COST BENEFIT ANALYSIS (CBA) OF DIGITAL SWITCHOVER

Economists in the Department of Trade and Industry (DTI), the Department for Culture, Media and Sport (DCMS), and the Radiocommunications Agency (RA) have developed a model to evaluate the **costs and benefits to the UK** of completing digital switchover. The switching off of analogue terrestrial transmissions and subsequent use of the UHF spectrum is compared with continuing with both analogue and digital transmissions. The model uses estimates provided by various industry stakeholders of costs and of benefits to broadcasters from not having to maintain analogue networks. Estimates of the benefits from future use of spectrum derive from survey work undertaken by the RA. The Independent Television Commission (ITC) has also contributed to estimates.

The model shows that the outcome in terms of Net Present Value (NPV) is most sensitive to estimates of the value of released spectrum. The central case shows quantifiable benefits in the region of **£1.5 – 2 billion in NPV terms**. This gives a clear message that switching off, rather than maintaining dual transmission systems, is in the economic interest of the UK. The model does not show that there is a preferred year for completing switchover, though it indicates that sooner is better than later. The model does not show the cost benefit analysis for particular groups, such as consumers or broadcasters. This will be an area for further work.

Introduction

1. This paper presents the results to July 2003 of the CBA of digital switchover. These results have been reviewed by the independent economic auditors. We have work in progress to further review the estimates for infrastructure costs and the forecasts of the non-digital TV set and VCR populations.

2. The CBA is a summation of all the costs and benefits associated with the digital television project of switchover to digital TV transmission only. This project is compared with the alternative scenario of a continuation of the current duplicate transmission of digital and analogue. This paper discusses the quantifiable results from the CBA model. Separate work is being developed on the environmental aspects. This paper does not discuss the distributional aspects of the project i.e. the equity of the flow of costs and benefits which will arise from the project. There is no discussion here of the non-quantifiable benefits e.g. the public service aspects of the digital TV project. These will all be part of the full CBA.

3. We have built the CBA using a spread-sheet model which shows the input variables (costs and benefits) in the year when they will occur. The model discounts all figures back to the present (i.e. converts them to Present Value) and then sums benefits and costs to arrive at a Net Present Value (NPV). The input estimates can be varied to test the effect on the NPV in sensitivity analysis. The year of switchover is a key variable which can be changed in runs of the model to show the consequent NPV. The period covered is from 2010 (the earliest year in which it might be possible to reuse the spectrum) to 2026 (when the licences for digital multiplexes granted in 2002 to BBC and Crown Castle reach the end of their second period of 12 years).

4. Figures 1 and 2 overleaf summarise the elements in the CBA and show how the work on various elements has fed into the estimates used in the CBA model.

Figure 1: Summary of elements in the CBA

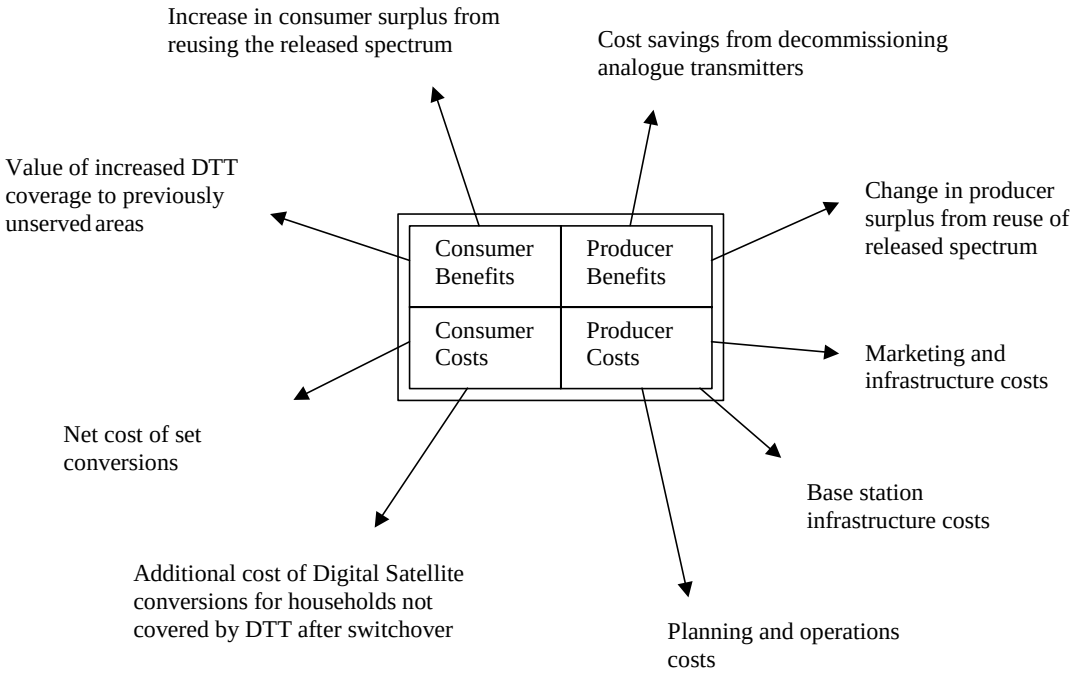
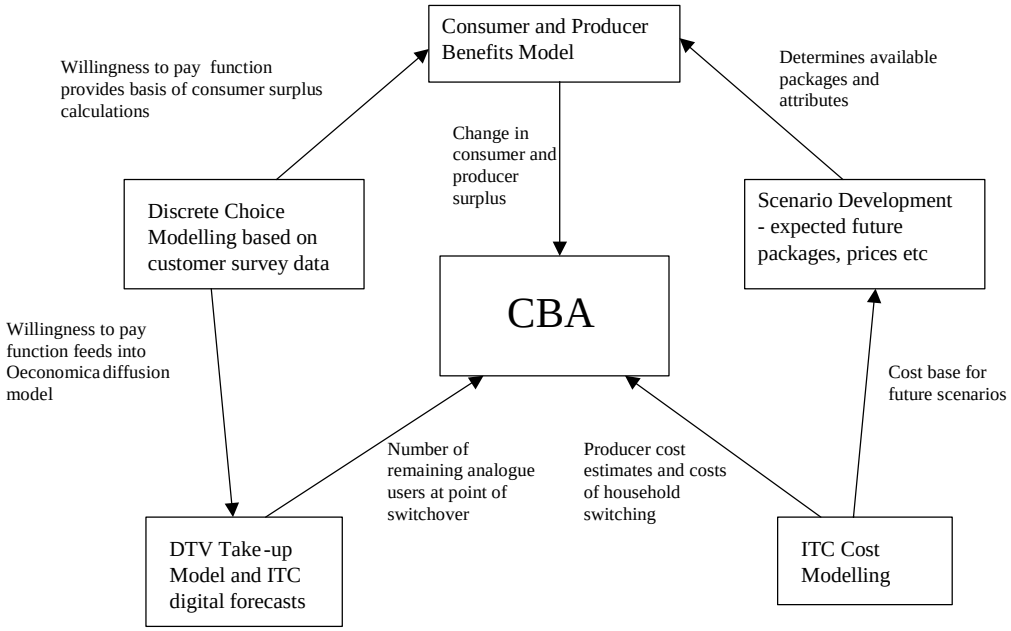


Figure 2: Models and assumptions feeding into the CBA



Estimates of costs and benefits

5. Because we are comparing digital switchover with the alternative of dual transmission, the estimates of costs and benefits used in the CBA are of the difference between the switchover scenario and the dual transmission scenario. Costs and benefits which would be the same in both scenarios are excluded from the CBA. As is normal in CBA, "sunk costs" will also be excluded. For this purpose, the counting of costs will start from a "decision point" in the near future where a decision would be possible not to proceed with the plan for switchover i.e. to continue with the scenario of dual transmission.

6. Table 1 overleaf shows the elements of costs and benefits that we have used in the runs of the CBA model. The figures used rely in many cases on information provided in strict confidence to members of the CBA group.

Table 1 Quantified estimates of costs and benefits in model

COSTS	**Source of estimates**
DTT transmission capital and operating costs. 80 and 1100 transmitter site options	ITC, TDN (collectively and individual members), Mentor
Marketing and Communications costs	DTI/DCMS/ITC
Planning, management, operating costs of switchover	DTI/DCMS/ITC
DSAT reception: Satellite dish; Annual viewing card payments	ITC for number of households migrated to satellite; Costs and payments
Cost of converting non-digital primary TV sets Size of population x cost of STB	Forecasts of non-digital primary sets from Oeconomica and ITC. ITC and TEG for costs of STB
Cost of converting non-digital secondary TV sets and VCRs Size of population x cost of STB	Forecasts from ITC and Intellect
BENEFITS	
Savings on analogue network transmission operating and maintenance costs	ITC
Value of DTT to areas previously unserved. Re-use of cleared spectrum for TV (14 channels clear plus channels interleaved between DTT multiplexes)	Estimation studies commissioned by RA

DTT = digital terrestrial television STB = Set top box
TEG = Technology and Equipment Group of the Digital Television Project
TDN= The Digital Network (broadcasters and transmission providers)

Costs

Capital and running costs of new digital terrestrial transmitter sites

7. The Government issued a statement in January 2003 which confirmed that the frequency assignments made to main public service multiplexes at switchover would be based upon the conversion of the current analogue assignments to digital. The Spectrum Planing Group (SPG) is currently developing a switchover spectrum plan based upon this principle, but no decision has yet been taken over the number of sites to be used. It is the number of sites which will determine the eventual coverage of the public services by DTT once switchover is completed. Today's analogue network uses around 1100 transmission sites. Today's digital network uses 80 of these sites. The analysis presented in the paper is based on two scenarios. The first is based upon reconfiguring the existing 80 sites to make best use of the frequencies available. This would mean that around 95 per cent of UK households could be served by DTT for the public services. In this scenario those viewers not covered by DTT for the public services would rely on digital satellite to receive these services. The second scenario is based upon conversion at all the existing 1100 sites. This should mean that all current analogue viewers could be served by DTT for the public services.

Consumer Reception costs

8. When switchover is implemented, for all consumers who have not already taken up digital television services, there will be various receiver equipment costs needed if digital reception is to be possible. We begin with a forecast of the number of consumers who will take up digital TV through whatever channel (terrestrial, cable, satellite) according to normal market development.

9. We have two sources for the forecasts of digital TV take-up: a forecasting model constructed for us by academic consultants, Oeconomica; and the forecasting work of the ITC. The ITC forecasts are to the year 2007, although for illustrative purposes they have projected their estimates to 2010. They give high and low projections (they also note that an average of independent City forecasts gives results slightly lower than the ITC high case). The ITC low projections are broadly comparable to the projections of Oeconomica. The runs of the model discussed in this paper are based on these Oeconomica projections.

10. For all households who have not gone digital at the time of switchover, there will be the cost of converting their analogue set. We have estimated this cost by assuming it will be done by purchasing a STB. However, this cost will be an overestimate of the net economic effect. When switchover comes some of these consumers will have been very close to buying into digital i.e. they value digital TV at some level below the cost of a STB but greater than zero. To model this, we have made the assumption that the implicit demand curve for digital is a straight line from the cost of a STB to zero. Therefore the average valuation by these consumers of the benefit will be half the cost

of a STB. We reduce the costs of the new equipment by half to measure its net effect on overall economic welfare.

11. In relation to those households who will have to migrate to satellite reception after switchover, there will be the cost of a satellite dish and we have assumed that there will be an annual charge for use of a viewing card to access public services.

12. At switchover it is not only non-digital primary TV sets which will lose functionality but all non-digital TV sets and VCRs. We know that the average ownership of TVs per household is currently about 2.5 sets and the current total population of TVs is around 55 million. Forecasting the size of the population of non-digital TVs and VCRs in the future is complex. As consumers buy new TV sets, old sets are often not scrapped but retained in use. In addition, a growing number of consumers who have converted their primary set to digital also convert other sets. In the case of VCRs , forecasting is made difficult by the prospects of growth in the sales of Personal Video Recorders (PVRs) . Some projections from industry are very optimistic about the growth of sales of STBs and PVRs with VCR sales dwindling rapidly. In the face of these uncertainties we have used a fairly conservative set of assumptions to build projections of the population of analogue only TV sets and VCRs. We have done sensitivity analysis around these central projections. As is the case for primary sets we have netted out an estimate of the benefit which consumers obliged to convert will obtain from their converted sets.

Benefits

Savings in analogue transmission costs

13. When analogue transmission ceases there will be a saving in the running, upkeep and capital replacement cost of analogue transmission sites. These costs would be incurred in the non-project scenario, so they are counted as benefits in the project scenario.

Benefits of released spectrum

14. When analogue transmission ceases, there will be a release of 14 channels of clear radio spectrum plus interleaved channels between the digital television multiplexes. The economic value of this spectrum will depend upon how it is used. RA has commissioned work which feeds into the estimates on two broad options: television and mobile telecommunications. Generally, estimates of the value of the spectrum give higher values for mobile telecommunications. However, because of risks and uncertainties attached to the possibility of using the spectrum for mobile telecomms, arising from the need for international agreements, the analysis in this paper is based on the assumption that the released spectrum is used for digital television services.

15. At switchover there will also be a benefit arising from the fact that digital TV coverage will be available for the first time to a substantial part of the population (during dual transmission it will be technically impossible to reach these households through terrestrial transmission).

16. RA has made estimates of the value of the benefits arising from the two categories above. A study was carried out of how consumers would value the new digital TV services, in terms of their willingness to pay, based on Revealed and Stated Preference survey work. This is inherently a difficult exercise because consumers are being asked to value services some of whose features are novel and which would arise some time in the future. As a result, and because of other assumptions which are needed for forecasting, the estimates of the value of these services have a wide range.

17. At present we have made a simplifying (and conservative) assumption that the producer surplus for the operators of the new services on released spectrum would be competed away. We will review this in further work.

Results

18. These are set out in Table 2. The figures shown are the overall Net Present Value of the digital TV switchover as compared with the alternative of continued dual transmission. The analysis is done varying the year of switchover for each of the years 2010 to 2015. Switchover in years earlier than 2010 has not been modelled as it has become clear that in broad terms the lead times needed for planning and implementation make 2010 the earliest feasible date.

Table 2 Results from CBA model

DIGITAL TV SWITCH-OVER
NPV in £million (2003) with switchover in year shown

	Number of transmission sites						
1 Central case		2010	2011	2012	2013	2014	2015
	80 sites	2,428	2,256	2,103	1,948	1,777	1,590
	1100 sites	2,388	2,218	2,067	1,915	1,746	1,561
2 Low benefits		2010	2011	2012	2013	2014	2015
	80 sites	147	157	180	196	187	160
	1100 sites	106	119	145	162	157	132
3 High benefits		2010	2011	2012	2013	2014	2015
	80 sites	5,565	5,143	4,748	4,359	3,961	3,556
	1100 sites	5,520	5,103	4,712	4,325	3,930	3,527
4 High Reception costs		2010	2011	2012	2013	2014	2015
	80 sites	1,842	1,660	1,527	1,435	1,320	1,188
	1100 sites	1,575	1,422	1,317	1,252	1,160	1,056

19. Two variants of the central case have been done, using the cost estimates for infrastructure costs, based on either 80 or 1100 transmission sites. The low benefits and high benefits cases refer to the outer ranges of estimates from the consumer preference surveys. The high reception costs assumes a greater number of sets requiring conversion.

To summarise the other main assumptions in the central case:

- The project duration is from 2003 until the year 2026 (when licences to the existing multiplex operators end following one renewal)
- digital take-up of primary sets follows the Oeconomica forecast;
- It is assumed that released spectrum is used for services using broadcasting technology;
- A discount rate of 3.5% p.a. is used following Treasury guidance in the Green Book.

20. The central case figures show a positive NPV for switchover in each year, starting at around £2.4 billion with 2010 switchover. The NPV falls for each year that the switch-over is delayed by around £150-£190 million. This reflects that the loss of benefit from delaying switchover is greater than the lower costs. However, given the magnitude of the input figures and the range of uncertainty this is not a particularly robust result i.e. the difference in the NPV resulting from delaying switchover from one year to the next could well be the same. However, the effect of a five year delay is likely to be at least £0.5 billion in NPV terms.

21. The results for the 80 site option are slightly better than those for the 1100 site option. These results are very close, however, differing by only about £40 million in NPV terms. Again, this means that the result cannot be taken as robust. There are, in any case, a number of other factors which would have to be taken into consideration in the decision on which number of transmission sites would be optimal.

Sensitivity analysis

22. All our input variables are subject to uncertainty and we have run the model with different values for all of them, on a high, central , and low basis.

23. As one would expect the NPV results are most sensitive to the input variables of the greatest magnitude and with the widest range around their central estimate: the benefits of released spectrum, the cost of transmission infrastructure and the population of non-converted reception equipment.

Varying estimates of benefits of released spectrum; low case

24. The RA work on estimating these benefits gives us a central estimate of their value of £460 million p.a., a high case of £790 million p.a., and a low case of £220 million p.a. If the low case is used, with all other variables the same as in the central case, then the NPV is reduced by between £1.4 and £2.3 billion depending on the year of switchover. For example, for 2010 the NPV in the central case (with 80 transmission sites) is £2.428 billion but in the low benefits variant the NPV comes down to £147 million. Also, the effect of delay is reversed i.e. the NPV rises as the switchover year is delayed after 2010 but falls again after 2013. The change is only by around £10 million a year in some cases, which is negligible given the margins of uncertainty.

Varying estimates of reception equipment costs

25. As a variant of the central case, we have used higher estimates of the future population of non-converted TV sets and VCRs i.e. we have taken a pessimistic view of the voluntary conversion of second TV sets and of VCRs (cf. “High Reception costs” case in Table 2).

26. The NPV comes down, compared to the central case by about £ 0.6 billion. This still leaves it at around £1.8 billion in 2010, when using the infrastructure cost estimates for 80 transmission sites.

Conclusions

27. There is further work in progress to elaborate some of the forecasts going into the model and to test the sensitivity of results to changes in assumptions.

28. However, on the basis of the results so far it would seem that the quantifiable benefits of switchover compared with dual transmission would be substantial, most likely in the region of £1.5 - £2 billion in NPV terms. The results are most sensitive to the estimated value of released spectrum. A combination of lower range estimates for a number of variables could turn the result negative.

29. In terms of timing, the central case shows a loss of NPV for every year of delay in switchover from 2010. This is close enough not to be a robust result for one year to the next, although the likelihood of a fall in NPV becomes higher with each further year of delay. However, if the project were only to achieve the low estimates of benefits, the model shows that a delay in switch-over would make little difference to the NPV.