional or consumer equipment, and the types of specifications chosen, could result in higher costs (or lack of supplier interest) than that of costs incurred by other countries. Potential suppliers and service providers who do not foresee

a reasonable payback for supplying your market may have to increase prices or decline to participate at all.

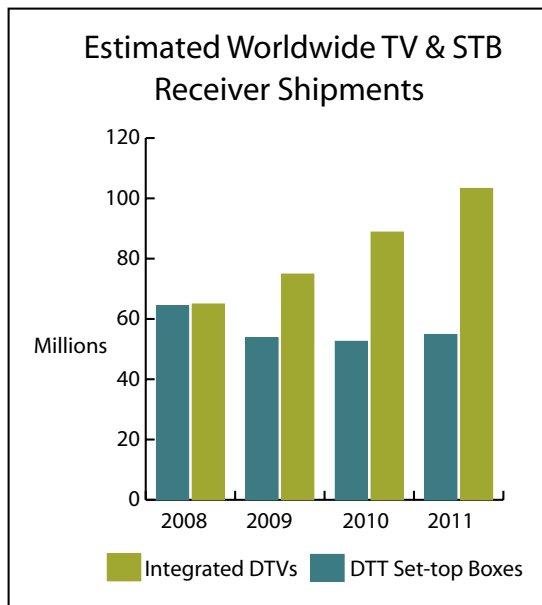
- It is also important to consider costs other than just components and manufacturing. All receivers will include a bill of royalties, which make up a significant segment of costs for receivers. Most open standards come with a royalty bill and it's important to understand how those fit into a receiver's cost structure. The ratio of costs illustrated in the pie chart is one example of a basic DTT set-top receiver specified for one country.



Source: Digital Tech Consulting

Each country or territory's specifications will differ, as will the royalty bill for those standards and specs. This example doesn't include additional costs added by mark ups from manufacturers and retailers.

- Carefully weighing the need to future proof the system against the advantage of adopting currently widely-used specifications can result in a system that is not antiquated but one that also can be practically built in the near term. This is closely tied with the cost and availability of equipment outlined above.
 - Many new systems incorporate more advanced technical specifications than those used in the first DTT systems, such as those built in the U.K. and the United States. New compression technology, varying transport options, better multimedia encapsulation schemes, etc., present a smorgasbord of improvements. Some of these improvements are not trivial – especially more efficient compression which will create more virtual bandwidth. But not all of those improvements will work with legacy content, and players who depend on existing content from outside sources will need to carefully calibrate the old vs. new calculation.
 - Availability of equipment and expertise must also be carefully considered. A highly future proofed system could create the unintended consequence of making it difficult for outside vendors and service providers to supply equipment and services at a low cost.



Source: Digital Tech Consulting

- Planners should consider all types of receivers that will eventually be used. Most countries building DTT systems and/or programs focus on low-cost single-purpose set-top boxes (STBs) when choosing specifications – a critical factor necessary for initial, and eventually widespread, adoption. But, in many countries integrated TVs, STBs with PVR functions, PC USB sticks, and other TV tuners will be a part of the mix for years to come. Not considering future devices when selecting specifications can result in future headaches. Receivers are mostly STBs in the early years of a transition, but, in most cases, integrated TVs make up the majority of receivers in later years.

- Technical specifications must also be considered for auxiliary items that make up part of the receiver system. One of the most critical areas is antenna specifications. Planners must consider the population's current use of indoor and/or outdoor antennas. This is particularly critical for the very high frequency (VHF) band, where most reception problems occur. Other factors to consider are whether or not transmission is from a central point. If transmission occurs from multiple points, planners may need to consider specifying/recommending omni-directional antennas.



- Is there a desire/need to build a DTT system that incorporates upon completion, or later, a pay TV component? If so, conditional access systems must be considered. Conditional access systems come in different varieties that can mix hardware and software security. Planners should also consider if a conditional access system will require any “enhanced” features, such as digital rights management (DRM) or interactive software components.

What role, if any, will the government have in the distribution of receivers to the public?

The answer to this question will have profound impact on most all other decisions and planning items for a digital transition. There are two main areas in which the government can and/or will be involved – educational and financial.

- There is no question as to whether or not educational messages must be distributed to the public explaining how the switchover will affect them. It is not possible to have a successful transition without this component. It is the size of the effort that must be planned, and this, of course, is tightly linked with the amount of money that can be devoted to the effort.

Although the government will be the likely centralized point, there are multiple stakeholders who can be a part of the effort. Broadcasters, retailers, and pay TV service providers (if adopting pay component for digital OTA) are potential beneficiaries of a switchover and should be a part of a coordinated public education effort. There are also multiple conduits for getting the message out. In addition to the stakeholders, consider community organizations, schools, and places of worship as places that citizens can learn about a transition.

- Most countries that have completed the AtD transitions have subsidized (or partially subsidized) the consumer purchase of receivers whether they be DtA converters or simply digital receivers. In the case of analog switch off, the cost of the most basic receiver must be affordable enough so that households dependent on OTA transmission can reasonably acquire a receiver.
 - A financial analysis that is tightly coordinated with receiver and professional equipment cost analyses must be produced.
 - Identification of potential funding sources and the means through which to receive funding approval must make up this financial analysis. A well-researched receiver/STB cost analysis is essential to preparing a subsidy plan.
 - If a government subsidy is part of the receiver distribution, it must be decided what, if any, other components of a “receiver

package” will be included. Will a subsidy incorporate the cost of an antenna? Remote control? Cables between a television and STB?

- If the government, or some other entity, is partially subsidizing receivers, what kinds of controls, if any, will there be on receiver quality? In other words, will there be some type of testing and/or certification program to ensure all receivers adhere to a minimum standard or specification? There are independent equipment-testing companies that can perform this kind of testing. Receiving a certification from one trusted source could help to streamline a certification program.
- If a subsidy program is established, how will the subsidy be delivered to the end user?

How can you get additional help in planning for a DTT transition?

DTC, a boutique market research firm with more than 10 years experience in quantifying and analyzing the DTT market, helps government agencies and other DTT stakeholders plan for digital transmissions. Among the services we offer:

- Creation of analog to digital transition plans
- Customized analyses of standards and specifications across platforms
- Customized receiver cost analyses
- Creation of market-research models to measure the availability and sales of receivers

We hope that you find this guide, which is created as a result of DTC’s expertise from years of working with broadcasters, government entities, and DTT receiver suppliers, useful and invite you to contact us to learn more about how we can help you in the all-important planning for a digital TV transition.

Not only did we receive personal attention from DTC’s senior analysts, but DTC’s STB cost analysis proved to be accurate.

-Second Authority for Television and Radio of Israel

DTC’s work in the digital TV industry has included forecasting the DTT receiver market throughout the world, helping individual governments plan their DTT transitions, tracking the activity of individual terrestrial broadcasters, and providing the only digital converter-box tracking service for the world’s

largest analog shut-off program. If you are at the beginning of a DTT transition or are planning for an analog TV shut off, please contact Myra Moore at DTC to see how you may benefit from our years of experience in the DTT industry.



DTC's president and chief analyst, Myra Moore, has more than 15 years of experience following the digital TV market. From the first implementations of the MPEG-2 video compression standard to the formation of the U.S.'s Grand Alliance, and the co-authoring of one of the first market guides to the worldwide digital terrestrial TV market (January, 2000), she has taken a front-row seat in the world's move from analog to digital TV. She has presented DTC's findings on the digital TV market to organizations such as the DVB Forum and the NAB, and is a member of the Academy of Digital Television Pioneers.

DTC demonstrated expertise and inside perspective in the digital TV market. Its work contributed to the Second Authority's implementation of our analog to digital TV transition.

-Second Authority for Television and Radio of Israel

For more information contact:
Myra Moore
www.dtreports.com
myra@dtcreports.com — 214-915-0930