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Practical recommendations for digital switch over

Supporting information to ITU's guidelines for the transition from analogue to digital broadcasting

February 2013

About This Report

In this report we provide a practical guide to the information already published by the ITU and others on digital switchover.

The opinions and conclusions expressed are those of Plum and Farncombe alone and do not represent official GSMA viewpoints.

An Annex to this report is available at the GSMA website that provides more information on issues in sub-Saharan Africa and practical aspects of the recommendations including visual examples of campaigns.

www.gsma.com/spectrum/resources

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1. Introduction

Digital Terrestrial Television (DTT) provides a more flexible and efficient technical platform for broadcasters to deliver both SD and HD programming. It can also provide wider consumer choice through more broadcast TV channels, multimedia, radio and data services. DTT makes more efficient use of scarce spectrum resources and as such it is a key enabler for the release of radio spectrum.

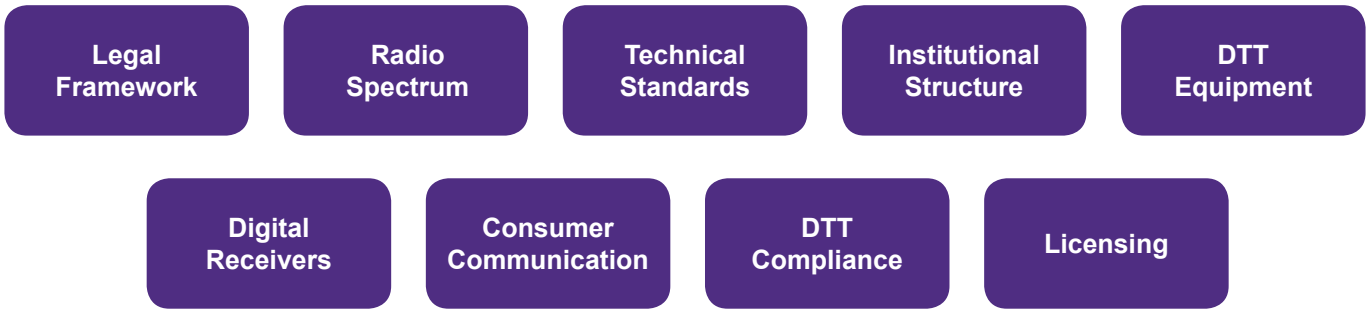
The process of Digital Switch-over (DSO) includes:

- The change of technology and technical infrastructure required to switch TV broadcasting from analogue to digital format
- The switching off of analogue television services
- The coordination of the many different groups involved in or effected by switchover
- Communication with all stakeholders and the public.

DTT has already been implemented in many countries and it is being planned and rolled out in others. The decision at WRC12 to allocate the 700 MHz band (694 to 790 MHz) on a co-primary basis in Region 1 for mobile and broadcasting from June 2015 creates an imperative to ensure that switch off of analogue television in the 700 MHz band occurs in a timely way. It also stimulates planning for and implementation of DTT. Achieving the dual objectives of changing the use of the 700 MHz band and introducing DTT elsewhere in the UHF spectrum requires strong government leadership, especially when it is to occur in a relatively short timeframe. The key question for governments is “how to meet the deadline”?

DSO is a complex programme involving many stakeholders including consumers for whom undisrupted access to television services for news, education and entertainment is an important consideration. Examples of the many facets to be managed are shown in Figure 1-1.

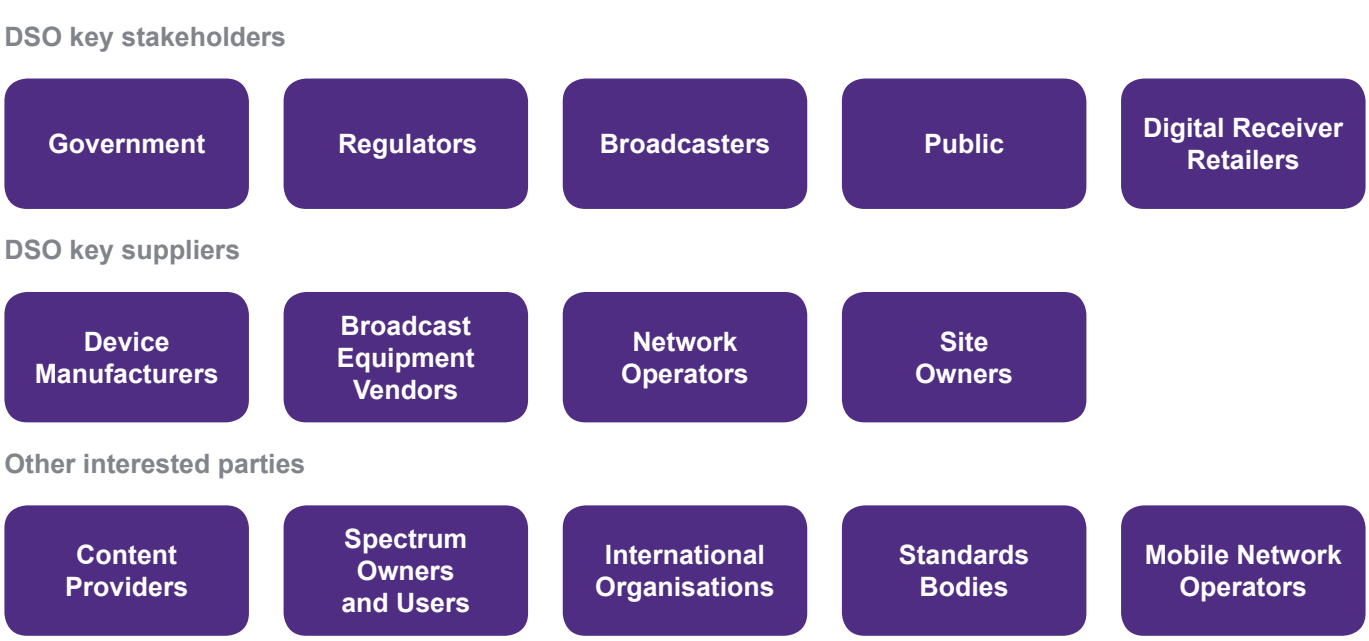
Figure 1-1: Digital switchover



A key part of the programme must be focused on creating incentives for the public to act. If this is not achieved the programme will fail. In addition to the activities shown above, ensuring adequate funding is central to a successful outcome and a key aspect for government to drive, especially in lower income countries where consideration of subsidy is essential.

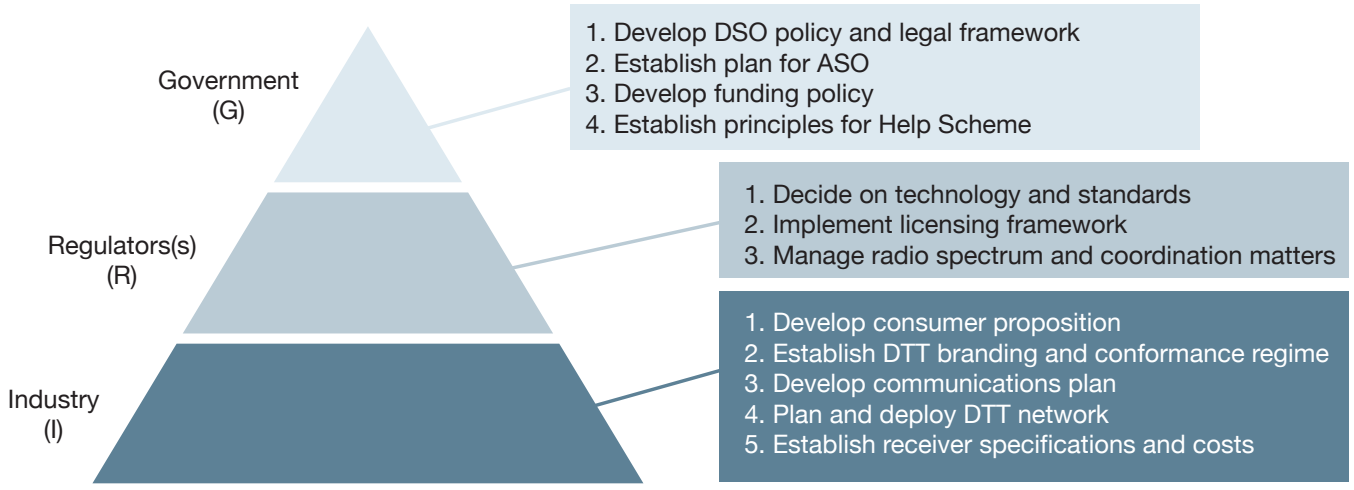
By its nature DSO is a multi-stakeholder programme, which requires strong leadership from Government. Examples of the many stakeholders that could be involved are shown in Figure 1 2. As with all multi-stakeholder programmes the complexity and management/governance effort required should not be underestimated. For this to be successful a clear view is required of activities to be led by government, those to be led by the market and the institutional arrangements for the management of the programme. Accountability and regular review must be implicit in the governance framework.

Figure 1-2: DSO stakeholders



In this report we provide a practical guide to supplement the information already published by the ITU and others on DSO. It focuses on a set of practical measures that anyone undertaking switch over / switch off must address. To do this we recast the activity defined by the ITU into a simpler framework and then set out recommended actions with supporting information. The framework is shown in Figure 1-3.

Figure 1-3: DSO actions



Source: Plum, Farncombe

Where possible we also identify risks that could derail the DSO programme. Especially in cases with short DSO timelines, these risks could be amplified. Examples include:

- Expensive receivers and low engagement from retailers to make receivers widely available in the market
- Cost of meeting roll-out and coverage obligations (e.g. when country/broadcast specific features are required)
- Poor communications campaigns, leading to confusion about DTT benefits and how to obtain them – this can be particularly damaging in remote communities with poor literacy skills
- Insufficient co-ordination with adjacent countries increasing the risk of cross border interference (shorter transition periods may make this more complex)
- Inadequate DTT network planning, which may cause delays to network roll-out and switch-on schedules.

In the remainder of this report we:

- Summarise best practice
- Briefly describe the benefits of adopting DTT and the resulting digital dividend
- Recommend a high level framework for DSO and practical steps for Government, regulators and industry.

2. Summary of best practices

In Table 2-1 we set out a list of recommendations and provide references to the appropriate section of the report. The letter in the left hand column refers to (see Figure 1-3):

- G = Government
- R = Regulator(s)
- I = Industry.

Table 2-1: Recommendations

	Recommendation	See section
G1	Review legislation and put in place all relevant legislation for DSO	5.1
G2	Set up a comprehensive plan for DSO (including organisation and timetable)	5.2
G3	Budget for financial resources and identify and action funding interventions	5.3
G4	Create the framework for the Help Scheme (with clear objectives and an implementation plan)	5.4
R1	Identify options for technology and standards and make decisions in sufficient time to deliver the programme	6.1
R2	Put in place licensing frameworks that are fit for purpose for DSO and issue license in good time	6.2
R3	Put in place a spectrum management plan to ensure that all spectrum management activity for DSO is planned and delivered in good time	6.3
I1	Develop an attractive consumer proposition for DTT services	7.1
I2	Put in place a DTT branding and conformance regime	7.2
I3	Put in place a communications plan that covers all key aspects of the DSO process	7.3
I4	Create a viable DTT network and deployment plans	7.4
I5	Create specification for set top boxes that meet local requirements in sufficient time to allow delivery and deployment	7.5

3. Benefits

This section briefly covers the benefits of adoption of DTT. This is shown in Table 3-1. Table 3-2 shows benefits of implementing mobile broadband, to which the release of spectrum through the DSO process contributes.

Table 3-1: Benefits of DTT

DTT
More TV services available, increasing viewing options and broadcasters' ability to target specific niche languages (e.g. education, children's programming)
Support for new business models (including Pay-DTT and Interactivity) enabling new services and market innovation
Job creation – the potential to create more jobs across the broadcasting value chain: • Content creation (incl. HD programmes and interactive applications) • Content management (e.g. metadata, quality control, etc.) • Advertising • Consumer device manufacturing, distribution, retailing • Other DTT equipment manufacturing (digital transmitters, encoders, MUXs, etc.) • Technical (e.g. EPG management, digital receiver conformance, installation, security management, etc.)
Potential to enable an increase in the efficiency to collect license fees for PSBs (where such funding mechanisms apply)
Enable new services such as education and other socially important content

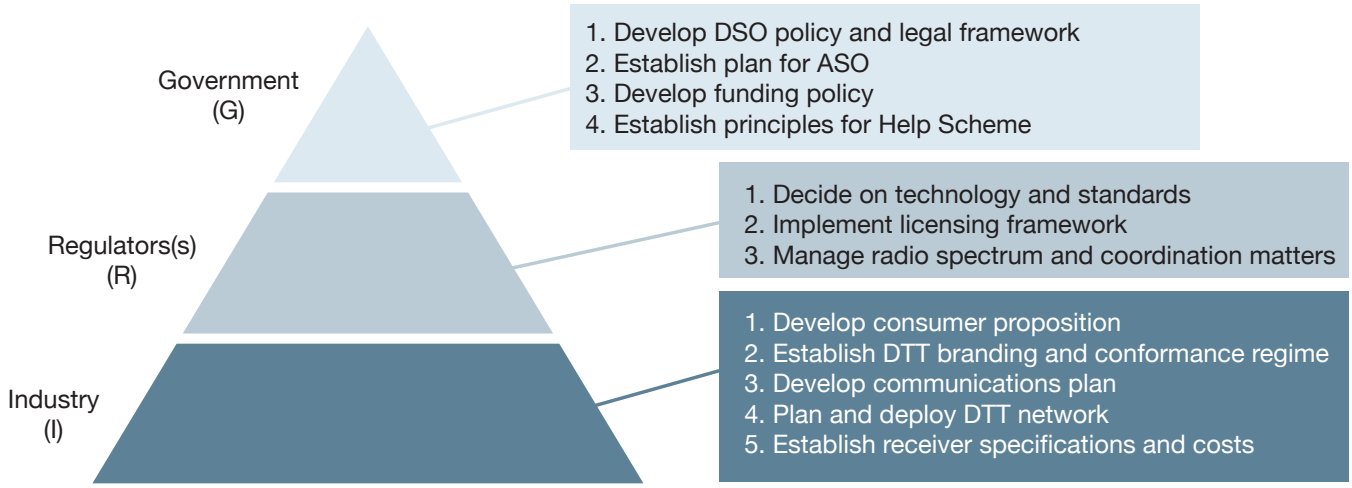
Table 3-2: Benefits of mobile broadband

Mobile broadband
Improved productivity – more efficient business processes, better supply chain management, lower costs of accessing suppliers/wholesale markets
Greater access to and use of information – reduced search costs, improved interaction and coordination among market agents
Extended geographic reach of markets – facilitates e-commerce; enables access to wider customer base and new ways of delivering products and services
Lower barriers to entry – reduced financial and reputational barriers to trade online (especially for SME); access to web tools and applications makes it easier for businesses to develop a web presence
Improved access to education and other socially important content

4. High-level DSO framework

A high level framework is essential for a successful DSO. It should clearly set out the activities to be led and undertaken by stakeholders. Figure 4-1 identifies a list of Items for Government, Regulator(s) and the Industry. While ownership of specific activities may rest with a given entity (e.g. Government) this does not mean that all aspects of delivery sit with that entity and cooperation across the framework is essential for success.

Figure 4-1: DSO framework – key action items



Source: Plum, Farncombe

In the following sections we cover each of these areas.

5. Government

5. Government

The role of Government centres on policy for and facilitation of the DSO. Government provides a key leadership role for the switchover programme and its objectives, which it will be responsible for defining. There are several prerequisites for DSO that should come from Government as shown in Table 5-1.

Table 5-1: Government actions

Item	Objective
Development of policy for DSO	Put in place all necessary policy, legislation and other legal instruments required for DSO to happen
Establish the plan for ASO	Ensure that an overarching plan exists that all stakeholders buy into
Develop funding policy	Make the necessary budgetary provisions from Government (on a multi-year basis) for the DSO programme to proceed
Establish principles for help scheme	To ensure that the help scheme is available and able to be delivered when needed

5.1 Legal framework and relevant Acts

A comprehensive and effective legal framework for switchover requires clear policy to be in place prior to considering legislation (if changes to legislation are required). The key policy objectives are relatively simple to define and they include:

- Creating the conditions for broadcasting of television to move from analogue to digital format
- Switching off analogue TV broadcasting in the relevant band (and in other parts of the UHF band if appropriate)
- Enabling the move of television services currently in those bands to other parts of the UHF spectrum that will continue to be used for broadcasting
- Enabling the subsequent licensing of other services (e.g. mobile broadband) once clearance has occurred to access the digital dividend.

While much of the above activity centres around use of spectrum it is also important to consider the future of public service broadcasting legislation in the switchover process, especially to ensure that switchover continues to allow public broadcasting to function in line with current or revised statutory requirements.

It is highly likely that the legislation required to do some or even all of the above is already in place but a review of current legislation is essential to identify where gaps may exist or to circumvent aspects of existing legislation that will be an impediment to achieving switchover.

Policy should also address the institutional aspects of DSO. Here Government will need to form a clear view of the organisation required for switch over, which parts of the programme are to be led by Government and which by the market. Whether or not the establishment of an institutional structure for DSO needs to be put into primary legislation, some form of secondary legislation or dealt with by other means is a matter for each country to consider based on its particular circumstances. However, it is important that the institutional and leadership arrangements are driven and overseen by Government to ensure that policy objectives are delivered.

[1] http://atu-uat.org/images/eventlist/events/files/reportsfolder/2ND%20DIGITAL/ATU_2nd%20Digital%20Migration%20Summit_Recommendations_0912%20EN.pdf

A critical area that is clearly within the Government's domain is funding and subsidy. As the ATU recognises in its report on digital migration in Africa[1] Government intervention is crucial to the success of the programme together with a requirement for funding and support. While this may be an implicit part of the policy objectives for DSO it will require negotiation with the finance/treasury ministry (funding for DSO will be in contention with other spending priorities). Such funding will need to be built into national budgets on a multi-year basis and where appropriate into finance legislation to ensure that funding does not become the element that derails the programme.

If the use of a Public Private Partnership (PPP) arrangement is contemplated for switchover it is also essential to check that both sector and financial legislation allows the intended arrangement to occur in a timely manner so as to allow a realistic timeframe for establishing the financial aspects of the PPP.

Other Government departments that may need to be involved in both policy making and legislation review/ enactment are:

- Economics/industry ministries (especially for consideration of competition issues)
- Consumer affairs ministries with a role in consumer communication and protection. It is also important not to forget the role played by regional and local government bodies and these entities should be fully considered when formulating and reviewing policy and legislation. This is especially important in countries with a federal or devolved Government model.

While Government will play a key leadership role in switchover it is also imperative that the regulator(s) involved in the broadcasting and communications sectors play their role, especially when they carry out delegated functions from Government. Regulators usually gain their powers through provisions in primary legislation and it is essential that legislation enables regulators to implement the aspects of switchover that fall within their domain. A review should be undertaken of regulators' powers to identify where there may be issues or conflicts for DSO and Government should ensure any issues identified are addressed.

During the switchover programme it may also be necessary to establish an operating protocol between regulators (and regulators/government) to ensure that inter-regulator matters can be addressed in a timely way. This protocol may be part of a more general Task Force arrangement established with industry or in addition to it.

Where aspects of regulation of broadcasting, wireless and communication services fall outside of sector regulators scope and powers (as they may do in some countries) it will be necessary to include all other relevant regulators (e.g. competition authority/regulator).

5.2 ASO planning

A comprehensive plan and timetable for ASO is a prerequisite for a successful DSO programme. It should include all relevant activity and stakeholders. The existence of the plan will help to identify and resolve bottlenecks and avoid unnecessary delays. While Government can provide strong leadership in this respect, it is advisable that a dedicated switchover organisation (e.g. a "DSO Task Force") is mandated to perform this role.

There are several activities that need to be incorporated by Government in the DSO planning process, which we describe below, including:

- Establishing the Task Force
- Developing an approach for transition
- A realistic timetable.

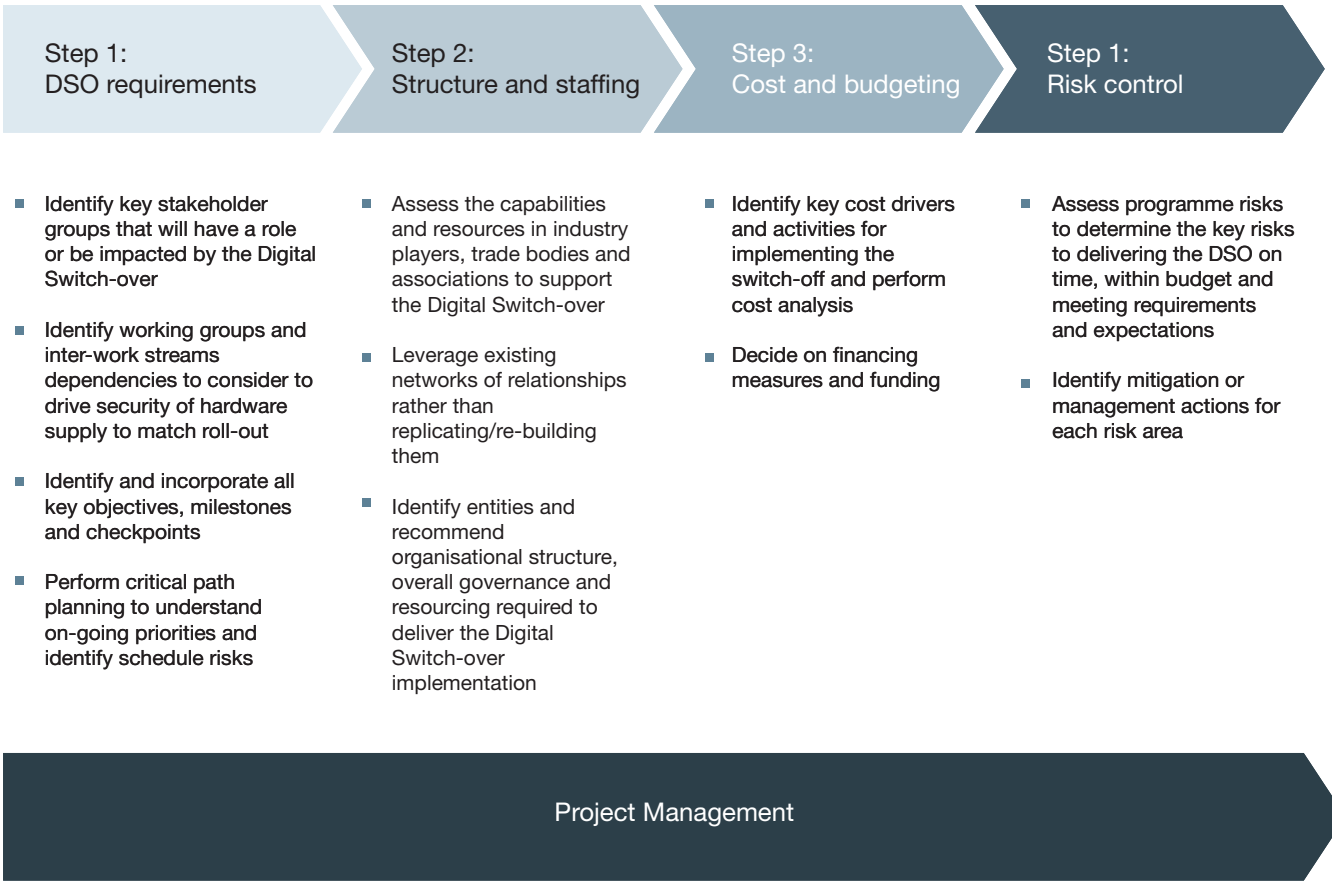
5.2.1 Setting up a DSO Task Force[2]

Experience of past and current DSO programmes shows that many Governments establish/mandate an organisation to steer DSO. In some other cases a preliminary evaluation team established by Government has recommended the appointment of an independent single entity with the necessary powers to manage the transition. In this document we refer to the organisation as a DSO Task Force.

It is important that the Task Force operates in an impartial way. It should assign roles and establish targets for all aspects of the DSO programme in line with Government policy, which it will then monitor throughout the duration of the programme. A key role of the Task Force is to ensure that the DSO programme stays on track and to flag to Government when serious risks are identified (together with mitigating action if this can be determined by the Task Force).

Identifying the Task Force's role, setting it up and ensuring effective management of its day-to-day operations requires initial planning and good stakeholder cooperation. Figure 5-1 shows an example with four steps to establish the DSO Task Force and the activities for each step. Figure 5-2 shows an example of how a Task Force could be organised and its relationship with key stakeholders.

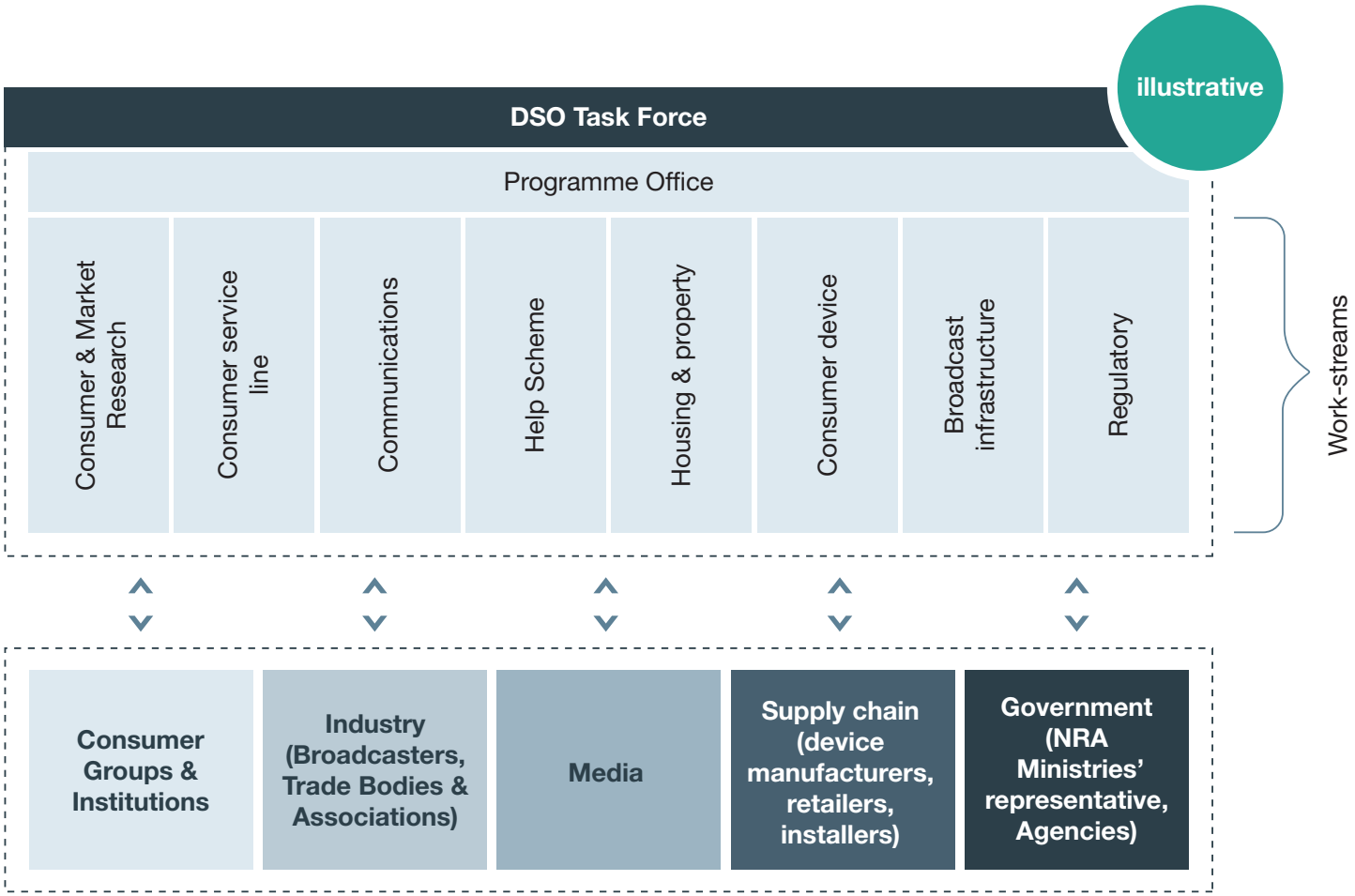
Figure 5-1: Planning the DSO Task Force



Source: Farncombe

[2] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.15)

Figure 5-2: DSO Task Force organisation



Source: Farncombe

5.2.2 Approach to transition

The ITU has covered approaches for transition in its guidelines . Here we look specifically at key issues for transition that need Government involvement – the requirement for simultaneous operation of analogue and digital services and ensuring that digital television receivers are available.

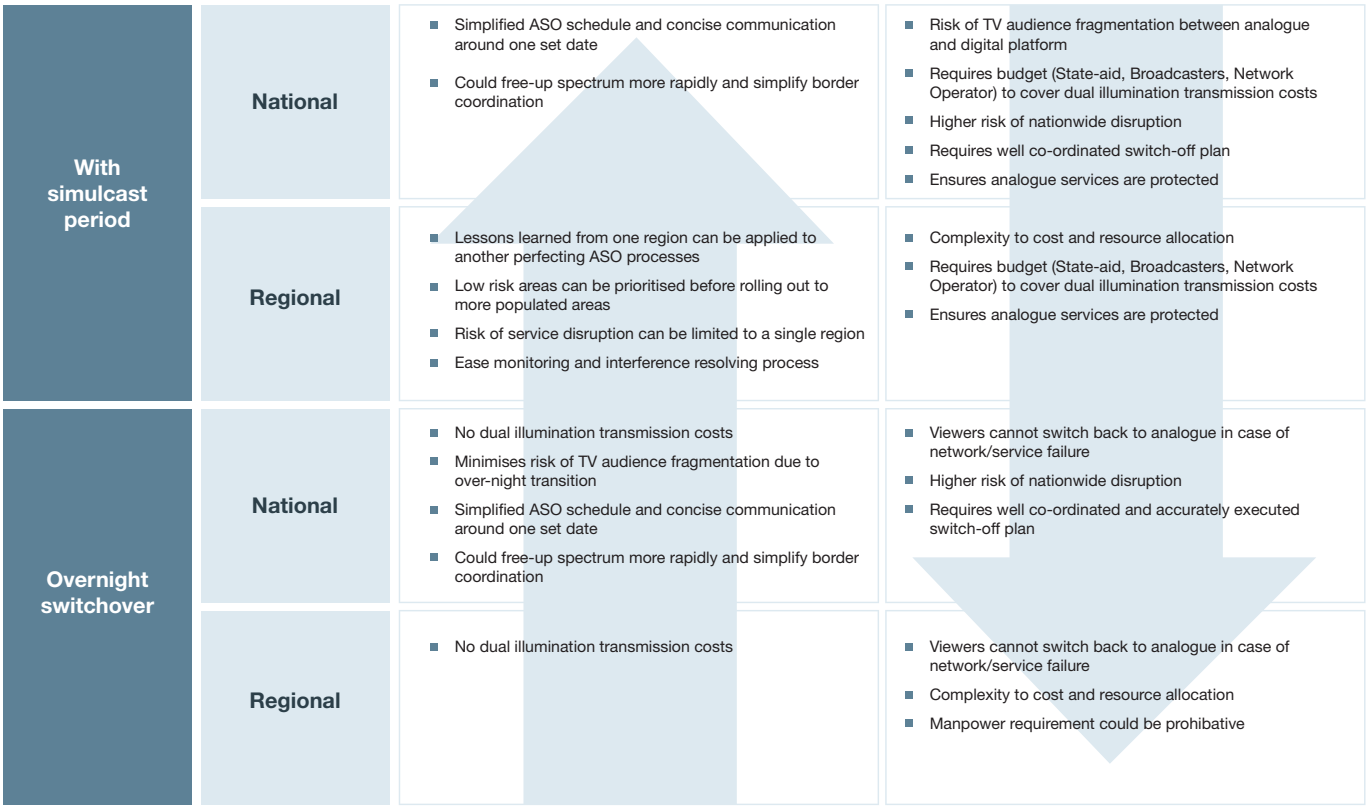
For the first of these there are two key questions to address:

- Whether to have an intermediary simulcast period with both analogue and digital transmission?
- Whether to switch off analogue signals gradually or on one day?

Whatever the model adopted, it should aim to minimise service disruption and keep the simulcasting period as short as possible. In practice countries have adopted a variety of transition approaches. In countries where terrestrial reception is significant, achieving high digital penetration (either on DTT or on other platforms) during the simulcasting period is usually a pre-condition of switch-off.

Figure 5-3 illustrates the advantages and disadvantages of simulcast and overnight switchover.

Figure 5-3: Pros and cons of transitions models



Source: Farncombe/ITU

It is also important that promotion and sale of analogue television equipment ceases early during the transition. After a specified date to be agreed by Government all television reception equipment sold should be equipped with digital tuners (meeting agreed technical standards).

[3] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.14)

5.2.3 Timetable[4]

The timetable is a key part of the plan, it requires input from Government (who will set some of the targets) and it must be realistic. In practice the timetable comes down to three discrete activities:

- Digital switch-on (i.e. commencing digital TV transmissions)
- A simulcast period (if applicable)
- Analogue Switch-Off, taking into account international deadlines.

It is crucial that firm dates are set and postponement avoided to avoid a loss of credibility in the plan. Where it is not possible to set firm dates there should be clear criteria identified that will be used to set dates (e.g. linking to a percentage digital terrestrial take-up and an achievable roll-out coverage level, before finalising switch off dates). In general, analogue switch-off dates should avoid:

- Major holiday periods, when communications campaigns may be less effective
- Major broadcast events, when TV viewing is expected to be higher.

The plan must take into account trials/pilots to gain experience prior to ASO (these should include analysis of viewer reactions and investigation and rectification of any technical issues that arise).

For analogue switch off to be viable there are several targets that must be achieved (these should be defined in policy and the plan) including:

- That the DTT network coverage requirements have been met
- That there is a sufficient penetration of digital receivers – 95% is the target adopted in many cases – and good availability of receivers for consumers
- The public has been well informed about the ASO date, receiver availability and consumer support.

It goes without saying that television services need to be attractive to motivate consumers to adopt DTT.

[4] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.16)

5.2.4 Trials/Pilots

There should be clear objectives established for any trial/pilot programmes set up to gain experience prior ASO. These could include:

- DTT concept demonstration
- Assessment of the impact of DTT on users
- Evaluation of technological issues like reception quality, indoor/outdoor reception
- Test HD/Data/Interactive/EPG services
- Test set top box receiver options
- Educate broadcasters, network operators, installer staff
- Familiarize key personnel involved with switchover e.g. in the DSO Task Force, retailers, etc.

There are several other issues that should be addressed before commencing a trial/pilot including:

- Deciding on the geographical scale and selecting DTT sites
- Scheduling and phases (e.g. the pilot may include a “soft” trial to iron out any network problems and technical issues, before involving consumers to minimize the risk of damaging DTT’s image)
- Decide on content provision for the trial period
- Estimate the cost and determine funding (especially where the cost will be funded from both public and industry sources)
- Prepare the licensing framework and allocate spectrum for the pilot
- Organise/coordinate communication activities.

5.3 Funding

Governments should make provisions to fund various elements of the DSO process and ensure that this is built into its relevant budgets. The Help/Subsidy scheme, the DSO Task Force and its activities and the Communications Plan are the three elements which usually require Government-safeguarded funding, even if these activities are not directly driven by Government.

There are a number of measures that can increase the effective use of financial resources during the programme, including:

- Assessing and regularly reviewing the programme’s costs
- Ensuring that announcements regarding funding of specific activates are timed to avoid unintended behaviour (e.g. timing of the announcement of subsidy for consumer devices)
- Adoption of a layered communication model with emphasis on local activity.

When designing the funding for DSO it is important to ensure that it does not unduly discriminate or give rise to competition problems. Examples of measures that could cause issues and need careful treatment are:

- Waiver of duty and import tax on receivers, receiver components or digital transmission equipment
- Financial compensation to cover dual illumination costs (if switch-over is planned with simulcast period)
- Additional funding for public service broadcasters and/or DTT transmission entity to provide greater coverage (this could include DTT network expansion or development and operation of a DTH platform).

5.3.1 Help/Subsidy scheme[5]

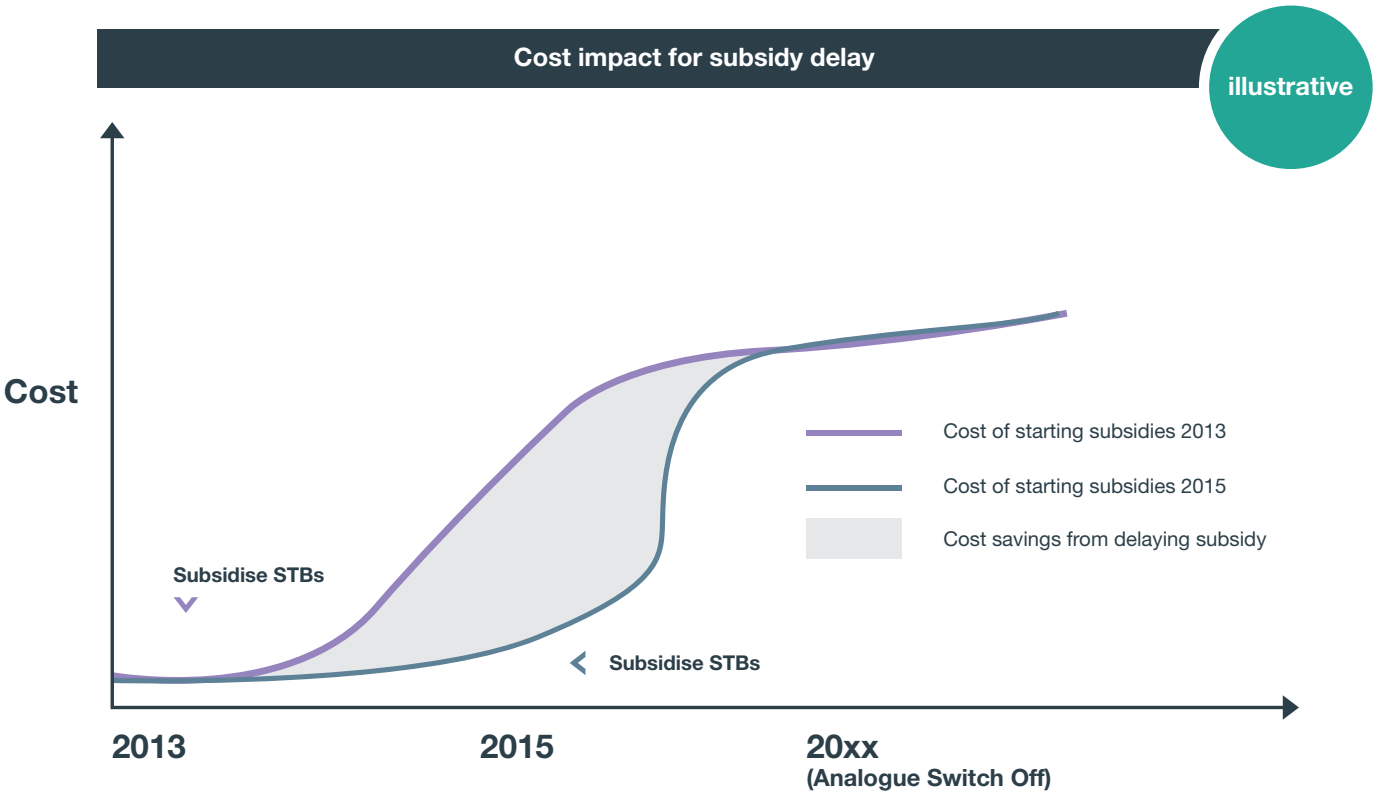
It is common that people act in the last weeks or days of the ASO date(s). States should make necessary provisions to accommodate the peak demand around these date(s) and/or incentivise people for early purchasing of the equipment (e.g. offer special discounts if equipment is purchased a few months earlier).

Timing of subsidy announcements is a key consideration and crucial for efficient spending of public money. The early announcement of subsidies could well result in people deciding to wait for them. Benefits from delaying the announcement of subsidies include:

- Cost savings as STB prices drop with time (better procurement terms)
- Subsidies are focused on people unable to afford devices (early adopters have already bought the receivers themselves).

Figure 5-4 illustrates how timing of subsidy announcements can impact costs.

Figure 5-4: Illustrative impact of subsidy delay



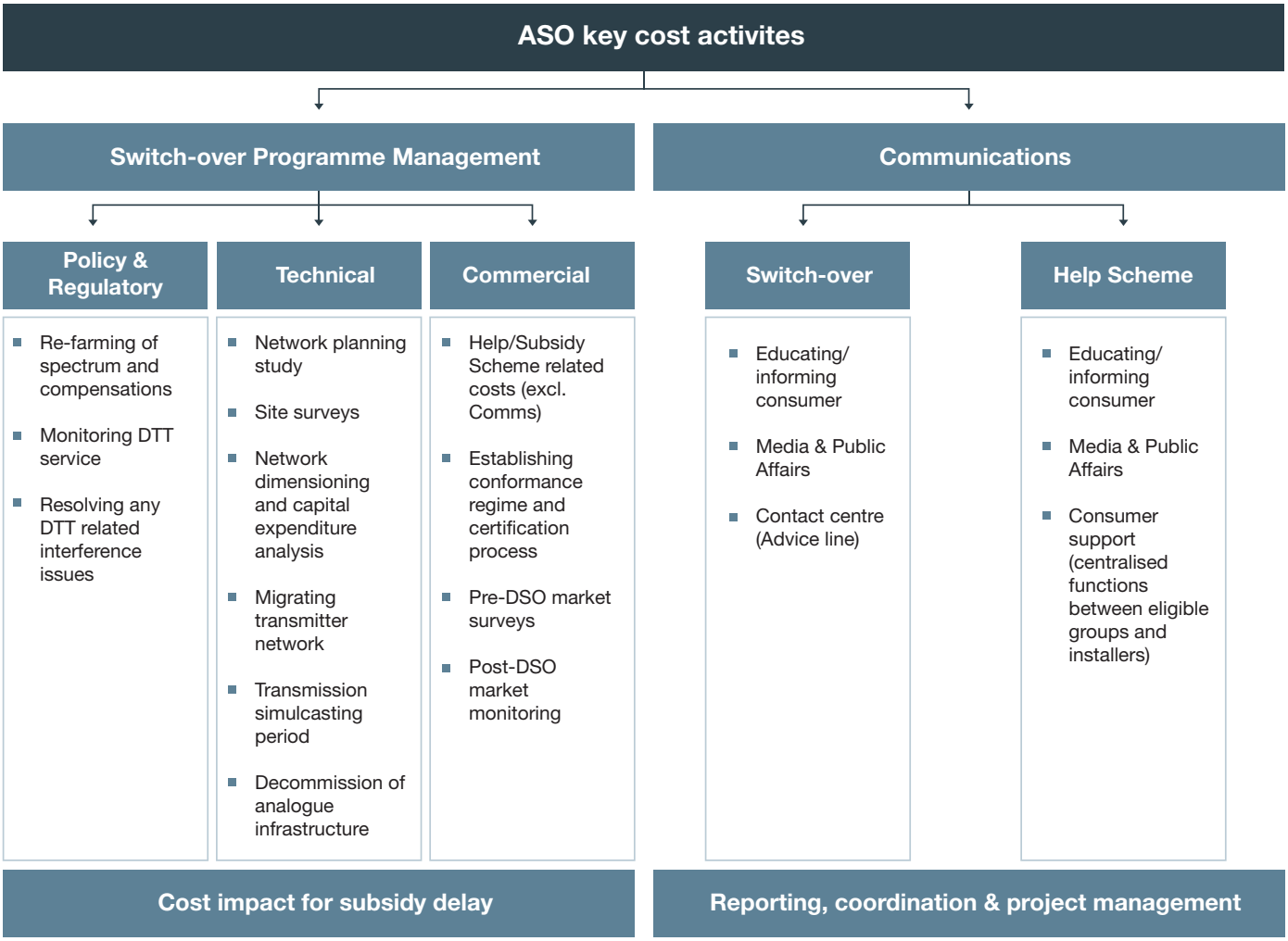
Source: Farncombe/ITU

[5] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.11 and 2.13)

5.3.2 ASO key cost activities[6]

The Task Force's remit will vary depending on market conditions and industry and government involvement during the switch-over process. Consequently, financial resources made available by Government will also differ. The key cost activities of the ASO need to be identified early in the programme and be benchmarked and reviewed periodically to ensure that costs are controlled and that the programme delivers value-for-money. This is an important consideration for all countries and especially for developing economies where there could be considerable competition for resources. Figure 5-5 shows ASO key cost drivers.

Figure 5-5: ASO key cost activities



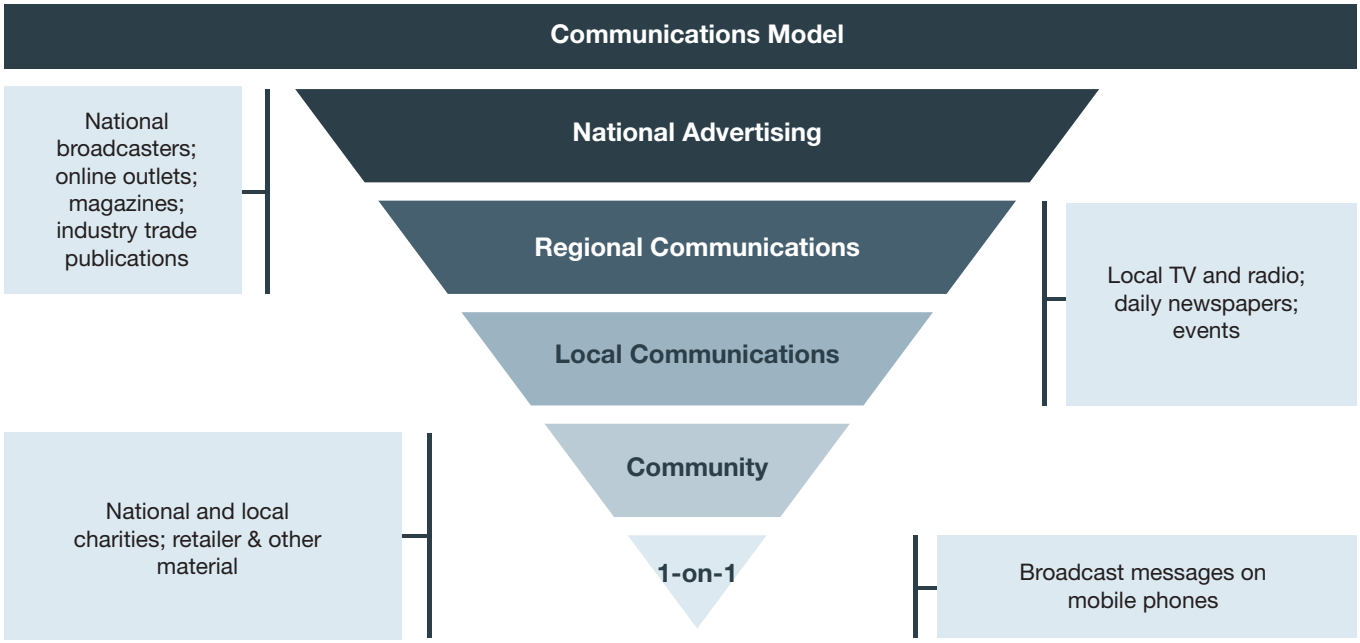
Source: Farncombe

[6] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.15 and 2.18)

5.3.3 Communications plan[7]

Without an effective communications plan there is a high probability of failure. It is therefore essential that Government ensures that the communications plan is properly funded. This is especially so in countries with low TV penetration. Here the DSO Communications model should leverage all media platforms and be tailored to reach remote communities. Figure 5-6 shows a model for a communications programme.

Figure 5-6: Communications model diagram



Source: Farncombe, Digital UK

Clear messages should be communicated to the public to avoid any misunderstanding. It is also recommended to review the main slogan/messages from common sense or potential interpretation point of view. The DSO Task Force should also review the information distributed by other players to filter any misleading or inaccurate information.

[7] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.13 and 2.18)

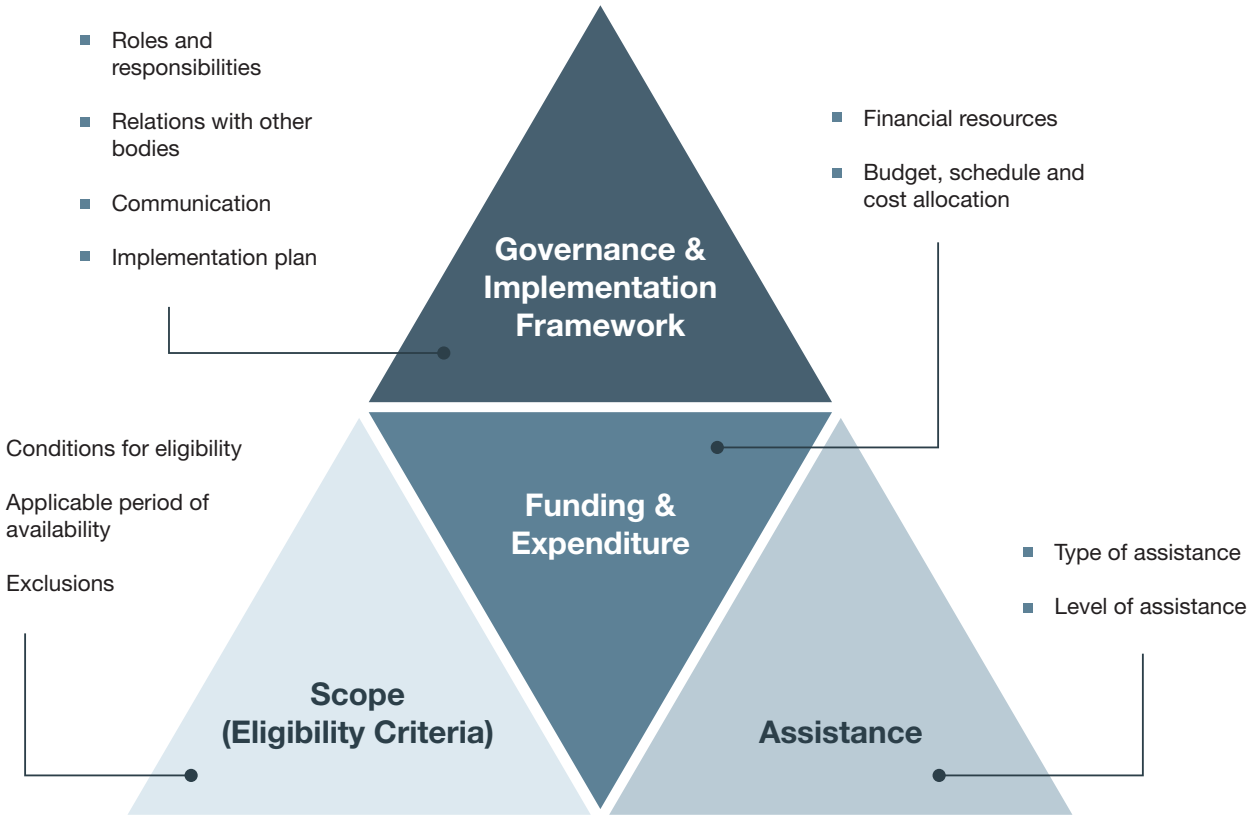
5.4 Help Scheme

The Government should facilitate the development of a Help Scheme strategy with clear objectives around:

- The schemes governance and implementation framework
- Funding and expenditure
- Eligibility criteria
- Assistance to the public.

The Help Scheme is likely to be focused on certain demographics. Depending on the scheme, it could include subsidies for the set top box, aerial, installation support, helpdesk, etc. The four basic components of a DSO Help Scheme are illustrated in Figure 5-7 below.

Figure 5-7: Key components of DSO consumer help schemes



Source: Farncombe

5.4.1 Governance and implementation framework

The Help Scheme requires a clear governance framework, which should include the following aspects:

- The Help Scheme's policy
- Legal support
- Management processes and performance monitoring
- Financial accountability.

5.4.2 Scope (eligibility criteria)

Many households will need help with the digital transition. Qualification criteria for the Help Scheme will be country specific; Government should prioritise the most vulnerable groups, which may include:

- Low-income households
- Senior and disabled people
- Ethnic minorities
- Households located in border regions.

In some countries, financial support has been made available to households regardless of income levels or need (e.g. United States). EU countries have adopted mixed strategies for DTT subsidies. The European Commission has not supported schemes that were funded by the government and were limited to DTT aiming to ensure that its rules governing competition and platform neutrality have been observed.

5.4.3 Assistance

The type of assistance delivered by the Help Scheme could include:

- Direct assistance for the eligible households providing them with the necessary equipment
- Direct subsidy for purchasing equipment
- Indirect financial support/funds for:
    - importing/manufacturing and distributing STBs
    - training on installing STBs and aerials
    - installation support (remote or physical assistance)
    - aftercare service, etc.
- Combination of the above

The level of subsidy is important. In cases where a direct subsidy for STBs is part of the Help Scheme, there is the risk that the subsidy has an inflationary effect on the STB market, and is absorbed by the manufacturing and distribution chains. The Help Scheme should not rely solely on the horizontal retail market for distribution of the STBs when the timescale for switchover is short – it may be necessary to generate the cooperation necessary to achieve a scaled rollout through a specific retail scheme.

Governments should be mindful of the need to avoid creating a secondary market for set top boxes, where subsidised STBs are sold to non-eligible households or even outside of the country.

5.4.4 Expenditure and funding

It is imperative that Government ensures that sufficient financial resources are available for the Help Scheme. The Help Scheme's budget may include marketing and communication costs, financing, administrative costs and other overheads. Countries have developed various Help Schemes suited to national requirements and needs. A number of examples are presented below in Figure 5-8.

Figure 5-8: Key components of DSO consumer help schemes

Country	Description	Key take-away
USA	• Coupons for free STBs, eligible to any household (2 per HH) • $1.5bn total funding	• Long timeline to use coupons; subsidy funds were delayed before being able to re-issue coupons as people started using them too close to switch-off date
UK	• Subsidised STB and installations for senior and disabled population • STB + installation guide of £40	• Low take up of Help Scheme due to perceived low value (inclusion of installation support not marketed)
France	• Help Scheme focused at marketing • Funding allocated where required as problems arose during DSO	• France's reactive approach (wait for problem before offering help) proved effective
Spain	• Subsidised antenna installation • Call centre support available throughout switch-over	• Most households purchased equipment close to ASO deadline and during holidays resulting in high concentration of demand for installations
Argentina	• 1.2m STBs distributed among low income (30% of non Pay-TV households) in first year of DTT transmission	• Timing - distributing free STBs before the DTT line-up was finalised impacted on perceived value of DTT

Source: Farncombe

A summary of key learning on financial effectiveness of Help Schemes from international case studies include:

- Subsidies not coupons – coupons can more easily lead to the formation of a secondary market and must be carefully managed e.g. coupons should expire after a certain period to motivate people to use them.
- Manage procurement and distribution – ensure that there is alignment of supply and demand for STBs and do not over rely on the support of retailers
- Raise awareness – actively engage community organisations and charities to raise awareness of the support available amongst the target demographics
- Provide support throughout transition – ensure awareness of the availability of support for installation, set up and retuning at switchover
- Retain flexibility in funding – be able to react to problems in specific areas as they arise (e.g. reception problems in a region).

5.5 Disposal of analogue TV receivers

The implementation of DSO is likely to lead to significant numbers of old analogue televisions being disposed of. Government should consider the measures required to ensure that this equipment is disposed of in a responsible way with minimum damage to the environment. Such measures may include establishing a working group spanning government, industry and other relevant organisations (e.g. those with responsibility for waste disposal) to ensure that an agreed approach exists before switchover occurs.

6. Regulatory

6. Regulatory

The role of regulation in the DSO centres on ensuring that licensing, standards and other aspects of management and coordination of regulated services are in place and managed in line with the timeframe and objectives set out by Government. There are three key areas for DSO where regulators have an essential role as shown in Table 6-1.

Table 6-1: Regulatory actions

Item	Objective
Technology and standards	To ensure that technology choices are made in sufficient time for a successful rollout of DTT services and mandated where necessary
Licensing	To ensure that all licenses and related authorisations are in place for DSO
Radio spectrum management	To ensure that all technical and coordination activities for switch on of digital services and switch off of analogue services are resolved
Establish principles for help scheme	To ensure that the help scheme is available and able to be delivered when needed

6.1 Technology and standards

It is critical to evaluate options and understand the market implications of technology choices.

Choosing the right technology is a crucial success factor for DSO. Equally important is to ensure the right level of mandated set-top-box specifications and to promote technical co-ordination between broadcasters. A number of elements[8] could require regulatory intervention as described below.

6.1.1 Transmission standards

Expert technical support is necessary to assess DTT transmission standards choices. The key drivers of the decision are the maturity of the standard (which impacts on STB prices), the risk of creating a legacy base of STBs and the efficiency of spectrum use.

6.1.2 Conditional access and STB control

Countries that have opted for Pay-DTT models or want to ensure addressability/ geographical control can opt for implementing conditional access services. By specifying conditional access from the start, regulators can lower the barrier to entry for Pay-DTT operators in the future, but this does increase the cost of a basic STB.

[8] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.1)

6.1.3 Indoor coverage

Reception requirements will impact network planning and configuration and will determine whether consumers will need an external antenna. Outdoor antennas can be seen as the basic requirement for digital terrestrial television. Indoor reception is more demanding and costly than outdoor reception because of the lower height and directivity capabilities of the receiving antenna and signal attenuation for in-building reception.

6.1.4 HD vs SD

The distribution between HD and SD services will directly affect the number of services that can be allocated in the DTT spectrum – STB specifications will impact the need to "simulcast", i.e. broadcast both in SD and HD, and their ability to receive HD signals, which has a direct impact on cost for broadcasters, cost of STBs, and attractiveness of the DTT proposition.

6.1.5 Interactivity

Which interactivity standard and whether it is mandated may impact on the cost of royalty fees for manufacturers and developers – but it must be looked at in context of other factors (e.g. scale and required conformance and integration). One of the approaches taken to minimise or avoid the royalties is fostering an open-source environment. However, it is important to consider that for device manufacturers and application developers, scale for their products is important and larger manufacturers will be unwilling to launch services in countries that impose burdensome compliance requirements. In addition, in many cases, one or two specific implementations of open source solutions predominate in the market, creating de-facto monopolies or oligopolies, which charge STB manufacturers for conformance and integration that can exceed the payment of royalties of commercial solutions.

6.1.6 Electronic programme guide (EPG)

The control of EPG access and the management of EPG information are key in a multi-territory implementation. Any rationality of services needed, by country, state or territory, requires careful management. It is advisable that a neutral entity/authority controls the access to and manages the EPG to minimise the risk of presentation of biased information on the services available. This could include provisions for EPG access being made on a fair, reasonable and non-discriminatory basis.

6.1.7 Transmission standards

Digital broadcast services can work in different spectrum modes:

- Single frequency networks (SFN)
- Multiple frequency networks (MFN)
- A mixture of both (Hybrid)

All of the above techniques have advantages and disadvantages.

The introduction of DTT services faces the challenge of spectrum that is occupied by analogue services which use a MFN structure. Even if some free channel assignments exist for digital services, these have limited use for the introduction of an SFN-based area service since the SFN mode requires a cleared channel for the entire service area (and across country borders if the transmitter is near the border). If there are still analogue services using this channel the affected analogue transmitters would have to be shifted in frequency.

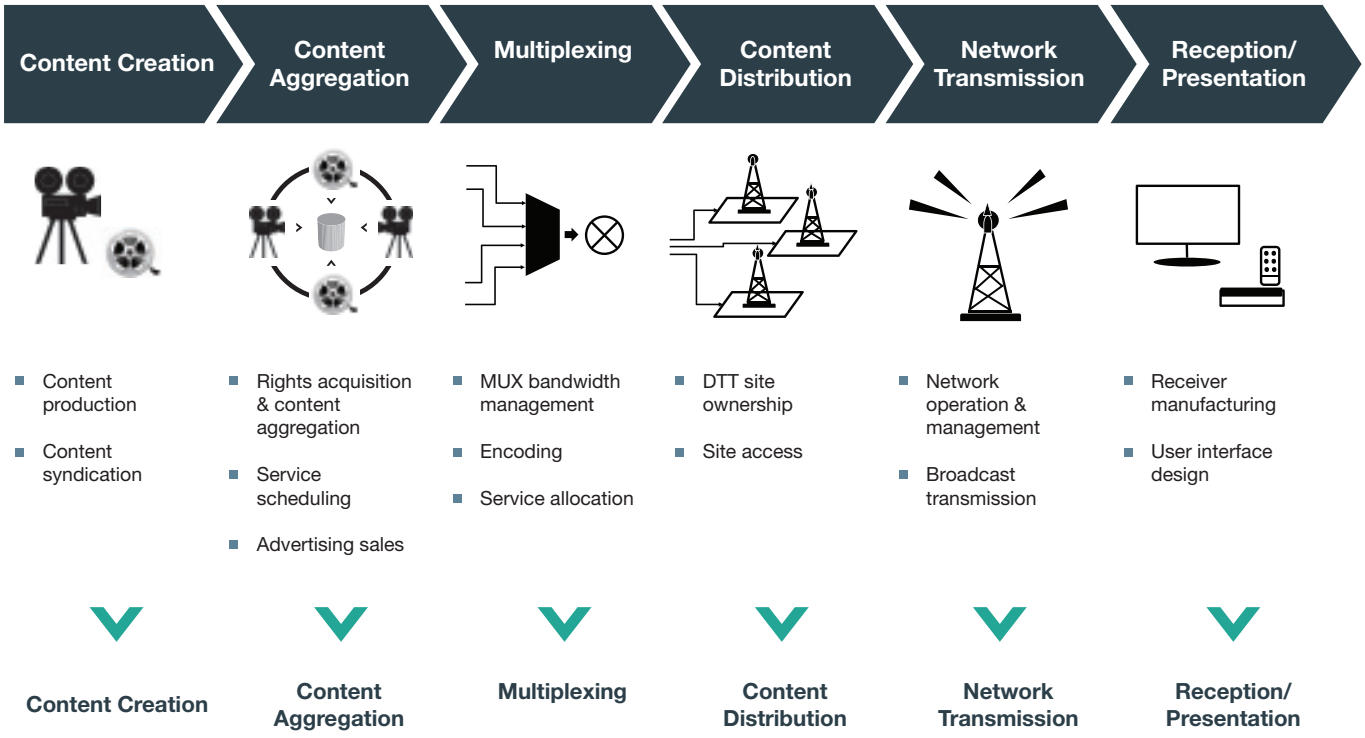
The benefits of SFN are questionable when considering the associated costs for broadcasters and consumers

and the need to re-arrange analogue services which will shortly be phased out, especially for areas with large number of transmitters. For smaller area networks (e.g. comprising only two or three high power transmitters) the SFN approach may be applicable and more attractive. Moreover, the possibility that one or more channels (not yet allocated or allocated but not is use) can be released for the implementation of digital services on a nation-wide scale should be evaluated. These cases offer a good chance to implement an SFN-based digital service on a national or regional scale[9].

6.2 Licensing

Figure 6-1 shows the value chain for DTT services from the point of content creation to viewing on a television device. Various aspects of the activity require the entity undertaking the activity to be licensed. This can include licensing of broadcasters, multiplexes, transmission sites and frequencies/radio spectrum. It is essential that the licensing framework is clarified before the DSO programme commences and that processes are in place to ensure that appropriate licenses are issued well before services commence. If there are to be trial/pilot phases for the rollout of DTT there will also need to be appropriate licenses put in place for these activities.

Figure 6-1: DTT value chain and key activities



Source: Farncombe

The precise nature and award processes for licences will depend on regimes in specific countries. Issues that will need attention for DSO are described below.

Although the licenses are shown as discrete licenses here it is possible that aspects of the licenses are combined in a national licensing structure. For example, the broadcasting and multiplex licenses could be a single instrument if both are provided and operated by a single broadcasting entity. Similarly, site and network/transmission licenses could be assigned to a single network operating entity.

[9] Source: EBU (General issues to be considered when planning SFNs)

6.2.1 Broadcasting licenses

Licenses issued to broadcasters must contain provisions to enable the change from analogue to digital television services.

These licenses usually contain details of the services to be provided by the broadcaster including:

- Public service broadcasting obligations (although these could also be defined in other instruments)
- Obligations for programming policy and standards (including access to education, news, regional and ethnic programming)
- Provisions regarding the imposition of charges for consumers, advertisers or others (if appropriate)
- Definition of fees payable to Government or the licensing regulator by the licensed entity
- Provisions regarding use of Government subsidy for the broadcaster (if appropriate)
- Other aspects depending on the scope of the licence.

Given that broadcasting licenses can be politically sensitive the reasoning for change must be clearly set out by the licensing regulator (and the Government) to ensure that licence changes can occur in the required timeframe.

6.2.2 Multiplex licenses

These licenses are for the operation of the multiplex equipment for broadcasting purposes. Again these licenses usually contain a definition of the service to be provided by the operator and they could include provisions on:

- Fees payable to Government or the issuing regulatory authority
- Authorisation of the operator to interface to one or more broadcasters providing content to be broadcast on the channel(s) supported by the multiplex
- Delivery of the multiplex output signals to the signal transmission network for transmission at a number of aerial sites (especially if there are coverage obligations associated with licenses in the broadcasting and/or the multiplex supply chain). This must include details of the frequency plan for the country in which service is provided as this must be coordinated across all multiplex operators
- Technical and quality standards and provisions regarding the transmission of services delivered through the multiplexes
- Fees chargeable to broadcasters for the provision of such services
- Obligations to carry specified and qualifying services
- Rules on Electronic Programme Guides (EPG)
- Conditions for the service allocation (TV, Audio, Data, etc.) and spectrum utilisation of the licensed MUXs
- Reporting
- License Transfer and Renewal
- Enforcement, sanctions and revocation.

6.2.3 Site licenses

Depending upon the licensing regime there could be a requirement to licence or authorise every UHF transmission site for the services provided at each site. There will be changes of use resulting from the lighting up of new digital services, simultaneous operation of analogue and digital services and the subsequent closing down and clearance of analogue services. Site licenses may also include;

- Obligations about site access and equipment (e.g. mast, antenna, power facilities, etc.) sharing
- Provisions to avoid infrastructure duplication
- Relevant fees for accessing the DTT sites and the use of the equipment.

6.2.4 Network/Transmission licenses

These licenses are for the operation and management of the DTT signal transmissions. Again these licenses usually contain a definition of the service to be provided by the network operator and they could include, among others, provisions on:

- Technical characteristics
- Obligations about minimum network and service availability levels
- Performance reporting

6.2.5 Radio frequency or spectrum licenses

These are licenses for the relevant radio spectrum for television broadcasting and they will usually be issued to each signal transmitter. DSO will entail changes to existing arrangements for frequencies and possibly the need for additional frequencies during the transition period. It is essential that these licenses cover all of these aspects and that licence fees are specified across the timeframe of the DSO. In practice the provisions of spectrum licenses may be combined with network/transmission licenses or multiplex licenses depending on the licensing regime in place in a specific territory.

6.3 Spectrum management

DSO is a major spectrum management project. As well as delivery of the switchover objectives spectrum management must ensure that spectrum is available for broadcast service to continue to be available to all consumers at all times during the switchover programme, especially if and when there is simultaneous broadcasting of analogue and digital signals.

Spectrum management for switchover comprises a number of activities including:

- Identification of services to be cleared from the relevant spectrum bands. While this is primarily analogue television services there could be other Government/public sector services in the spectrum as well as potentially illegal users
- Development of a new spectrum plan for digital television broadcasting. This requires inputs that include the number of channels and therefore multiplexes required and the planning of the geographic distribution of channels to ensure coverage requirement are met and interference minimised
- Creation of a spectrum management plan (based on the overall DSO plan) for switching areas from analogue to digital transmission and making other changes, which allows scope for commissioning and testing to occur before ready for service dates
- Ensuring that local planning approvals are obtained, where required

Central to the success of DSO is an agreed frequency plan, which encompasses all multiplexes. It is especially important that this takes into account where MFN and SFN services are to be deployed (see Section 6.1.7).

This requirement extends across country borders and liaison on cross border frequency plans and interference issues is an important part of the spectrum management activity for DSO, which must be tackled well in advance of launching services. It is also an on-going activity as any future changes to the frequency plan will need to be coordinated.

7. Industry

7. Industry

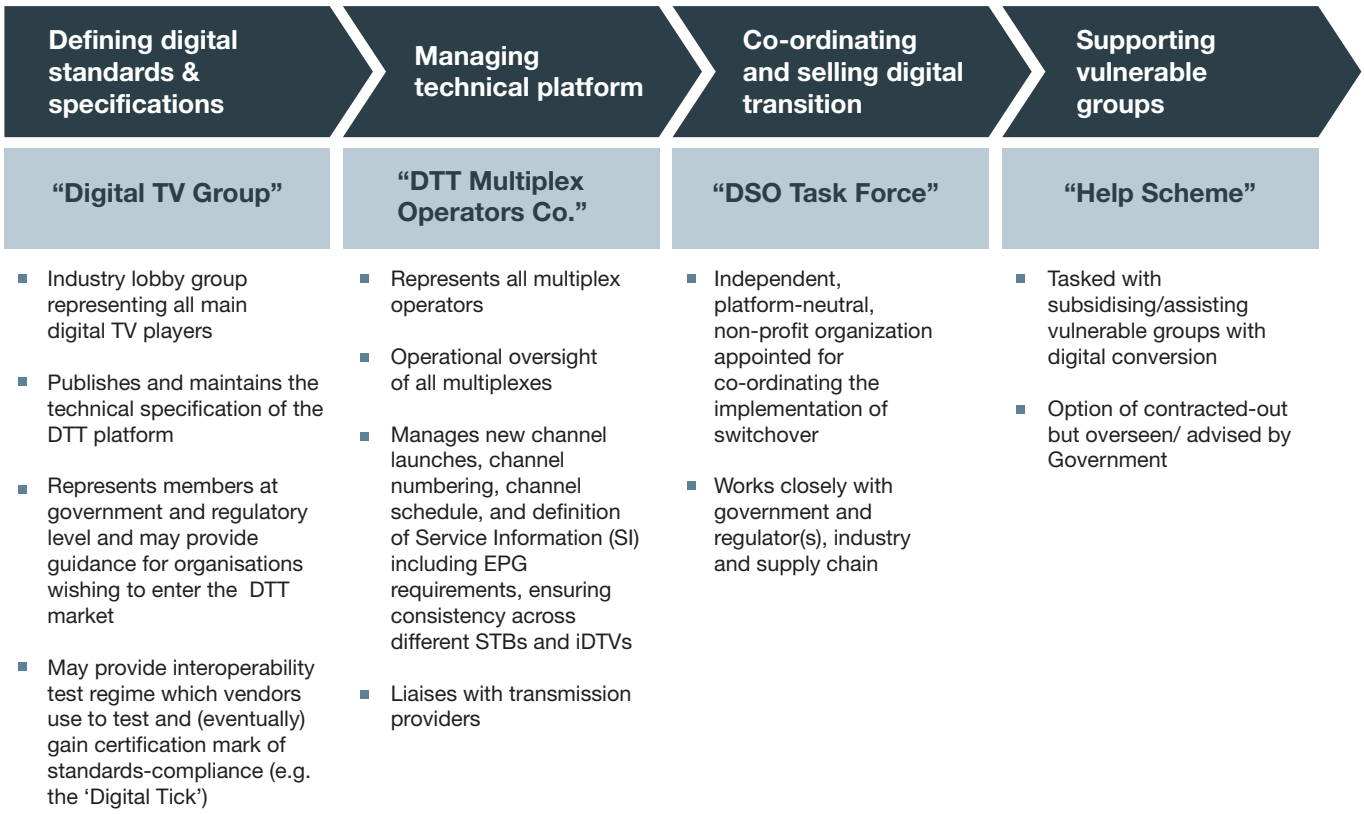
Industry plays the key role in implementation of the DSO. It needs to be involved in the DSO programme from early in the conceptual and planning stages if there is to be a successful outcome. There are six key areas for DSO where industry has an essential delivery role as shown in Table 7-1.

Table 7-1: Industry actions

Item	Objective
Consumer proposition	Develop an attractive proposition to draw people to digital television and thereby aid the DSO process
DTT banding and conformance regime	To put in place a branding and conformance regime to raise awareness of the DTT platform and provide incentives to equipment and set top box manufacturers
Communications plan	To establish a plan that builds awareness and delivers clear actionable messages to consumers at the right time for switchover and switch off
Network planning and deployment	To ensure that the DTT network is planned and delivered in a timely way to provide the required coverage
Receiver specifications and cost	To ensure that set top boxes that meet local specifications are available to consumers prior to launch of DTT services (nationally or region by region depending on the roll out plan)

A key element for a timely and well-managed transition to DTT is information sharing and industry co-ordination. Countries with organised cross-industry support for aspects such as the EPG, conditional access system, multiplex operation, and communications, tend to benefit from shorter transition timescales. A co-ordinated and agreed establishment of Industry Groups will not only facilitate the digital transition, but it will also provide a stable Post-DSO environment for the evolution of the DTT platform. Figure 7-1 provides some examples of industry groups across the DTT delivery chain.

Figure 7-1: Industry group across the DTT delivery chain



Source: Farncombe

7.1 Consumer proposition

DTT requires an attractive, value-add service offering that delivers competitive advantages over analogue and other digital platforms. The commercial proposition for DTT will vary between markets, as different markets have different drivers of adoption. However, international experience suggests that some key components should be considered by broadcasters, content providers and potential Service Providers (e.g. Pay-DTT)[10]. These are shown in Figure 7-2. We then expand on each of the areas identified.

[10] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 3.1 and 3.2)

Figure 7-2: Key dimensions of DTT consumer proposition

	Country	Description	Key take-away
1	Additional channels/content diversity	• The extended channel choice given by DTT has proven to be a key driver of adoption • Re-broadcast services offer flexibility on viewing times	• Content availability • Range of thematic channels • Time-shifted services
2	Interactivity	• Interactive services can allow more personalisation and user-friendly interfaces • Examples include EPG, multi-lingual subtitling, e-learning, e-government services, etc.	• STB specs need to support an interactive standard or have a return path-enabled (e.g. PSTN, Ethernet port) • Interactive content/applications
3	HD services	• Clear differentiation from analogue • Enhancing “Better sound and Video quality” message	• HD content (or upscaled SD content) • HD-enabled STB • HD TV on viewers’ houses • Spectrum availability
4	Portable/ mobile reception	• The additional functionality of portability/ mobility can attract viewers to the DTT platform • Differentiator from DTH, Cable, IPTV	• Network configuration and infrastructure • Handsets/Devices availability • May require additional spectrum
5	Free-To-Air (FTA) Pay services	• A Free-To-Air proposition helps to combat the common misconception that digital TV is necessarily Pay-TV • A Pay proposition is usually associated with premium or exclusive content, making the proposition more attractive	• Pay services would require STB with Conditional Access and backoffice infrastructure (Customer support, billing, etc.)
6	Coverage, service availability and usability	• Better coverage, high availability levels and easy to set-up/use service can contribute on consumer’s positive perception for the DTT proposition	• Coverage obligation part of DTT Licence conditions • High level technical design and implementation

Source: Farncombe

- **Additional TV services/ content diversity:** DTT can offer opportunities to broadcasters to monetize better content services. Regional services targeting specific geographical areas with localised content and "+1" services (time-shifted by one hour version of broadcast content) may also be seen as an additional incentive for consumer adoption.
- **Interactivity:** Interactive services can be enabled on the DTT platform. The use or not of a return channel will impact the level of sophistication of these services. With no return channel interactive services are limited to applications where information is stored in the receiver like the Electronic Program Guide (EPG), additional program information, games, enhanced teletext, e-gov and e-learning services. A return channel can enable advanced services with viewer interaction in real-time (e.g. voting, betting, email, web access, etc.) and true on-demand services. Such services though, would require additional investment on support infrastructure (e.g. back-office, network infrastructure, etc.) and the development of advanced STBs.
- **HD services:** High-definition could be a driver of adoption where there is enough bandwidth availability; in cases where DTT spectrum is limited, HD services may result in fewer channels and effectively decrease choice for the consumer. In addition, the introduction of HD services requires investment across the value chain; broadcasters and content providers need to invest in HD content creation/acquisition; consumers need to purchase HD-enabled STB and TV sets and network operators must ensure the DTT network is capable to distribute HD services.
- **Portable/mobile reception:** The DVB-T and DVB-T2 standards allow mobile reception with the use of mobile phones with integrated DVB-T/T2 receivers. Using a DVB-T/T2 network for mobile reception is significantly cheaper than deploying a network using specifically designed standards (e.g. DVB-H) for mobile-TV services. The introduction of the T2-Lite profile (a subset of the DVB-T2 standard) offers better mobile performance while using the same infrastructure that is used for DVB-T2 services. Whether portability is a competitive advantage for the DTT platform will depend on local market characteristics and broadcasters should investigate if such feature will allow them to reach wider audiences.
- **Free-To-Air/ Pay services:** The "subscription-free" message has been heavily advertised as a clear differentiator from Pay-TV platforms in markets where DTT services were launched around a free to air proposition. Pay-TV services are often launched on the basis of a multi-channel offering combining both free-to-air and pay services. Pay-TV service operators develop subscription-based packages and they are usually responsible for the operation, marketing, promotion, billing and customer interface aspects of the service, including the development of conditional access enabled STB to secure the premium content offering. Similarly, the introduction and the commercial viability of Pay-DTT services depend on market conditions and the competitive environment.
- **Coverage, service availability and usability:** For consumers, the changeover to digital broadcasting means spending on new equipment to decode and decrypt digital signals. Especially when the cost is a significant portion of consumers' disposable income, they must be convinced that they are offered a better service overall;

  — **Coverage,** Particular attention is required to ensure that whoever is receiving analogue TV programmes must be able to continue to receive programming through the digital platform. In geographies, where the terrestrial infrastructure makes it impractical to reach certain areas, alternatives of broadcast signal distribution (e.g. satellite links) or more cost-effective platforms (e.g. DTH, taking into account that in this case a dish antenna and installation support will also be required) need to be considered.

  — **Service Availability,** Network quality is of major importance. Poor network and service availability may harm DTT's image and have a negative impact on take-up of DTT and penetration of STBs. Network design, planning and implementation should ensure high levels of service availability and minimise service disruption during migration and future modifications.

  — **Usability,** Minimising any further actions required from consumers e.g. installation of a new antenna, adjusting an existing antenna, retuning of receivers, can also have a positive effect on the perception of the DTT service. Additional support through Helplines, trained/authorised personnel at retail shops/ local dealers and frequent updates on service changes/upgrades and "need to do" messages can increase consumers'' familiarity with the service.

7.2 DTT branding and conformance regime

Clear branding and communication is critical to raising awareness and understanding of the DTT platform. Any lack of consumer confidence regarding the ability of devices to receive DTT can lead to delayed adoption. In addition, consumer electronics manufacturers will have a higher incentive to convert product portfolios quickly if they feel the pressure of consumers demanding a conformance logo.

A conformance regime and branding licensing can achieve maximum clarity for consumers. An example of this is illustrated in Figure 7-3

Figure 7-3: Examples of DTT platform branding

illustrative

The DTT brand (e.g. DigiTiVi)		
DigiTiVi	A source of better television	• High quality signal – better video and sound • A wide selection of TV channels • Free TV – No subscription fees • HD channels available
DigiTiVi+	Better television + interactive services	• Access to a range of advanced service e.g. interactive applications, PVR, etc.
DigiTiVi+ Premium	Better television, ready for upgrade to Pay services	• A choice of easy to set up Pay services, accessible by purchasing a Pay TV module for your device

Source: Farncombe

The core DTT brand can be used to promote awareness among consumers and industry of the key concepts behind the platform (e.g. free television, delivered through an aerial with no subscription fees – and where applicable HD capable). The DTT+ brand can be used to promote awareness of additional services available on the platform, including interactivity. A Tick brand can be used on devices to demonstrate compatibility with the service as advertised and raise consumer confidence in devices[11].

The incentive to manufacturers driven by DTT branding and the mandating of DTT compliant equipment in the early stages of the DSO programme can generate a "natural" migration effect. Mandating compliance is not very popular with consumer electronics manufacturers although this can to some extent be offset through investment in marketing to create and heavily advertise the "DTT compliant" logo.

Successful development of the DTT brand can result in:

- A higher incentive for manufacturers to have DTT compliant devices in the market
- Reduced risk of device fragmentation and market flooding of non-compatible devices
- Increased consumer confidence to buy a device which will not become obsolete.

[11] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.18)

7.3 Communications plan

Central to the success of the DSO programme is a communications and marketing strategy to promote Digital TV benefits, which clearly communicate the migration process. Common practices from international markets include two main phases of marketing campaigns[13]:

- **Consumer awareness** of DTT, its various benefits, and the issues involved in upgrading (e.g. the right logo to look out for on TV equipment)
- **Analogue switch-off warning**, explaining that analogue broadcasts will be lost in homes yet to switch, accompanied by appropriate onscreen messages.

These campaigns may also be accompanied by Help Scheme marketing targeted at specific demographics. Mobile operators can play a supporting role with the development of consumers' awareness and delivery of key messages. Especially in regions where mobile penetration can be higher than TV penetration, and other means of advertising lack reach, mobile technology can reach wider audiences:

- Broadcasting SMS in parallel with the marketing messages
- Providing information about the DSO schedule and updates, contact details for further assistance on retailers locations for the purchase of receivers, etc.
- Offering free/discounted calls to DSO helplines.

7.3.1 Consumer awareness

This is broken down into six phases as shown below.

1. Initial 'visionary' campaign

It is essential to set out the vision for DTT. This stresses the benefits of DTT for consumers and prepares them for the call to action. Table 7-2 sets out the characteristics of this campaign.

Table 7-2: Initial visionary campaign

Timing	DTT Switch-on → 8 months
Media	TV/Press/Outdoor – National and Regional
Key messages	"Clearer and better quality picture" "More TV for free" "No subscriptions" "HD for free" "Digital TV through your aerial"

[12] More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.18)

2. Service details

It is key that consumers understand the details of the service to be provided after DSO. This campaign communicates the key pieces of information consumers require in this respect. Table 7-3 sets out the characteristics of this campaign.

Table 7-3: Service details campaign

Timing	6 months to 2 years (depending on the duration of the DSO programme)
Media	National TV/Press/Outdoor and Regional mixed media + Industry support
Key messages	"# channels available for free" Highlights of available programming Comparison of service to other platforms Where to buy equipment, how to install Retailer and pricing details

3. Launches of new functionality

If the DTT service delivers functionality that consumers will not have experienced with analogue services it is essential for this to be clearly communicated. Table 7 4 sets out the characteristics of this campaign.

Table 7-4: Functionality campaign

Timing	Pre/post launch of relevant functionality
Media	National TV/Press/Outdoor
Key messages	"Upgrade to… (HD, PVR, Interactivity, etc…)"

4. Transition awareness

Table 7-5 sets out the characteristics of this campaign.

Table 7-5: Transition awareness campaign

Timing	1 year to 18 months for television and radio services and 18 months to 2 years for any other services
Media	TV and Radio; Direct Mail; Outdoor/local press
Key messages	Date of analogue switch-off for each region Advertising of local events

5. Help Scheme

Table 7-6 sets out the characteristics of this campaign.

Table 7-6: Help scheme campaign

Timing	1 year for specific publicity (e.g. booklet) and 18 months to 3 years for other aspects
Media	Booklets; Local TV/Radio, Local workshops
Key messages	“What is The Help Scheme?” “Do you know anyone who needs help?” How to apply for assistance / subsidie

6. Analogue switch-off warning

Table 7-7 sets out the characteristics of this campaign.

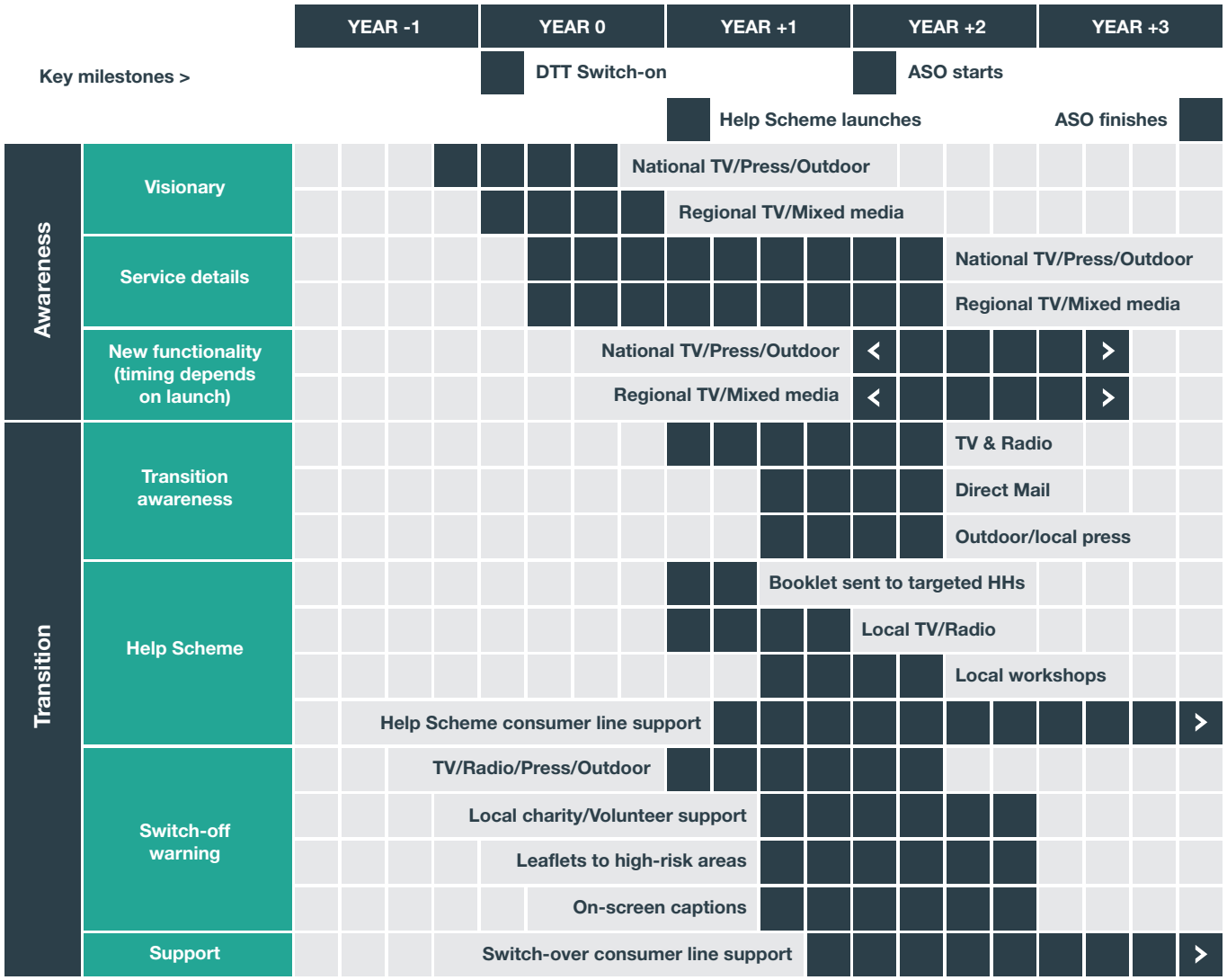
Table 7-7: ASO warning campaignn

Timing	6 months prior to analogue switch-off
Media	All (National, Regional and Local)
Key messages	"You must be ready for switch-off" "All TV sets must be converted to digital" "Call our information centre for assistance"

In addition to its general benefit the Help Scheme should provide focused marketing and support to vulnerable members of society (e.g. low-income households, ethnic minorities, rural households, and senior or disabled people). Most digital transitions around the world have relied on gradual consumer education over 5 years or more. In case of a relatively short transition period the need for support for the most vulnerable in society is even more important.

An indicative time schedule of the communications activities is shown in Figure 7-4 below.

Figure 7-4: Indicative communications plan time



Source: Farncombe

7.4 Network planning and deployment

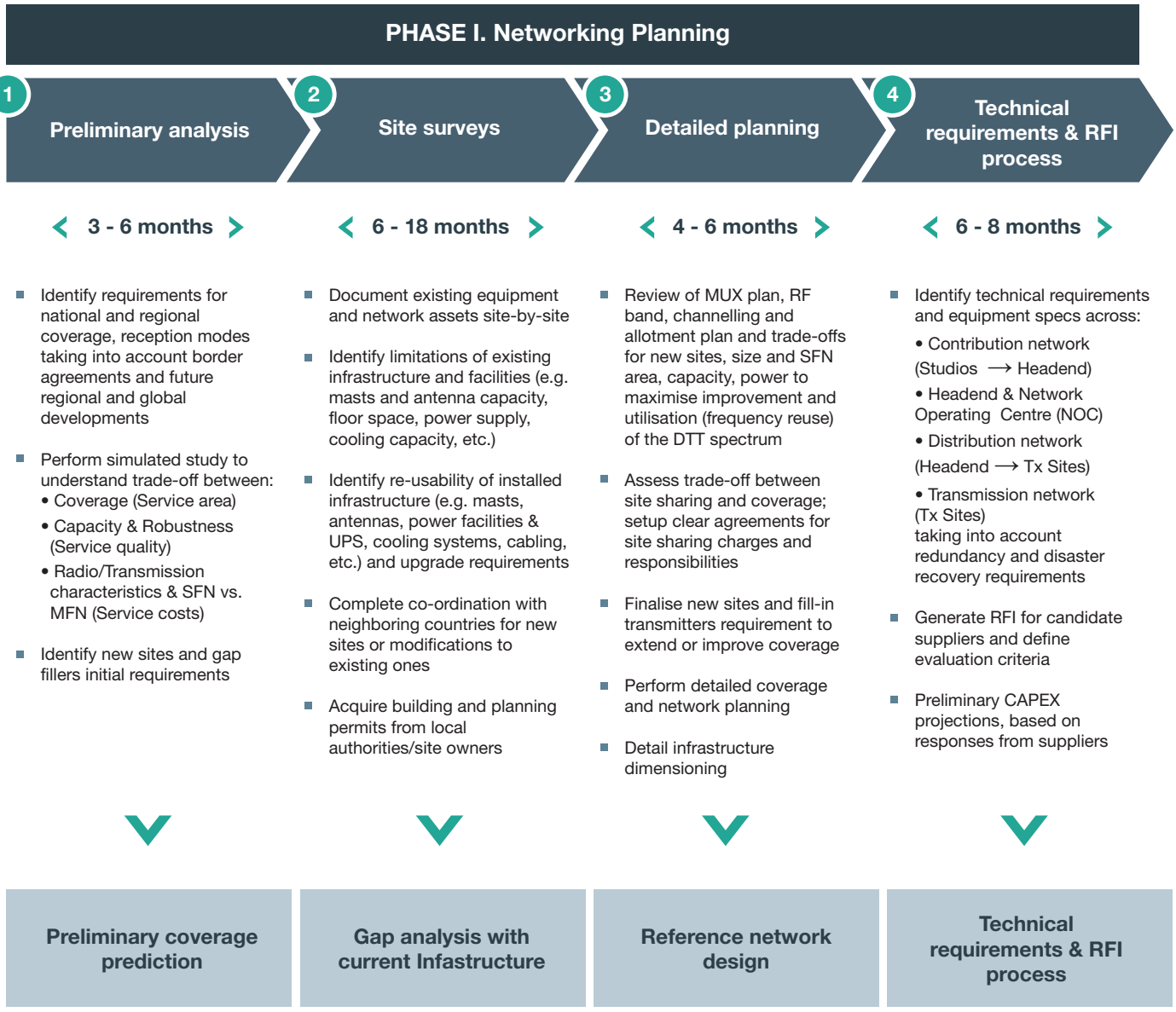
The roll out of DTT infrastructure for TV services represents a technological and economic challenge[13]. Network planning and deployment needs to meet coverage targets[14] in line with an agreed schedule while allowing effective use of spectrum resources.

DTT service operations require a high level of network and service availability[15]. Technical choices should be balanced against their commercial impact on the service

[13]More information can be found at ITU's Guidelines for the transition from analogue to digital broadcasting (www.itu.int/pub/D-HDB-GUIDELINES.01-2010/en, Section 2.17, 3.4, 4.3, 4.5, 4.8 and 4.9)
[14]After analogue switch-off, DTT population coverage in Europe for PSB/Commercial MUXs range from 90% to 99% (Source: DigiTAG: Analogue switch-off, Learning from experiences in Europe).
[15]In the UK, Ofcom's Television Technical Performance Code requires the broadcasters to maintain standards of transmitter reliability which are as high as reasonably practicable. Specifically, transmitters should be available for service for at least 99.8% of the time in the case of the 80 larger transmitters, or 99% of the time for other transmitters (Source: Ofcom).

A high-level step approach on Network Planning and Deployment is shown in Figure 7-5.

Figure 7-5: Overview of DTT network planning steps, major activities and milestones

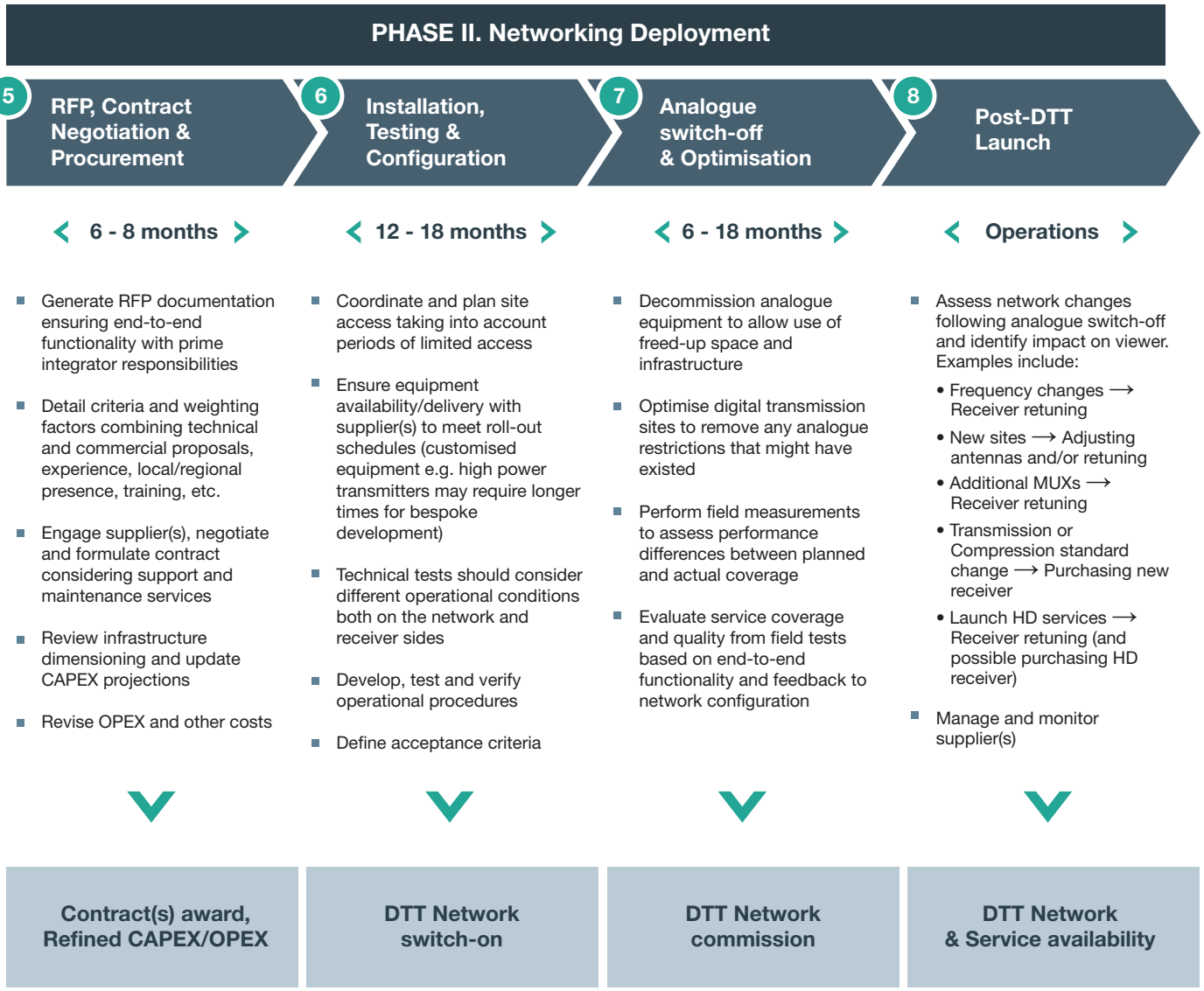


Source: Farncombe

The vendor selection process must be aligned to the strategic and commercial objectives of the operators of the network. Operators can save time in the evaluation process by developing a detailed common response framework designed around the Operator's evaluation criteria to normalise responses and make the RFI/RFP processes more transparent.

The successful completion of the RFI process and the pre-selection of suppliers should lead to the RFP stage, kicking-off the Network Deployment phase. Figure 7-6 shows the phases of network deployment.

Figure 7-6: Overview of DTT network deployment, major activities and milestones



Source: Farncombe

It is important that both phases (network planning and network deployment) are given equal attention and adequate resources. The Network Deployment phase will face significant challenges without a detailed Network Planning process. Special attention should be given in the schedule to requirements to coordinate the approval for new sites with neighbouring countries.

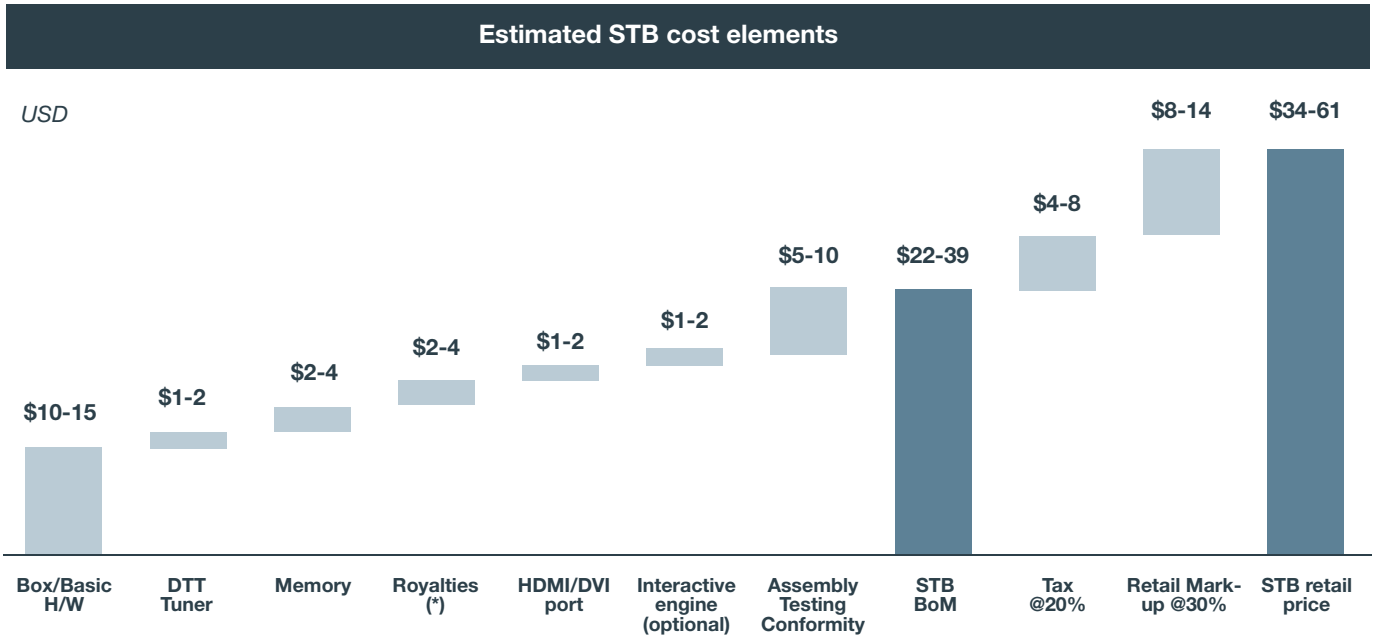
7.5 Receiver specifications and cost

Set-top-boxes are usually the main mechanism for viewers to migrate to DTT – ensuring that there are STBs available at low prices is fundamental for the success of the DSO process. STB costs will vary from country to country. Common cost drivers include:

- **Scale of adoption:** The higher the scale of adoption of decoders, the quicker prices drop, as suppliers benefit from economies of scale
- **Retail margin and distribution Costs:** Retail distributors charge a margin over STB wholesale prices
- **Technology evolution:** the price of elements such as memory and hard disk storage for PVR models is decreasing
- **STB configuration and integration:** Decoder prices will vary depending on the middleware solution chosen, interactivity engine, as well as the enabled or active conditional access
- **Negotiation with suppliers:** The negotiation process with vendors can be lengthy - if the government is buying set-top-boxes, prices will vary depending on the volume committed and contract terms, such as liability for upgrades.

Figure 7-7 illustrates how the cost of set top boxes is comprised.

Figure 7-7: Cost range of DTT STB main components



(*) e.g. MPEG Video & Audio, Dolby, HE-AAC, H.264

Source: Farncombe estimates

An efficient procurement process for STBs, distribution services and installation services, aims to:

- Select multiple suppliers to promote competition and lower prices
- Favouring local suppliers of STBs to reduce logistics costs and allow tax efficiencies
- Using a network of local installers
- Promoting self-installation.

The specifications of STBs used in the Help Scheme may be tailored to the needs of targeted demographics, with ease of general use and ease of re-tuning a priority. The STBs must also be of a sufficient quality to avoid unnecessary expenditure on replacements or support for equipment malfunctions.

Pay-TV operators have STB refurbishment programmes to reduce the overall STB manufacturing costs. In most cases, the refurbishment will include minor changes e.g. changing the front panel, for instance, to meet new branding requirements or simple software upgrades ("Screen and Clean"). Moreover, these changes are designed for the device to operate for the same operator's network/platform for which it was originally manufactured.

Refurbishing STBs which were initially built for different platforms/networks (e.g. DTT, Cable, DTH) or standards (DVB-T/T2, DVB-S/S2, ISDB, etc.) would require changes to internal hardware and software and possibly to peripheral components. Additional modifications to the STB's settings may also be needed to re-configure the device together with re-testing and re-certifying for basic health and safety requirements. Specialised, quality equipment and highly trained personnel will, also, add to the total cost of refurbishment.
Specific issues include:

- **Technical**
  - Chipsets may not be able to be re-programmed to contain all relevant drivers, APIs, etc. to control the replacement chip (for instance, when a DVB-T STB is refurbished for DVB-T2)
  - Although some low-cost STB elements can be refurbished and reused (e.g. Box/Panel, basic cabling, HDMI/DVI ports, RF connectors), the reusability of the chipset and DTT tuner depends on the initial manufacturing process
  - Be sure that changes to DRAM/Flash memory and backup battery do not have a detrimental effect on the re-programming (e.g. boot behaviour, etc.)

- **Commercial**
  - No guarantee that STB will work satisfactorily following the refurbishment process, although collection, shipping, warehousing and refurbishment cost has been incurred
  - Quality Assurance (QA) processes would be required after the refurbishment to verify the operation of the STB. Detecting hardware faults would need further testing
  - Resolving licensing terms and conditions for middleware/interactivity engine and version tracking if refurbished STBs will be used in different regions from the one originally built to operate
  - Negotiating STB warranties and replacement terms with manufacturers and/or refurbishment companies.

Whether Governments can benefit and to what extend from ordering refurbished STBs instead of new low-cost units requires analysis to assess if the potential cost savings from re-using some of the STB's hardware elements can offset the costs of the new, replaced components in addition to labour, logistics, warehousing, testing and QA and waste management costs. Given that refurbished STBs from different countries or regions would likely require hardware changes, it is questionable if the initiative would result in any gains. In cases where, potentially marginal, cost savings could be achieved, Governments should balance these gains against the commercial risks.

Glossary of terms

API	Application Program Interface
ASO	Analogue Switch-Off
ATU	African Telecommunications Union
CAPEX	Capital Expenditure
DD	Digital Dividend
DRAM	Dynamic Random Access Memory
DSO	Digital Switch-Over
DTH	Direct-to-Home
DTT	Digital Terrestrial Television
DVB	Digital Video Broadcasting
DVI	Digital Visual Interface
EPG	Electronic Program Guide
FTA	Free-To-Air
HD	High Definition
HDMI	High-Definition Multimedia Interface
IDTV	Integrated Digital TV
IPTV	Internet Protocol TV
ITU	International Telecommunication Union
MFN	Multi Frequency Network
MPEG	Moving Picture Experts Group
MUX	Multiplex
OPEX	Operational Expenditure
PPP	Public Private Partnership
PSB	Public Service Broadcaster
PVR	Personal Video Recorder
RF	Radio Frequency
RFI	Request for Information
RFP	Request for Proposal
SD	Standard Definition
SFN	Single Frequency Network
SI	Service Information
SMS	Short Message Service
STB	Set-Top-Box

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