THE INTRODUCTION OF DIGITAL TERRESTRIAL TELEVISION IN JAMAICA 2012: A FEASIBILITY STUDY

Submitted to:
Broadcasting Commission of Jamaica

Submitted by:
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Project Team

This project report was prepared by a team from the College of Business and Management, University of Technology, Jamaica, for the Broadcasting Commission of Jamaica. The purpose of the report is to determine Jamaica's readiness for Analogue Switch Off (ASO) and to propose a strategy for Digital Terrestrial Television (DTTV) implementation. The project team consisted of the following persons:

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MRSL	Market Research Services Limited
MTV	Mobile Television
MUX	Multiplexer
OFDM	Orthogonal Frequency Division Multiplex
PBCJ	Public Broadcasting Corporation of Jamaica
PMO	Project/Programme Management Office
PPP	Purchasing Power Parity
PSB	Public Service Broadcaster
RFP	Request for Proposal
SD	Standard Definition
SDTV	Standard Definition Television
SFN	Single Frequency Network
SMA	Spectrum Management Authority
SPSS	Statistical Package for the Social Sciences
STATIN	Statistical Institute of Jamaica
STB	Set-Top Box
STV	Subscriber Television
T-DAB	Terrestrial-Digital Audio Broadcasting
T-DMB	Terrestrial-Digital Multimedia Broadcasting
TS	Transport Stream
TV	Television
TVJ	Television Jamaica
UHF	Ultra High Frequency (frequency range between 300 and 3000 MHz)
UK	United Kingdom
US$	United States Dollars
USA	United States of America
UTech	University of Technology, Jamaica
VCR	Video Cassette Recorder
VHF	Very High Frequency (frequency range between 30 and 300 MHz)
VSB-8	8-Level Vestigial Sideband
WTP	Willingness to Pay

In most countries evaluated by the ITU, the regulators were neutral on the Television Presentation Format, suggesting that market demand should drive the adoption of this service or if the regulators deem HD to be part of the country's universal service package, they should stipulate the standard. We believe that the regulators' role should be aimed at setting standards relating to interoperability, economies of scale and safeguarding universal service. We therefore recommend that the regulators stipulate the minimum required standard of SD and allow market competition to drive the introduction of HDTV.

Transmission Standard

The international market for DTV standards is fragmented along the major poles of industrial activity, USA, Europe, Japan and China. The proponents of these systems have been competing for business across the globe and decisions to adopt a standard by many countries are based on geopolitical and regional considerations. The emerging pattern for the adoption of standards is based on regional blocs albeit with subdivision and exceptions.[2] The four main transmission standards are:

- North American Advanced Television Systems Committee (ATSC) — has been adopted in USA, Honduras, El Salvador, Dominican Republic, Mexico, Canada, South Korea
- European Digital Video Broadcasting (DVB) — adopted in all of Europe, Turkey, Russia, Saudi Arabia, Iran most of northern and southern Africa, most of Australasia and some countries in South America.
- Japanese Integrated Services Digital Broadcasting (ISDB) — adopted in Japan, Brazil: Bolivia, Chile, Argentina, Uruguay, Venezuela and the vast majority of South America.
- Chinese Digital Terrestrial Multimedia Broadcast (DTMB) — adopted in China and Hong Kong

These standards are incompatible and the broadcast from one system cannot be received by televisions in another standard without the use of a set-top box. Best practice in almost all jurisdictions examined indicates that the regulators stipulate a transmission standard. Setting a single standard will deliver full harmonization which will lead to the greatest possibility of gaining economies of scale and interoperability and prevent customer confusion. Based on discussion within the industry and international adoption patterns the two standards under consideration for Jamaica are ATSC and DVB-T2 or second generation DVB.

We spoke to the three main broadcasters and they all indicated a preference for the ATSC standard based on, inter alia, initial investments, cultural, economic, technological, and political relationships with the USA. Adopting the ATSC standard will involve less dislocation for consumers and suppliers as the digital TV sets (receivers) currently supplied by distributors comply with the ATSC standard. The ATSC signals are designed to use six MHz bandwidth which is similar to the standard currently used in Jamaica.

From the perspective of suppliers in the receiver market and consumers, adopting DVB-T2 would not involve much dislocation either. The local industry for receivers has indicated that they will not have problems sourcing either DVB-T2 or ATSC television sets for the local market. Consumers who have already purchased ATSC receivers or who intend to purchase ATSC receivers from the USA they would also need to purchase a DVB-T2 set-top box. Recent research has indicated that the differences based on standards are not significant when the price of set-top boxes, integrated television sets and audiovisual

[2] Garcia, Leiva, (2011). International Policy Preferences, Technological standard-setting and digital television. *Observatorio 5* (4), 103–126.

technology to select should be MPEG-4. In adopting DTTV, regulators in first-mover countries took the decision not to stipulate the compression standards; however, we suggest that MPEG-4 be stipulated by the regulators to ensure a smooth and efficient transition, interoperability and economies of scale.

Section 3: Design Principles and Network Architecture

Section 3 examines the DTTV infrastructure design. After a review of the Jamaican market situation and structure, and in particular, the Geneva Agreement of 2006 (GE06), the following are being recommended for implementation:

1. Required DTTB network architecture: Multiple multiplex
    a. We are in support of multiple multiplex to allow for several DTT channels, as may be demanded by viewers or as dictated by government policy to encourage investment.
    b. We recommend having the existing broadcasters on a single multiplex to enable
        i. use of existing tower infrastructure operated by them.
        ii. speedy roll out of the DTTB network to meet the DSO timeline.
        iii. continuity of local programming.

2. Required spectrum channels per national multiplex: Three
    a. In Jamaica, terrestrial broadcast coverage is restricted primarily by terrain and not Effective Radiated Power (ERP), that is, transmitter power and antenna gain. Given the robustness and flexibility of the DVB-T2 standard, a combination of Multi Frequency Network (MFN) and Single Frequency Network (SFN) deployment will achieve this.

    This will allow for 99 SDTV channels within the 470–698 MHz planned assignment with 8 MHz bandwidth, three channels per multiplex implementation.

3. Required broadcast network design: Hybrid MFN and SFN
    a. This will reduce the number of channels required to provide national coverage by using SFN as secondary transmitters to support the MFN as primary transmitters.

4. Required national population Coverage: 95% portable reception in urban centres and major towns and fixed reception in rural communities.
    a. Existing combined free-to-air (FTA) and subscriber television (STV) coverage is 87.4%. Increasing population coverage by 7.5% through DTTB will be a huge incentive for viewers to accept and take up the service.
    b. Achievable using DVB-T2 and 18 existing transmission towers operated by existing broadcasters. (See coverage plot in Appendix D)

5. Required Digital switchover approach: Phase 1 - Kingston Metropolitan Area (KMA), Mandeville and Montego Bay. Phase 2 - other areas with three-month simulcast in both phases.
    a. DSO for 2016 is realizable with urban centres with the deployment of seven transmitters.
    b. Urban centres are less dependent on FTA broadcast and hence will be the least affected at ASO.
    c. Broadcasters will fine-tune coverage during simulcast period(s).
    d. Viewers will be prepared and take service at ASO in 2017.

6. Required site location: Use of existing towers operated by FTA TV broadcasters

to the analogue broadcast value chain. This will eliminate the need for individual TV transmitters for each TV station. With the extra function of a multiplex operator, the ITU Guidelines indicate that there are two basic licensing models from which all DTTB assignment models are derived — Model A and Model B.

Model A: The spectrum rights are assigned to the multiplex operator and this entity *can* decide the allocation of the available capacity to the various services. In this model, the frequency licence holder is allowed to use the defined spectrum and *can* decide the loading of the multiplex(es), for example, which broadcasters can get access to the platform.

***Model B*:** The spectrum rights are assigned to the content distributor and this entity *cannot* decide the allocation of the available capacity. In this model, the frequency licence holder is *only* allowed to use the defined spectrum.

We recommend a variant of Model A, where spectrum rights have been assigned to the single entity that runs the multiplex and distributes content using the operating rights for physical facilities. The existing broadcasters in the Jamaican market would then carry out the role of content aggregators and be dynamically assigned capacity on the multiplex for distributing their content to the public. It is also possible in this option for the multiplex operator to only manage the multiplex by assigning capacity but the ownership (operating rights) of the transmission towers, antennas, buildings and so on rest with a separate content distributor. This recommendation will satisfy the overall policy objective of achieving interoperability, economies of scale, efficient use of spectrum, the presence of a competitive market, safeguarding universal service and cost efficiencies for both the broadcasters and the consumers.

As it relates to Public Service Broadcasters (PSB), their licensing on the DTTB platform would take on one or both of the following forms:

a) The PSB channels are free-to-air on the DTTB platform of commercial multiplex (es) with or without the application of a conditional access system (such as pay-per-view, video on demand, etc.).
b) For commercial content aggregators such as individual commercial broadcasters on the DTTB platform, no additional PSB or any other broadcast obligations should be levied above those for the existing analogue broadcast license.

The licensing assignment procedures are stipulated in the statutes mentioned earlier in this section and they may be described as a public tendering or modified first-come-first-served application process conducted by the regulator followed by a recommendation to, and final decision by, the Minister. There is also an appeals process for decisions made by the regulator and the Minister. The categories of requirements that are to be met by applicants include fit-and-proper, technical capabilities and financial soundness. It should be noted that the Minister can give directions of a general nature to the regulator regarding factors that should be considered in the evaluation of license applications.

Section 5: Market and Business Development

Section 5 examined the demand drivers for DTTV and a forecast for TV advertising market was done. We will examine the demand drivers and then forecast the advertising market.
To determine the demand drivers, data were collected over a one month period in eight of the fourteen parishes in both urban and rural areas. A simple random sample was the basis of the data collected from 1,483 respondents, 1,112 face-to-face interviews and 371 online; an orthogonal design generated in SPSS was used. Participants were asked to rate several digital TV package based on their preferences. The

C_s = growth in consumer spending (proxy is GDP)
C_p = colour TV penetration
D_r = digital TV take up rate

The model to be estimated is as follows:

Industry Revenue Forecast is given as: $A_r = f(P_a, A_o, P_p, P_s, A_F, C_s, C_p, M_s, D_r)$
In equation form it is now $\text{Log } A_r = \alpha - \beta_1 \log P_a + \beta_2 \log A_o + \beta_3 \log P_p - \beta_4 \log P_s + \beta_5 \log A_F + \beta_6 \log C_s + \beta_7 \log C_{p,} + \beta_8 \log M_s + \beta_9 \text{Log } D_r + \mu$

The main findings of this subsection were:

- The most significant determinant of advertisement revenue is GDP. The estimated model predicts that the elasticity value of current and one period lag GDP is 1.4%.
- Sensitivity analysis reveals that at the switch-off date, a 1% deviation from the estimated take-up rate (91%) will result in a loss of revenue of 0.53%. This 91% take-up rate at the switch-off date implies a revenue loss of J$108,777,962 or 6.44% of total revenue.
- Finally, advertisement revenue will not be significantly affected by the switchover because of the proposed simulcast during the period. Moreover, at the switch-off date, the expected revenue loss of 6.44% lies just outside of the 5% margin of error.

Section 6: Digital Dividend

The transition of terrestrial television broadcasting from analogue to digital brings to viewers the potential for a larger number and variety of programmes, better quality and new services such as video on demand, high definition TV (HDTV). It therefore represents a very positive evolution for this type of broadcasting. In addition, digital television transmission produces significant additional value because it is much more spectrum efficient than analogue.

Given the very important gains in spectrum efficiency which may result from this transition, there has been growing interest in the last few years on how these gains might be utilized in communication markets. Consequently, the concept of digital (television) dividend has emerged, which may be defined as the amount of spectrum made available by the transition of terrestrial television broadcasting from analogue to digital.

The digital dividend has been defined, in relation to markets of high demand for spectrum, as the spectrum made available over and above what is required to accommodate the existing analogue television services. Based on this definition, the digital dividend could be of the order of 80 per cent, or more, of the UHF/VHF spectrum that is used for analogue broadcasting.. This definition requires that a successful transition to digital TV has occurred, and in turn that digital terrestrial broadcasting has been able to attract analogue viewers in sufficiently large numbers to make this possible. This can only happen if DSO and ASO are mandated with hard cut-off dates and an effective, well funded implementation programme[4] or digital service offering is attractive enough to viewers to justify the purchase of digital adaptors. This in turn requires a significant increase in the number of programmes and perceived quality

[4] A programme that is mandated must ensure that all users of current analogue service have a fair opportunity (in cost, equipment availability and reasonable time) to access the digital equivalent of their current service.

The cost-benefit was modelled on the approach used by Ofcom, in the UK and other countries who made the transition from analogue to DTTV.[6] The basic framework of the CBA is that all the associated benefits and cost were inputted to a spreadsheet model for the four-year period, 2013–2016. We then discounted the cash flows using a discount rate of 6% to arrive at the Net Present Value (NPV) of the project. In order to determine the 'robustness' of the results, a sensitivity analysis was done using some key inputs into the model. The basic framework of the CBA model was then modified to evaluate the impact of different scenarios on the NPV. These scenarios include uncertainties in the timing of expected benefits, switch off dates and government policy.

The CBA indicated that the DSO project is a worthwhile investment. The project will yield a positive NPV of $2.59 billion (central case scenario) in 2019.

The sensitivity analysis suggests that the viability of the DSO will heavily depend on how the digital dividend is used and the benefit derived from it. The sensitivity analysis also suggests that the success of ASO will depend on the following factors:

- The cost to consumers: The consumer is most sensitive to the cost of STB; a 50% subsidy on STB will result in a 12% increase in NVP which will translate to a positive change in NVP of JAJA348.4M.
- Broadcaster: Infrastructure cost will have a significant effect on the NPV, a 25% increase in the cost of infrastructure will reduce the NPV by $262.8M.
- Use of digital dividend: To a great extent, the positive NPV depends on using a DTTV platform to increase broadband penetration. If the broadband penetration should decline by 1% (from 5% to 4%), this will result in a $938M (35%) decline in the NPV. Therefore, the success of the DSO project will depend on the creation of new services that will contribute positively to GDP.
- Change in time horizon: The costs significantly outweigh the benefits for the period leading up to ASO and results in a negative NPV. However, when we extend the CBA model up to 2019 (when the benefits from the 'digital dividend' begin to be realized) the NPV was positively impacted. The net benefits were estimated and discounted back to 2016 in the CBA model. While longer time period increases the uncertainty of the estimation, NPV is likely larger as most of the benefits associated with ASO will occur consistently after ASO.
- Change in discount rate: The NPV was also positive after the discount rate was increased by 4% (6% to 10%) but the NPV decreased by $482.7M. This shows that even though the NPV remained positive the NPV is very sensitive to changes in interest rates.

Section 8: Funding the Conversion

The research indicated that most governments facilitated the uptake and development of DTTB services by providing tax/duty concessions on DTV hardware imports including STBs for consumers and production and transmission equipment to broadcasters, content creators, and MUX operators. In the US, a coupon of US$40 was provided to each household. The European Commission has published guidelines on the aid governments can provide to ease the transition. In the UK certain households were eligible for the concession such as households with members over 75 years of age or members with severe disability.

[6] UK Government, July 2003. DCMS/DTI Memorandum: The Cost and Benefits of Digital Switchover: Department of Culture Media/Sport.

b. No issue with spectrum or broadcast interference during period of transition since VHF is currently the primary terrestrial television broadcast frequency used in Jamaica.
c. Opportunity and flexibility exist now to assign and allocate spectrum in the best interest consistent with planned growth and development of the information and communication industry.

5. Conduct full-scale frequency planning before ASO in order to sort out possible islandwide frequency channel in supporting transition.
6. See DSO timeline in Appendix K.

Section 10: ASO Communication Plan

Developing a communication strategy to encourage voluntary take up of DTTV will be vital to the success of DSO in Jamaica. It is recommended that a strong media awareness campaign be launched by the government, broadcasters and suppliers to get consumers on board for the migration from analogue to digital. As outlined in the ITU Guidelines, the communication strategy should be based on several successive stages (that is, creating awareness, understanding, influencing attitude etc.). See ASO Communication Model in Figure 1.

Based on the model, a communication budget was created covering a five-year period from 2012to 2017. The total production cost is JAJA14,485,000.00 (See Figure 21 in Appendix J) and the placement cost is estimated to be $300M over the six-year period. Among the objectives of the communication strategy is to:

- Limit the risk of distorting or confusing the market by communication based on principles of impartiality and accountability, responsibility and transparency.
- Select appropriate communication tolls for each target audience

The communication campaign is scheduled to continue at least six months after switch off.

Section 1: Current Broadcasting Situation in Jamaica

Introduction

In 2010, the BCJ announced that 2015 was the nation's target date for the transition from Analogue Terrestrial Broadcasting to Digital Terrestrial Television Broadcasting (DTTB). Digital Switchover (DSO) is an ongoing project across the globe involving a gradual replacement of analogue broadcasting (transmission and reception) with digital broadcasting (transmission and reception). The International Telecommunications Union (ITU) agreed at the Regional Radio Conference in 2006 that by June 2015 all countries should have completed their transition from analogue to digital transmission.

Digital television offers great opportunities both to broadcasters and viewers. Compared to analogue digital television provides improved quality: a more captivating TV experience through better voice and sound technology. Viewers get access to additional programmes and receive the opportunity to watch TV via their mobile phones. Moreover, digital television provides new features and interactive services such as the electronic programme guide and video-on-demand.

DSO while offering great opportunities also has its challenges. Regulators, for example, must enable the launch of this new platform while dismantling the old one. DSO will free up a significant amount of high quality radio spectrum, the so called 'digital dividend'. Applying the principle of spectrum efficiency, regulators must decide upon how they intend to utilize the 'digital dividend'. Additionally, the DSO process must be managed appropriately as its success will depend on regulatory certainty.

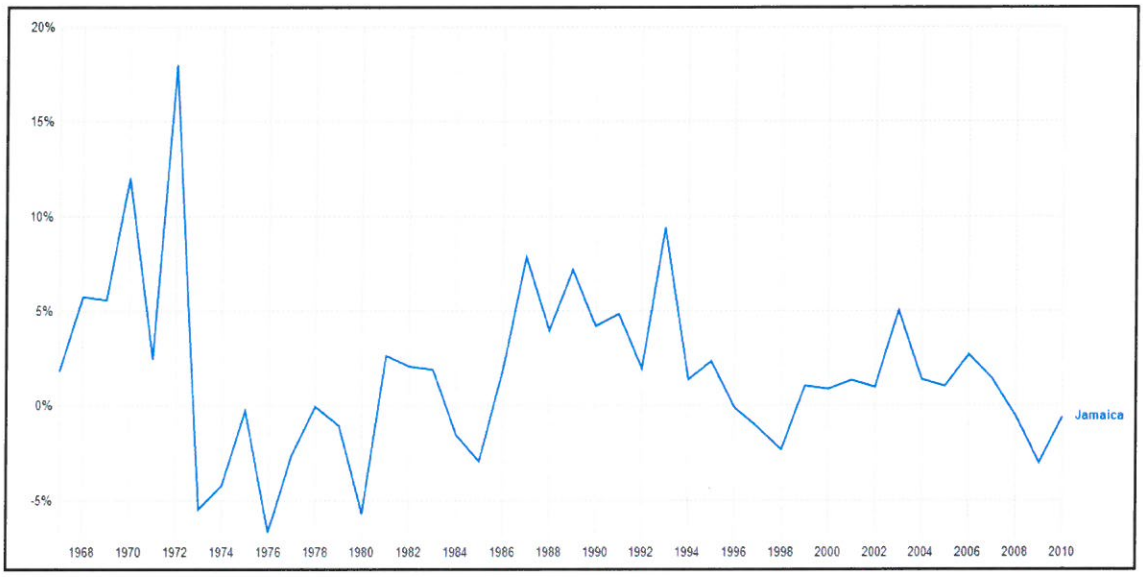
Another challenge from a technological perspective is that analogue equipment will have to be replaced by its digital equivalent. Viewers of terrestrial broadcast will have to buy new TV sets or digital receivers. The digital switchover process can also cause difficulties for a significant proportion of society as elderly and underprivileged people might need technical and financial support to go digital. All TV viewers must be informed accordingly regarding the changes on the terrestrial platform. It is therefore very important that the DSO be well planned with clear strategies and a definitive timetable to avoid confusion and field measures to ensure adequate digital coverage, coordination and collaboration with all stakeholders.

The BCJ had began exploring the issue of DSO from 2003 and has since had several activities including a DSO workshop in 2008, the establishment of a National Steering Committee in 2009 and a forum on Managing the Transition from Analogue to Digital Broadcasting in December 2010. The BCJ started its plans on the premise that if Jamaica took too long to make the shift, it ran the risk of being placed at an economic disadvantage and may end up on the wrong side of the digital divide. The main output of the 2008 BCJ DSO Workshop, mentioned earlier, was a clear strategic outline of a DSO framework, including the need for a feasibility study.

The purpose of this document is to provide, inter alia, the cost and benefits associated with ASO, a proposed licensing framework for the new DTTV platform, and customer insight and research as well as the identification of demand drivers, competitive advantages and service uptake projections.

This analysis was based on best practices relating to policy. These included achieving interoperability, economies of scale, efficient use of spectrum, the presence of a competitive market, safeguarding universal service and cost efficiencies for both broadcasters and consumers. The Draft Framework,

Figure 2: Jamaica's GDP Growth Rate[14]



Market Structure for Free to Air (FTA) Television and Subscriber Television (STV)

Free to Air (FTA) Television

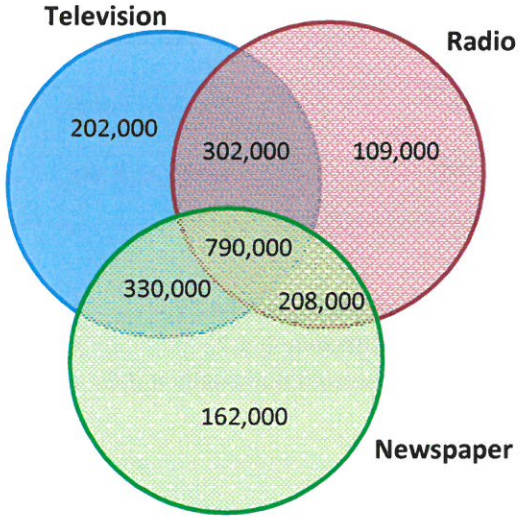
FTA Television refers to television that is transmitted over the air without charge for the delivery of the signal to viewers. Previously, the Jamaican Free to Air Television market had been controlled by one entity — the Jamaica Broadcasting Corporation (JBC). Presently, there are three licensed FTA broadcasters namely CVM TV, TVJ and LOVE TV. The MRSL 2010 Survey reports that most viewers of FTA TV are mature individuals with those aged 35 years and upwards accounting for 49.39% of the total viewing audience.[15] Twenty-five to 34 year olds account for 20.18%. Additionally, these TV viewers are from the low middle to low income socioeconomic levels. Table 1 indicates that TVJ has the largest market share with 59.9% followed by CVM TV with 38.8% and LOVE TV with 1.3%. Table 1 also outlines the weekly viewership figure for each broadcaster.

[14] www.google.com.jm/publicdata.

[15] Broadcasting Commission, April 2012. An Economic and Financial Analysis of the Jamaican Electronic Communications Industry.

frequently. According to Marketing Strategy Limited's Media Usage Study 2010,[30] 64% of the Jamaican population watches television every day.

Figure 3: Jamaicans' Interaction with Media, 2007[31]



There is no reliable data on the number of households with STV service. Data from the BCJ indicate 264,000 households in 2010 based on quarterly reports submitted by STV operators. Data from MRSL (2010) indicates 396,000 households with STV. An industry expert suggests that the BCJ number is under-reported and that it should be closer to 350,000 of which approximately 175,000 households have digital cable service. The MRSL 2007 Electronic Media Survey reported 578,000 households with STV service; however, this seems to suggest the number of TV connections and not the number of households connected. For this report, we have decided to use 300,000 households with STV service, this is an approximation based on BCJ data and the estimate from industry.

Based on data from the Jamaica Survey of Living Conditions 2009 it is estimated that 654,037 or 87.4% of households have TV. Based on our assumption of 300,000 or 45% of households with a television set also have STV service and 354,037 or 55% have FTA TV. With the average number of TV sets per household being 1.7[32], the total number of TV sets nationally is estimated to be 1,111,863 (STV: 510,000 and FTA: 601,863). Based on sales data for the last three years from Courts Jamaica Ltd and Singer Jamaica Ltd and a 25% allowance for sales from other sources, it is estimated that less than 20,000 of these TV sets have a digital tuner. Table 2 provides a detailed breakdown of households with regard to the number of television sets and viewers.

[30] http://televisionjamaica.com/siteimages/documents/tvjpresentation.pdf.
[31] MRSL, 2007. Electronic Media Survey.
[32] MRSL, 2009. All Media Survey.

network offering ad-supported and premium on-demand streaming of television shows, plays, movies and webisodes to PCs, tablets, smartphones and television.

Table 3: Breakdown of STV Zones Islandwide[35]

Parish	Total Number of STV Zones	Zones licensed to 1 STV Licensee	Zones licensed to 2 STV Licensees	Zones licensed to 3 STV Licensees
Kingston and St Andrew	66	31	30	5
	39	7	19	13
Clarendon	22	11	10	1
	15	8	6	1
St James	15	1	11	3
	14	0	9	5
St Ann	14	1	13	0
	14	4	7	3
St Mary	12	7	5	0
	10	0	6	4
Portland	8	1	4	3
	7	2	5	0
Trelawny	7	0	5	2
TOTAL	**243**	**73**	**130**	**40**

Regulatory Framework

The regulatory framework for the use of electromagnetic spectrum for all broadcasting in Jamaica, including the introduction of DTTB services, is comprised of:

- Part IV (Spectrum Management) of the Telecommunications Act 2000 (Amended 2012),
- The Broadcasting and Radio Re-Diffusion Act,
- The Television and Sound Broadcasting Regulations,
- Radio and Telegraph Control Act (for channel pricing), and

[35] BCJ, April 2012. Status of Service Provision by Broadcast (Islandwide) and STV Licensees .

Section 2: Technology and Standards Regulations

Overview

The DTTV implementation will affect market structure, revenue and audience market shares and the diversification of information sources which means more plurality of content and options. Early in the DOS process, regulators are required to make key decisions about network elements which will guide DTTV implementation. Decisions are required regarding the following:

- Television Presentation Format
- Transmission Standard
- Compression Technology

Television Presentation Format

Determining the TV presentation format is a step that precedes the actual selection of a transmission standard and system. The two formats under consideration are SD and HD. These standards are independent of the transmission standard and are established as part of the programme production process. However, the choices regarding the presentation format have an impact on the broadcast delivery process.

Internationally, most TV transmissions are in SD with 625 lines and 4:3 or 16:9 picture format. More recently, HD transmission services have become available, either with 1080 lines interlaced scanning (1080i) or 720 lines progressive scanning (720p).[36] The European Broadcasting Union expects that in the future all TV programmes will be of HD quality and that a minimum of 20–25 HDTV programmes will need to be provided on the terrestrial platform in order to make it attractive for viewers.

Recommendation

In most countries evaluated by the ITU, the regulators were neutral on the television presentation format, suggesting that market demand should drive the adoption of this service or if the regulators deem HD to be part of the country's universal service package, they should stipulate the standard. We believe that the regulators' role should be aimed at setting standards relating to interoperability, economies of scale and safeguarding universal service. We therefore recommend that the regulators stipulate the minimum required standard of SD and allow market competition to drive the introduction of HDTV.

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[36] ITU Guidelines 2012, 189.

been reproduced in Table 4. DTMB is not included in the initial standards selection in Recommendation ITU-R BT.1306; as DTMB is a multi-carrier standard and is likely to behave similar to DVB-T (system B).

Table 4: Guidelines for Initial Selection of Transmission Standard[39]

Requirements		Suitable Systems
Maximum data rate in a Gaussian channel for a given C/N threshold	Required	A
	Not required	A,B or C
Maximum ruggedness against multipath interference[(1)]	Required	B or C
	Not required	A,B or C
Single Frequency Networks (SFNs)	Required	B or C
	Not required	A,B or C
Mobile reception[(1)], [(2)]	Required	B or C
	Not required	A,B or C
Simultaneous transmission of different quality levels (hierarchical transmission)	Of primary importance	C
	Required	B or C
	Not required	A,B or C
Independent decoding of data sub-blocks (for example, to facilitate sound broadcasting)	Required	C
	Not required	A,B or C
Maximum coverage from central transmitter at a given power in a Gaussian environment[(3)]	Required	A
	Not required	A,B or C
Maximum ruggedness against impulse interference	Required[(4)]	A
	Not required[(5)]	A,B or C

[(1)]Tradeable against bandwidth efficiency and other system parameters.
[(2)]It may not be possible to provide HDTV reception in this mode.
[(3)]For all systems in situations with coverage holes, gap filler transmitters will be required.
[(4)]This comparison applies to B and C in the 2K mode.
[(5)]First results from Australia, testing the 8K mode, show significant improvements over the 2K mode and suggest the performance of Systems B and C in the 8K mode may be comparable to that of System A. However, further comparative tests of Systems A, B and C are required to verify relative performance.

Given that Jamaica's coverage constraint is terrain based and not transmission power, there is a need to implement a DTTV system suitable for SFN in order to implement several transmitters without having to

[38] Recommendation ITU-R BT.1306. Error correction, data framing, modulation and emission methods for digital terrestrial television broadcasting; Appendix 4 to Annex 1.
[39] Reproduced from Recommendation ITU-R BT.1306.

not significant and should not be a deciding factor in standard selection from the consumer point of view.[40]

Based on our assessment, the gains to be achieved from adopting DVB-T2 are significant from the infrastructure perspective. One of the main features of the DVB-T standard is that it increases the number of channels and services available. In our analysis we allocated 24 MHz of spectrum to both ATSC and DVB-T2. ATSC would provide four channels islandwide while DVB-T2 would provide 11 channels, indicating a more efficient use of spectrum. The cost of deploying the architecture is US$5M less for DVB-T2 than for ATSC. Maintenance and operating cost will also be less as DVB-T2 requires fewer transmitters per multiplex for given channel demands and less energy cost at transmitter sites.

In addition to the DVB-T2 standard being the most widely used, (see Table 5 for status of the different standards) it is the most extensive, it has set standards for digital television for satellite (DVB-S and DVB-S2), cable (DVB-C and DVB-C2) and terrestrial, either by landline (DVB-T and DVB-T2) or mobile (DVB-H) access. This means, for example, that a mobile architecture would seamlessly integrate into the broadcasting architecture.

Table 5: Status of Digital Terrestrial Television Systems Globally

	DVB-T	DVB-T2	DVB-T or DVB-T2 Countries	ATSC	ISDB-T	DMB-T/H	UNDECIDED
Total Number of Countries which have Adopted/Deployed	121	50	143	8	11	3	46

It is important that the government does not approach the decision of a standard selection from a technological substitution perspective or only from an internal perspective but from a regional strategic perspective. As Jamaica immerses itself in the digital age, its regional strategy should be to develop content which can be exported regionally. This is a necessary and natural step as local viewers have indicated a demand for new local content and there is also regional demand for Jamaican content.

Another important approach by the government should be to encourage regional harmonization of a standard, even if DSO dates by country are different. Many English-speaking Caribbean countries have not yet decided on a standard and it is recommended that Jamaica leads the region in the harmonization thrust, first co-opting Trinidad and Tobago; the other countries should then follow suit in having the region operate as a bloc. All other regions have effectively used this strategy to enable ubiquitous service

40

Angulo, Calzaba and Estruch, (2011). Selection of Standards for Digital Television: The Battle for Latin America. *Telecommunications Policy, 35*,773 –787.

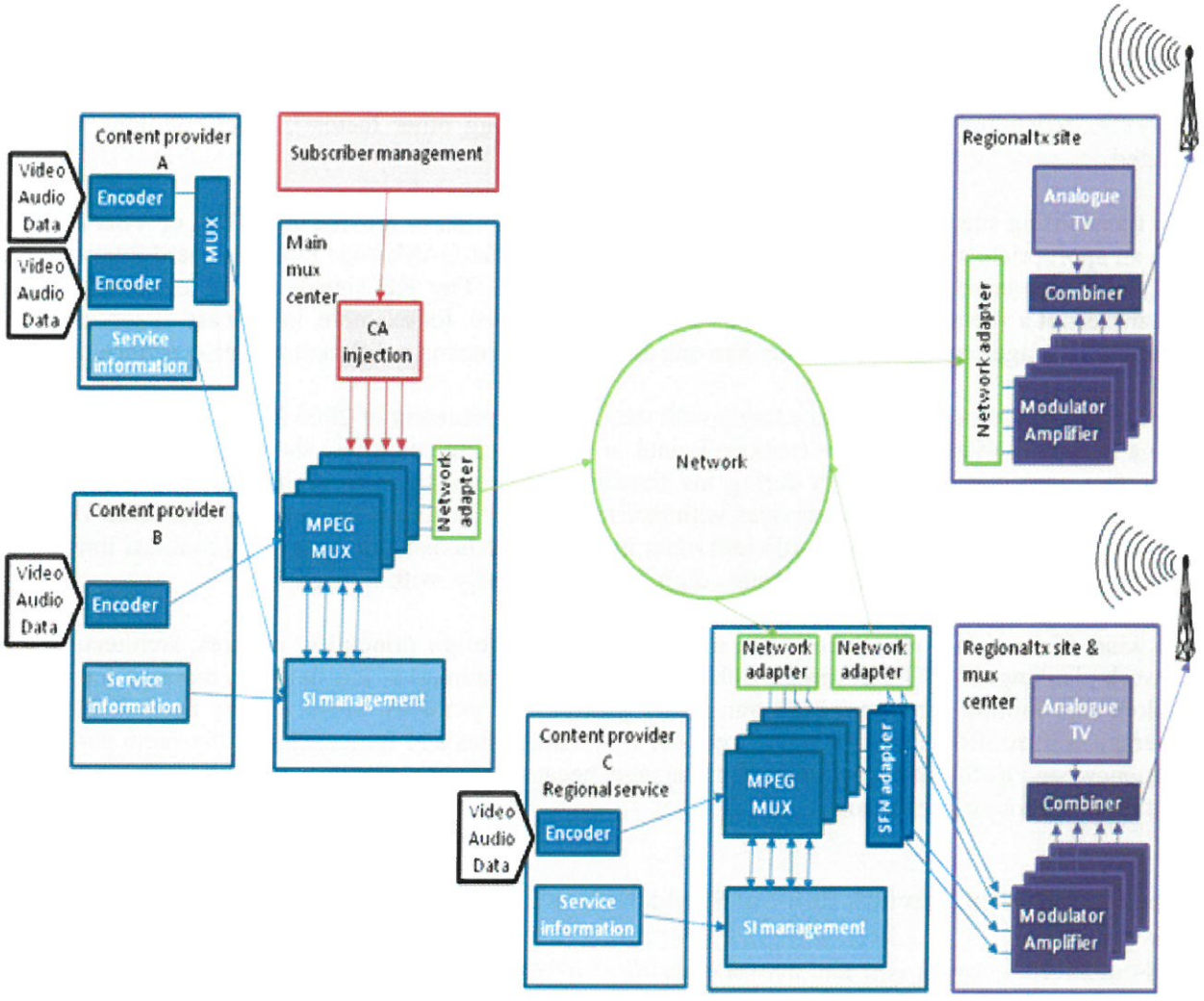
Section 3: Design Principles and Network Architecture

Overview

Development of a broadcast infrastructure with new technologies is a challenging but complex matter. It is essential that technical staff understands not only the main principles regarding network architecture and network planning, but also the impact of technical choices on the business plan and regulations.

A DTTB network consists basically of one or more head ends, a distribution network and transmitter sites. A block diagram of a typical DTTB network is shown in Figure 5 below.

Figure 5: Block Diagram of a Typical DTTB Network[43]



[43] http://www.itu.int/ITU-D/tech/digital_broadcasting/project-dbasiapacific/Guidelines_draft.pdf.

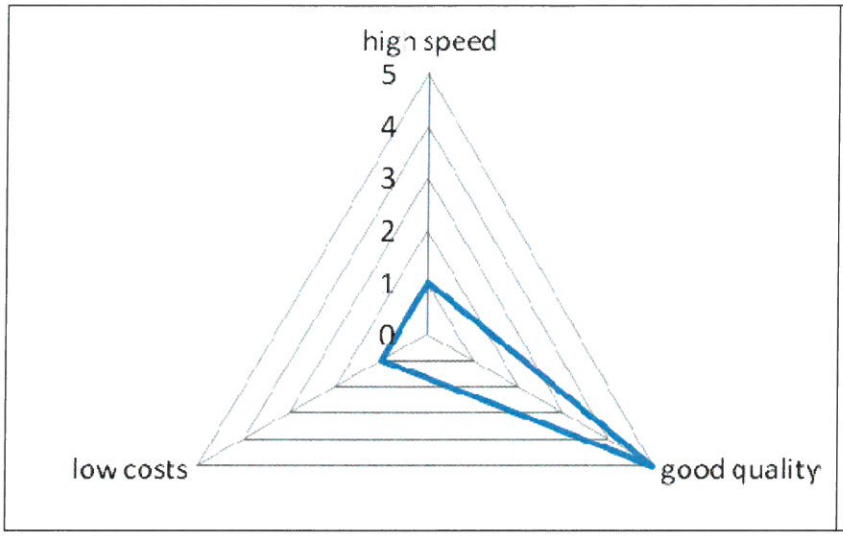
Many factors could be relevant in the trade off between roll-out speed, costs and network quality depending on local circumstances. Some of these factors are indicated in Table 6.

The balance in this trade off could be different for various roll-out phases and various areas, such as in main population centres and rural areas. Examples of three typical cases are shown in Table 7. The interrelations among roll-out speed, network cost and network quality are illustrated in graphical presentations on a subjectively valued five-point scale.

Experience in Europe has shown that good coverage is of major importance. In areas where coverage is marginal, service take up is low and competitive offers (like IPTV, cable TV or satellite TV) obtain an advantage.

Table 6: Elements in Trade off among Roll-out Speed, Cost and Network Quality

Network Element	Impact	Generally Positive (Y), Negative (N) or more or less Neutral (O) Contribution		
		High Roll-out Speed	Low Network Cost	High Network Quality
Use of existing sites	Sites available at limited costs, possibly restrictions to new services	Y	Y	O/N
Use of additional new sites	Extra costs, acquisition time	N	N	Y
Roof top reception	Relative low powers	O	Y	N
Portable reception	Relative high powers and SFN	O	N	Y
Regional/local services	Extra multiplexer(s)	O/N	N	Y
Sufficient human resources	If not, external staff for project planning, supervision and installation	Y	N	O
Reserve equipment	Extra costs, less service interruptions	O	N	Y
Fill-in transmitters	Extra cost, better coverage	N	N	Y
High coverage probability	Relative high power, better coverage	O	N	Y
Temporal transmitting facilities during transition	Better coverage	N	N	Y
Frequency use in accordance with GE06	No time consuming international negotiations needed	Y	N	O/Y



Good indoor and mobile reception in and around main population centres, with new sites to obtain better coverage in an SFN.

Site acquisition takes a long time and slow network roll out is acceptable.

The optimal balance in the trade off between network roll-out speed, network cost and network quality depends to a great extent on the local situation. Network elements contributing to the trade- off are summarized in Table 8.

In making the trade off the following points need to be taken into consideration:

- Network quality is of major importance. If network quality is poor at the start of DTTB introduction, service take up will be low and it may take a long time before potential consumers have confidence in the service.
- Communicating with the public during the roll-out phases of the project and with areas that have good quality reception (the more precise, the better) is essential. Additionally, help and advice on purchasing and installing receiving equipment is very important.

Table 8: Network Elements Contributing to Trade-off between Network Roll-out Speed, Network Cost and Network Quality

High Roll-out Speed	Low Network Cost	High Network Quality
• Use of existing sites • Sufficient human resources • Frequency use in accordance with GE06	• Use of existing sites • Roof top reception	• Use of additional new sites • Portable reception • Regional/local services • Reserve equipment • Fill-in transmitters • High coverage probability • Temporary transmitting facilities during transition

Recommendations

Having reviewed the local Jamaican situation with due consideration given to the recommendations and guidelines for implementation provided by the ITU (2012), and in particular, the Geneva Agreement of 2006 (GE06), the following are being recommended for implementation in Jamaica:

5. Required digital switchover approach: Phase 1 — Kingston Metropolitan Area (KMA), Mandeville and Montego Bay. Phase 2 — other areas with three-month simulcast.

    a. DSO for 2015 is realizable with urban centres with the deployment of seven transmitters.
    b. Urban centres are less dependent on FTA broadcast.
    c. Broadcasters will fine-tune coverage during simulcast period(s).
    d. Viewers will be prepared and take service at ASO in 2016.

6. Required site location: Use of existing towers operated by FTA TV broadcasters
    a. Enable speedy roll out of DTTB network.
    b. Avoid having to seek local permits for tower and shelter construction.
    c. Avoid new environmental concerns with tower construction.
    d. Reduce cost of implementation.

7. DTTB in Band 470–698 MHz (UHF Band)
    a. Broadcast equipment is readily available in the UHF Band from major commercial trading partners (USA and Europe).
    b. No issue with spectrum or broadcast interference during period of transition since VHF is currently the primary terrestrial television broadcast frequency used in Jamaica.
    c. Opportunity and flexibility exist now to assign and allocate spectrum in the best interest consistent with the planned growth and development of the information and communication industry.

8. Projected Cost

    a. Projected cost for studio, multiplex and transmission is included in Appendix J. The implementation cost differential for DVB-T2 5SD channel configuration versus a similar ATSC 5SD configuration is US$4,713,400.

chain.[44]This will eliminate the need for individual TV transmitters for each TV station. This extra function is also referred to as managing the functional bandwidth of the multiplex, i.e. assigning access and available capacity to each service. See Figure 6 for more information about the digital value chain.

Figure 6: Function of Players in the Digital Value Chain[45]

With the extra function of a multiplex operator the ITU Guidelines has indicated that there are two basic licensing models from which all DTTB assignment models are derived.

Model A: The spectrum rights are assigned to the multiplex operator and this entity *can* decide the allocation of the available capacity to the various services. In this model the frequency licence holder is allowed to use the defined spectrum and *can* decide the loading of the multiplex(es), for example, which broadcasters can get access to the platform. The function of multiplex operator and service provider can be aggregated into one entity/organization. In turn, this organization can outsource the technical operations to a specialized content distributor (that is, a broadcast network operator). In this model, it can still be required for the individual broadcaster or service provider to get a general broadcast authorization (for example, by a media authority) for broadcasting television content (very often not defined for a specific platform). This model was applied in countries like the Netherlands (for DTTB and MTV), Belgium (for DTTB and MTV) and the UK (for DTTB and MTV).

***Model B*:** The spectrum rights are assigned to the content distributor and this entity *cannot* decide the allocation of the available capacity. In this model, the frequency licence holder is *only* allowed to use the defined spectrum. The regulator decides the loading of the multiplexes by assigning broadcast licences/rights for the DTTB/MTV platform to individual broadcasters and/or service providers (bundling the various broadcast channels into one or several packages, in a separate assignment procedure (very often a public tender/beauty parade). The regulator is the actual multiplex operator, or in other words the functional bandwidth manager. The service provider can be a separate entity from the content distributor

[44] ITU Guidelines, 30.
[45] ITU Guidelines, 30.

We consider this proposal to be a combination of (a) and (b) above and therefore it belongs more in the category of Model A than Model B. The features of the models that were adopted in the UK and the Netherlands appear to be alignment with these provisions. However, the ITU Cambodian Road Map assigns cases where there is a common multiplex operator to the category of Model B.

2. Competition Rules and Objectives: The regulator would like to see the introduction of a new competing platform next to a dominant (for example, satellite or cable) platform. This would argue for a licensing framework in which either

a. the spectrum rights are assigned to an independent multiplex operator and/or service provider (by excluding market parties which already offer television and/or telecommunication service in the end market) and with enough capacity to provide a competitive offering, by aggregating several multiplexes (variant of model A), orb. the broadcast rights and obligations for the DTTB platform are relaxed as compared to the dominant platform. For example, the DTTB service provider is exempt from 'must carry' or 'price cap' rules (variant of model A).

We believe Option 2 (b) is not applicable because the BCJ will not exempt "the DTTB service provider from 'must carry' or 'price cap' rules." Price cap rules in this case means that the conditional access capability of DTTB will not be used to introduce anything but zero charge for FTA broadcasts. Option 2 (a) is only partially applicable if the BCJ has the objective to support a strong DTTB to provide a competitive counter to the dominant cable platform. This indicates that Model A would therefore be relevant.

3. Market Structure and Environmental Objectives: In order to avoid duplication of infrastructure, the regulator can decide to structure the licensing framework in which either

a. the broadcast rights (for distributing television content on the DTTB or MTV platform) and frequency rights are awarded to separate entities. By assigning only one license for the frequency and operating rights, the regulator ensures that only one network will be rolled out (variant of Model B), or

b. the operating rights are put into operation by laying down site and, possibly, antenna sharing obligations. Such an arrangement only 'loosely' avoids infrastructure duplication as, in most cases, it creates only a possibility and not an obligation to share infrastructure (in a variant of model A).

Similar to Option 3 (a), we propose to award broadcast rights and spectrum frequency rights to separate entities in Jamaica; and in pursuit of the lowest cost infrastructure objective we seek to avoid duplication of infrastructure. However, we do not propose that only one license for multiplexes is granted. Instead, we propose to consolidate the transmission infrastructure of existing broadcasters into a single multiplex operator but allow for additional multiplexes to enter the market on a competitive basis according to market factors and the limitation of the finite spectrum resources. This would argue *against* adopting model B.

In the case of Option 3 (b), the new amendment to the Telecommunications Act removes the looseness from the infrastructure sharing obligation and therefore strengthens the arguments for choosing Model A.

4. Media Rules and Objectives: Several objectives are possible. Firstly, the regulator could strive to maintain a 'level playing field' in a defined television market (this may run across the different broadcast platforms, including cable, satellite and terrestrial platforms) and ensure that the same rules are applied to

Two DTV options are shown in Table 11. In the case of model Jamaica_A1, spectrum rights have been assigned to the single entity that runs the multiplex and distributes content using the operating rights for physical facilities. The existing broadcasters in the Jamaican market would then carry out the role of content aggregators and be dynamically assigned capacity on the multiplex for distributing their content to the public. It is also possible in this option for the multiplex operator to only manage the multiplex by assigning capacity but the ownership (operating rights) of the transmission towers, antenna, buildings, etc. rest with a separate content distributor.

In the Jamaica_A2 model, the multiplex operator and content distributor roles can be separate or combined in on entity. If they are separate, then the service provider role can be assigned either to the multiplex operator or the content distributor or it can be free standing. The service provider role is assigned spectrum rights because billing and marketing functions can be carried out via sub-channel capacity allocation on the multiplex. The roles of content creator and content aggregator are the same as in model Jamaica_A1.

In either of the cases above, competitive entry can be protected by excluding market entities which already have a dominant position in offering television and/or telecommunication service in the end market (perhaps on a separate platform, such as cable) and with enough capacity to pose a competitive threat. Based on our stated policy objective, we are recommending option Jamaica_A1.

Public Service Broadcasting

The requirements for Public Service Broadcasting (PSB) are specified in the Media or Broadcast Acts. PSB service can be organized in different ways, depending on whether the PSB is partially or fully funded. In practice two basic forms can be found, which can change or be combined over time:

1. A PSB entity is established by government, with defined PSB services, fully or partially funded (PBCJ);
2. Commercial/private broadcasters that are fully funded by commercial revenues that are either advertisement based and/or subscription based, and which have a PSB obligation assigned when the broadcast rights are granted. The PSB obligation may or may not be funded by the government.

In reviewing the DTTB cases of PSB implementation internationally, we have concluded that cases where a separate multiplex or multiplexes are assigned to PSB at DSO are not relevant to Jamaica at this time. The licensing of PSB on the DTTB and MTV services platforms would therefore take on one or both of the following forms:

a) The PSB channels are free-to-air on the DTTB platform of commercial multiplex (es) with or without the application of a conditional access system (such as pay-per-view, video on demand, etc).
b) For commercial content aggregators such as individual commercial broadcasters on the DTTB platform, no additional PSB or any other broadcast obligations should be levied above those for the existing analogue broadcast licence.

The first option would apply to the Public Broadcasting Corporation of Jamaica (PBCJ) which has been established as a legal entity but is not currently active in the broadcasting landscape. However, its role as specified in the relevant Act must be provided for in the DTTB model that is adopted. For example, this can be done by assigning a share of the commercial multiplex capacity to the PBCJ channels on a cost

a) If the regulator would like to exclude possible applicants, for example, due to the risk that they may abuse their market power, prepare these exclusions of possible applicants thoroughly as these rules can be legally contested. The qualification rules should be published proactively.
b) Stipulate accumulation rules in cases where more than one multiplex license can be applied for in the assignment procedure. Without accumulation rules, there is risk of 'deep pockets' acquiring all available licenses which can limit the quality and/or diversity of the service offerings.
c) There should be publication of provisions for the possibility of future DTTB assignments of spectrum, in stages, to additional multiplexes, when the first DTTB assignment procedure is announced. This will give applicants some useful knowledge of their competitive environment.

The SMA and BCJ regulators should strive to achieve spectrum and media objectives by *comparing* service offerings from different applicants so as to select the 'best' service from those who satisfy the application criteria. Comparison of offerings is necessary because the regulators need to follow policy direction and may not be familiar with what is commercially possible.

Table 12: Attributes for Digital TV Packages

Cost Level	Channel Level	Service Quality	Additional Features
• **$900**	• 10 Channels	• High sound quality	• Video on demand
• **$1800**	• 20 Channels	• Standard sound quality	• Simultaneous viewing and recording
• **$2700**	• 30 channels	• High Definition Video quality	• Social Networking
• **$3600**		• Standard Definition Video quality	• Closed Captioning
			• Internet and • Email on Screen

Based on the number of attributes and the attribute levels, the total possible number of stimuli (digital TV package) is calculated as 4 *3 *4 *5 = 240. However, the total number of stimuli was deemed too large for respondent evaluation; a fractional factorial design was therefore created with 25 stimuli (see Table 28 in Appendix C). To create the fractional factorial design, an initial orthogonal design was generated using SPSS. The orthogonal design represents a main effects design that permits the statistical testing of several factors without testing every combination of the factor levels. Each stimuli generated in Table 28 (Appendix C) represents a potential digital TV package, bearing trade-off features. Each stimuli was rated based on participants' willingness to trade off certain value-added characteristics while accepting others. This process is known as the conjoint task. During the conjoint task a participant provides a score that represents the rating of each stimulus between 0 and 10 ranging from lowest to highest; this range was selected based on recommendations by Hair et al. (2006). This score is known as the utility.

The potential drawback of conjoint analysis, identified by Hair et al. (2006), that participants may become tired during the evaluation of conjoint task, was observed in this study. To counteract this effect, participants were given an explanation of the conjoint task before hand, with instructions indicating that although the stimulus (Digital TV packages) appeared to be repetitive they were all different and should be examined carefully. Following collection, the data was entered into SPSS and analysed.

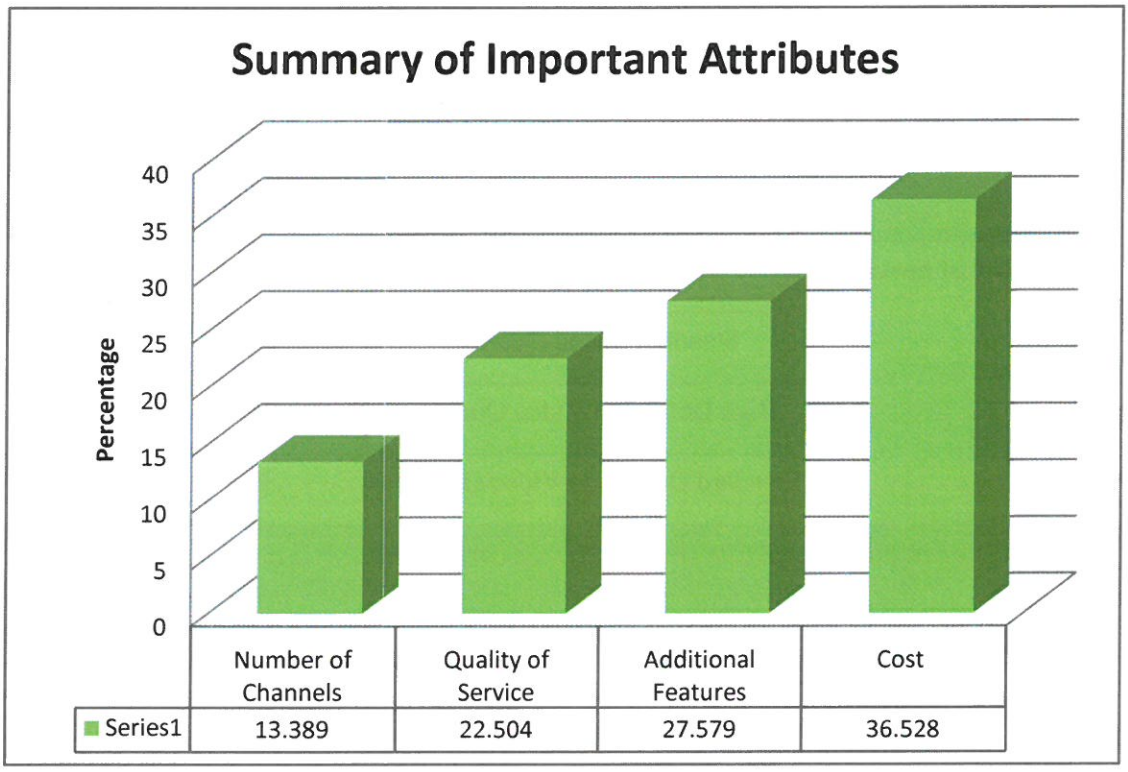
Findings

Below are the findings based on 1) desk research which highlights viewing trends in the local market for FTA TV and 2) primary research which highlights DTTV service propositions and demand drivers, simulated market preferences and receiver availability.

Trends

Data from the MRSL Survey (2009) indicate a stable viewing pattern for FTA TV, with a peak between 7 p.m. and 8:30 p.m. across all geographic regions within the KMA (Kingston, St Andrew, Portmore and Spanish Town), accounting for the lion's share of the audience. The next highest viewing period is 9 p.m.

Figure 7: Summary of Important Attributes



Further inspection of the results revealed that cost has a negative impact on the desirability of a package (see Table 28 in Appendix C). The results suggest that a lower cost was most desired by consumers. It was noted that a cost of $900 associated with a package was considered more desirable with a path-worth value of -1.111 in comparison to a package with a cost of $3600 which has a path-worth value of -4.444. An incremental increase in cost results in a corresponding decrease in desirability.

An examination of additional features offered within a package indicated that social networking as an additive value added service was the most desirable with a path-worth value of .583. In addition Internet and email services were a close second in desirability by consumers with a path-worth value of .561. The positive path-worth values for both social networking and Internet services suggest that an inclusion of these features in a digital TV package would increase consumers' desirability of the package. In contrast simultaneous viewing and recording, video on demand and close captioning all had negative path-worth which suggest a level of undesirability of these features as a part of a digital TV package by consumers. Most importantly simultaneous viewing and recording was the most undesirable with a path-worth value of .673 (see Table 28 in Appendix C).

As it relates to the number of channels included in a package, the results point to the possibility that having a small number of channels could result in negative consequences for the uptake of a package. The results pointed out that ten channels was the least desirable package with a path-worth value of -.290. On the other hand, 20 channels was the most desirable package with a path-worth value of .153 (see Table 14).

Simulated Market Preference

A choice simulation analysis was conducted to assess potential market share for proposed digital TV packages. The utility scored for each package was calculated using the estimated path-worth values in the conjoint analysis. The results indicate that Package 3 —20 channels, standard definition video quality and social networking at a cost of $900 — had the highest utility score of 6.946 when compared to three other packages (see Table 15). Most importantly, based on the maximum utility value, 75.4% of the respondents would have preferred Package 2 in comparison to the other packages (see Table 16). This preference for Package 2 is also supported by the Bradley-Terry-Luce and the logit values. It should be noted that despite the fact that Package 1 had the second highest utility score based on the maximum utility and the logit values, it was considered the third most preferred service among the respondents. The least preferred was Package 3 which had the smallest values for the maximum utility, Bradley-Terry-Luce and the logit values (see Table 16).

A detail analysis of the simulation results suggests that cost is indeed an important factor in the selection of digital TV packages. It was noteworthy that as the cost increased the preference of the package among respondents decreased significantly. This is consistent with findings from Hylton and Virtue (2012).[50] Interestingly, the two packages (Package 1 and Package 4) that were priced the same at $1,800 had relatively similar preference levels with values 13.9% and 14% for their logit scores and 25.5% and 23.9% for the Bradley-Terry-Luce respectively (see Table 16).

Table 15: Preference Scores of Simulations

Packages	Features	Score
Package 1	$1800, 20 channels, standard definition video quality, video on demand	5.003
Package 2	$900, 20 channels, standard definition video quality, social networking	6.946
Package 3	$3600, 30 channels, high definition video quality, video on demand	2.893
Package 4	$1800, 10 channels, standard sound quality, Internet and email service	4.646

[50] Feasibility of Digital Switchover in Jamaica: The Consumer Perspective .

Consumer Proposition

Based on the above analysis, 'the must have' service proposition includes additional channels above the current threshold provided by FTA broadcasters, and better reception/video quality. Based on the results the consumer proposition that would best generate voluntary take up of DTTV would be a consumer strategy based on services such as extra channels and interactive services which would require a STB working with existing analogue TV sets. A customer proposition which would require a new TV set is not desirable at this time.

Receiver Availability

Checks with the two main suppliers indicate that they primarily supply ATSC standard TV sets and that the total number of set with digital tuners (DTV) was less than 15,000 in total since 2009. At the time of submitting this report the local suppliers had not yet received responses from all their foreign suppliers; however, the ones that did respond indicated that it was possible to source televisions with DVB-T and DVB-T2 standards, with the former being more readily available. Should Jamaica decide to go with the DVB-T2 standard, DTVs that use the USA, ATSC standard would require a DVB-T2 STB. For best quality, HDMI video connectors between the STB and the TV are recommended; however, S-video connections can also be used.

Selecting the DTTV Uptake Curve

The main purpose of this section is to determine how quickly the population is likely to switch from analogue to digital. This will have implications for first, the broadcasters as they would have made large upfront capital investments; and second the government and policymakers as the take-up rate would be indicative of how many households would be in danger of being directly deprived of TV service at ASO.

Methodology

The ITU recommends that one way to estimate future household DTTV penetration is to fit a classical 'S-shaped' cumulative diffusion curve or logistic growth model, this approach would allow us to produce reliable estimates using econometric analysis. This would require survey data on consumers' intention to switch to DTTV. Collecting this data was beyond the scope of this research; hence, we examined 19 countries from Europe, Africa and Asia which started DSO in 2008 or later to determine a pattern in the DSO period (see table 17). These countries have varying socio-economic, cultural, geographic characteristics and TV market structures. The period of DSO ranged from one year in the case of Ireland to six years for the Ukraine. For countries in Africa , the range was between two and three years while for Asian countries the range was between three and five years. In the absence of any additional data and subject to further discussions with broadcasters, we are recommending a four-year transition period from 2013 to 2017 for Jamaica which is consistent with the data in Table 17.

Findings

Based on the methodology outlined above, Table 18 depicts the digital uptake for the forecast period 2013–2017. Consumer uptake of DTTV hinges on the balancing of related costs and benefits. Uptake is likely to occur only if the consumer values the additional benefits offered by digital services at least commensurately with the cost of acquiring the necessary reception equipment (STB converter or other viewing device with an inbuilt digital receiver).

Table 18: Digital Terrestrial Television Take-up Forecast

Years	% of Jamaican Households	Actual Cumulative Take up	Annual Take up
2013/14	28	99,130	99,130
2014/15	73	194,720	95,590
2015/16	84	283,230	88,509
2016/17	91	322,174	38,944

We must again stress that the results should only be treated as rough indicators of likely future projections.

Forecasting the TV Advertising Market

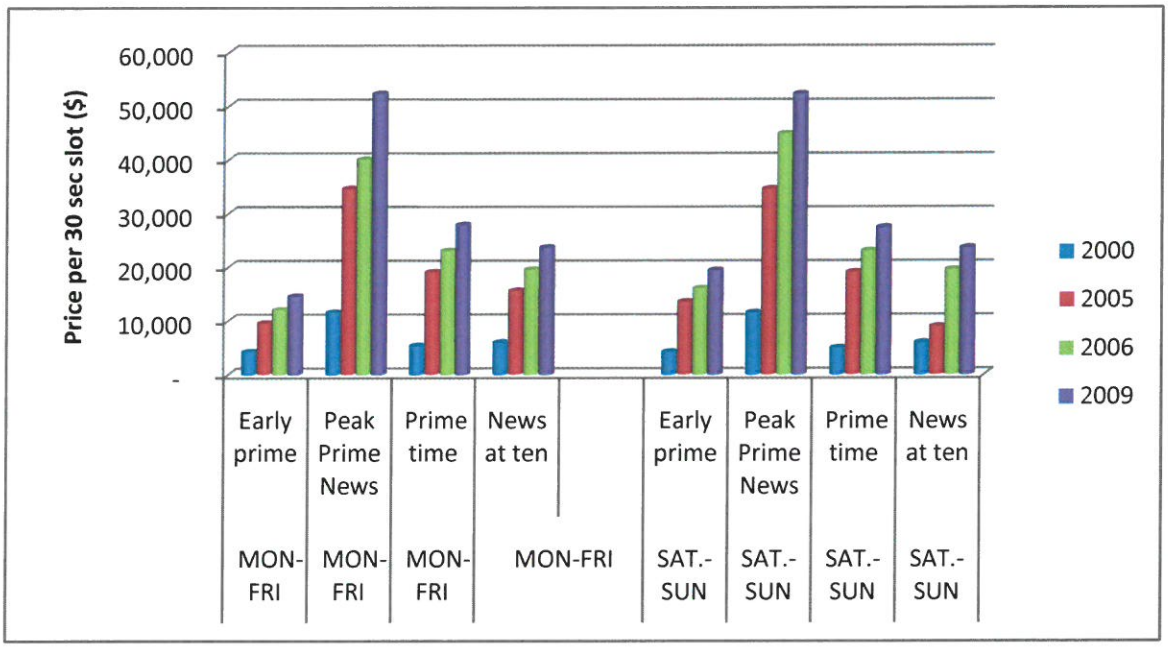
The objective of this section is to model the traditional TV advertisement market which is characterized by the use of analogue TV sets. We will then develop a forecast for the advertising the market with the introduction of digital TV. The development of a robust model will depend on a number of factors that include a clear depiction of the market for advertisement in Jamaica and the determinants of TV advertisement revenue in Jamaica.

The TV Advertisement Market in Jamaica

On the supply side, the TV advertisement market is dominated primarily by two major players, TVJ and CVM Television; other players include Love TV, Hype TV and RE-TV. TVJ is currently the number one ranked station in the island with market share of 57%. TVJ Sports, a subsidiary of TVJ caters to approximately 0.1% of the market. CVM follows with approximately 37% of the market. CVM TV provides islandwide coverage with transmitters in all fourteen parishes. The entity also operates a cable channel CVM Plus with market share of approximately .1%. Love TV and RE-TV take approximately 3% of the market.

On the demand side, the market for TV advertisement is affected by a relatively weak economy which is manifested in the form of the gross domestic product (GDP) that grows at a weak average annual 1%. There are 50,000 registered businesses that offer goods and services on the island. Interestingly, the economy is dominated by relatively strong consumer durables and services subsector in which individuals have a high marginal propensity to consume. Therefore, the advertisement sector relies heavily on the economy's GDP.

Figure 10: TVJ's Prices for 30–Seconds Slots, 2000, 2005, 2006, 2009



Figures 9 and 10 indicate that the more dominant TV station, TVJ, enjoys the higher prices for 30- second advertisement slots. Where CVM increased its prices, it resulted in losses in demand or market share.

The Number of Programmes with Large Audiences (Pp): When a programme enlists large numbers of viewers, prime time is created and hence the respective station is motivated to increase the price for 30-second advertisement slots around the time that programme is aired. The greater the number of these programmes, the greater the market share and the greater the revenue associated with advertisements. However, the potential for revenue that can be derived by increasing market share or audience exposure is limited. On average the number of potential viewers of FTA TV is an approximately 1.4M persons which is approximately 20% more than the number of persons who watch TV at peak time.

The size of the potential audience for FTA TV should not be overstated as a means of generating significantly more advertisement revenue. The most significant driver of TV advertisement revenue is the size of the economy. To significantly increase revenue from the potential audience, the economy must grow substantially.

The Price of Substitutes (Ps). Substitutes to television advertisement includes advertisement on radio, cable channels and the Internet. Two important questions then are: how has the increase in cable penetration impacted the demand for TV advertisement and how will Internet penetration and internet marketing impact the demand for TV advertisement?

The cable subsector has seen an average annual growth rate of approximately 4%. Similarly, the average annual growth rate in TV has remained relatively constant with the same 4% growth rate as cable. Interestingly, the growth in gross value added revenue from TV and radio advertising sector has remained relatively flat at 1%.

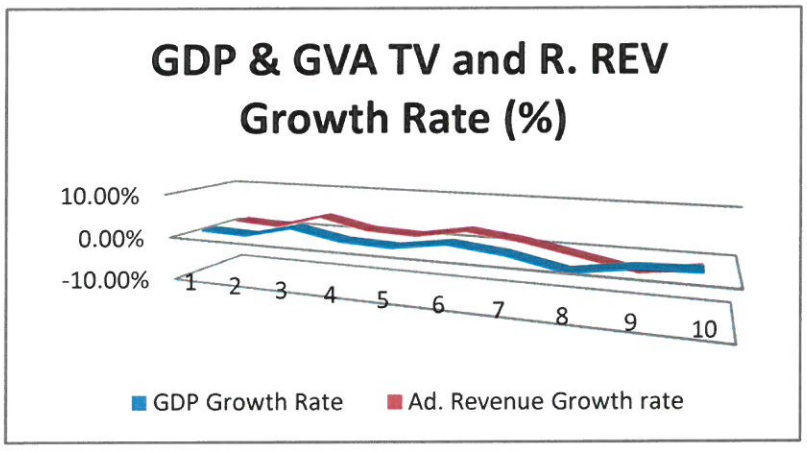
Audience Fragmentation (A_F)

Audience Fragmentation refers to the number of competing media in a given entity that competes for a share of the audience. Currently TVJ and its subsidiary occupy 57.1% and 0.1%. Meanwhile CVM and its subsidiary occupy 37% and 0.1% respectively. While TVJ's subsidiary has grown steadily over the last ten years, the smaller arm, TVJ Sport, has seen very little growth. On the other hand growth in the audience of CVM's subsidiary, CVM Plus has declined over the same period. The impact of the two subsidiaries on their parent companies is inconclusive.

Growth in Consumer Spending (C_s)

Consumer spending is a significant determinant of advertisement revenue. The growth in advertising revenue and the growth in consumer spending are procyclical. To understand the potential for advertisement revenue, the growth in national income must be taken into consideration as greater income levels imply greater spending levels. Growth in the Jamaican economy has remained relatively flat over the last decade. The annual growth rate of GDP for the period is the same 1% as the growth in gross value added revenue from the TV and radio industry. The growth in TV and radio advertising revenue for the same period is approximately 5%. The growth in revenue in the television industry for the period in review was approximately 9%, for CVM it was approximately 6% (see Figure 13).

Figure 13: Growth Rates in Real GDP versus Growth in Gross Value Added TV and Radio Revenue, 2000–2009



The Rate of TV Penetration (Cp): High TV penetration rates translate into larger viewer numbers which then translate into higher audience exposure for businesses. TV penetration rates have remained relatively flat in Jamaica over the last decades. In the year 2000 the number of TV sets in the country reached 904,000 and 1.3M in 2009. The current penetration rates (87.4%) imply that the additional benefits for new TV sets will be relatively small in increasing exposure audience or advertisement revenues (see Figure 14).

The model to be estimated is as follows:

Industry Revenue Forecast is given as: $A_r = f(P_a, A_o, P_p, P_s, A_F, C_s, C_p, M_s, D_r)$
In equation form it is now $\text{Log } A_r = \alpha - \beta_1 \log P_a + \beta_2 \log A_o + \beta_3 \log P_p - \beta_4 \log P_s + \beta_5 \log A_F + \beta_6 \log C_s + \beta_7 \log C_{p,} + \beta_8 \log M_s + \beta_9 \text{Log } D_r + \mu$

The coefficient values β_1 to β_9 are the respective elasticity coefficients of the variables, they measure unit changes in the dependent variables per unit change in the independent variables. The unavailability of time series data on most of the variables in the model does not allow for the model above to be estimated. In addition, the limited number of data points for those variables for which data was found severely limits the robustness of the estimated models. However the estimated models exhibited other good statistical qualities. See appendices for these statistics. The model that is estimated is as follows $A_r = f(\text{GDP}, C_p)$

Model 1: TV Industry Revenue Forecast Model

This model uses financial data provided by the BCJ for CVM television to estimate the total level of TV industry revenue. The methodology involves the use of market shares to recover industry revenues by dividing CVM's revenue by its respective market shares then multiplying the result by the total industry share. This methodology became necessary because no TV industry revenue data was available. The following are the other major assumptions of this model:

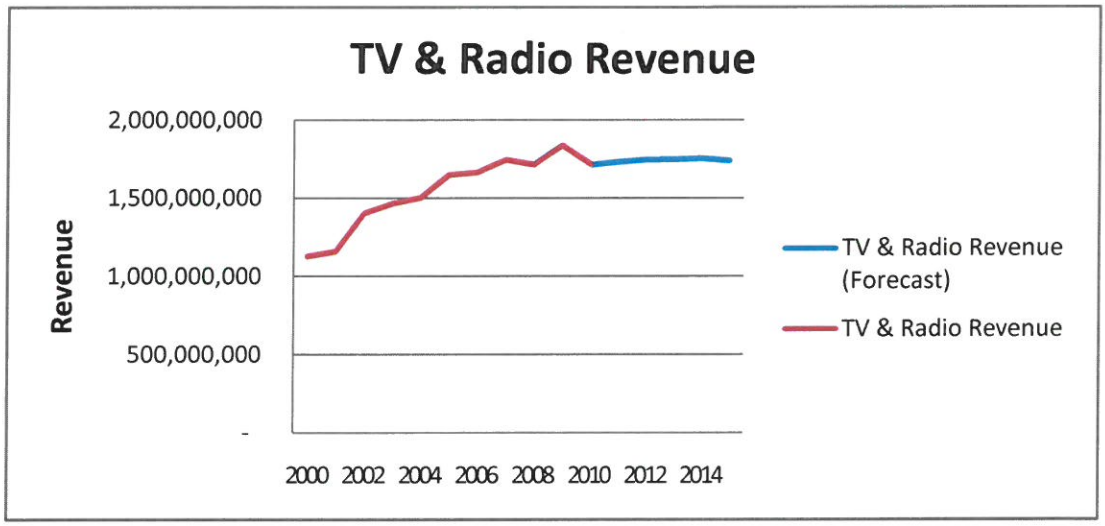
1. The price per 30-second advertisement slot is directly proportional to audience exposure.
2. Market share and audience exposure grow proportionally.
3. The number of television sets and audience exposure are directly related.
4. Market share and total advertisement revenue grow proportionally.
5. Gross domestic product and consumer spending are directly related.

Secondly, the model is estimated using EVIEWS. Several variants of the model were tested using various combinations of the major determinants in order to find the most parsimonious model. The statistical test of significance ruled out all other besides the one below. The following is the estimated model: $\ln(\text{TVREV}) = -24.992 - 1.734*\ln(\text{GDP})_{(-4)} + 11.68*\ln(\text{GDP})_{(-1)}$.

Thirdly, a four year moving average for GDP was used to forecast the level of GDP up to 2015.

Finally, the estimated model was then used to run the forecast for TV revenue (TVREV) for the period 2010–2015.

Figure 16: Actual and Forecast Revenue for TV and Radio



The model suggests that growth in revenue for the TV and radio industry for the period 2010–2015 is likely to be relatively flat. This growth is again in line with growth in the national economy. The switch from analogue TV to digital is not expected to impact industry revenue significantly given the process of phasing in DSO (see Figure 16).

Model 3: Gross Value Added TV and Radio Revenue

This model uses financial data provided by the BCJ for the radio and TV industry to develop a forecast model using EVIEWS. The following are the major assumptions of the model:

1. The price per 30-second advertisement slot is directly proportional to audience exposure.
2. Market share and audience exposure grow proportionally.
3. The number of television sets and audience exposure are directly related.
4. Market share and total advertisement revenue grow proportionally.
5. Gross domestic product and consumer spending are directly related.

The following is the estimated model TVREV = 8.56 + 1.16*ln (GDP) + 1.734*$\ln(GDP)_{(-1)}$ - 1.36 $\ln(GDP)_{(-4)}$ - 0.117ln(TV). Secondly, a four year moving average for GDP was used to forecast the level of GDP up to 2015. Finally, the estimated model was then used to run the forecast for TVREV for the period 2010–2015.

The model shows that, using the predicted take up rate of 28% at the end of year one, 73% at the end of year two, 84% at the end of year three and a final take up rate of 91% that for every 1% that the expected number of DTTVs falls below the respective target, total advertisement revenue falls by 0.53%.

Major Findings

- The market for advertisements in Jamaica is highly competitive. The dominant players are TVJ and CVM, these players compete vigorously for market share and hence premium advertisement prices per 30-second slot.
- The more dominant broadcaster, TVJ, enjoys the higher market share as of 2009 (57%); a wider audience (an average of 900,000 viewers during peak time), and therefore, higher advertisement prices per 30-second slot ($52,192.00). The difference in the premium price between CVM and TV for similar advertisement slots at the end of 2009 was $2,692.00
- Market share held by subsidiary stations has remained relatively small; at the end of 2009 the combined market share held was approximately 0.2%.
- Market share held by Love TV and the cable channels (RE TV and Hype TV) was approximately 3% at the end of 2009.
- The most significant determinant of advertisement revenue is GDP. The estimated model predicts that the elasticity value of current and one period lag GDP is 1.4%.
- Sensitivity analysis reveals that at the switch off date, a 1% deviation from the estimated take up rate (91%) will result in a loss of revenue of 0.53%. This 91% take up rate at the switch off date implies a revenue loss of JA$108,777,962 or 6.44% of total revenue.
- Finally, advertisement revenue will not be significantly affected by the switchover because of the proposed simulcast during the period. Moreover, at the switch-off date the expected revenue loss of 6.44% lies just outside of the 5% margin of error.

Conclusion

The analysis suggests that the implementation of the DSO over the period 2013–2015 will have no significant effect on TV advertisement revenue. This is primarily so because of the way in which the switch over will be implemented; up until 2015, broadcasters will be able to broadcast in digital and analogue TV simultaneously and hence there will be no significant loss in audience exposure and no loss in advertisement demand and advertisement revenue. Furthermore, at the switch-off date in 2015, the final take-up rate is 91%, meaning 9% (31,863) of households in Jamaica will be without digital TV. This however, is not significant in assessing revenue loss since currently approximately 94,000 persons are without televisions sets in Jamaica.

initially for DTV (see Section 3: Design Principles and Network Architecture) in the UHF band. The remainder of the UHF spectrum allocated for broadcast television in Region 2, 472–698 MHz could be defined as digital capital. The pricing model for digital capital or digital dividend is the same as they represent the pricing model for spectrum in the UHF band. The discussion henceforth will reference the digital dividend pricing models and the allocation of spectrum based on the digital dividend. Tables 19 below specifies the allocation of spectrum in selected countries.

Table 19: Overview of the Allocation of Sub-bands for Mobile Services in Select Countries[54]

Country	National Situation
Australia	• Analogue TV switch off in 2013 • 694–820 MHz allocated to mobile broadband services • Auction of licences in 2012
Finland	• Analogue TV switch off in 2007 • 790–862 MHz allocated to mobile broadband services • Agreement with Russia on protection of Aeronautical Radionavigation services from mobile services in the band 790–862 MHz in December 2010 • Re-allocation of PMSE services to 700 MHz band
France	• Analogue TV switch off finalized on 30 November 2011 in Metropolitan France and overseas territories • 790–862 MHz allocated to mobile broadband services • Migration of broadcasting and military from 790 to 862 MHz • Auction of licences in December 2011
Germany	• Analogue TV switch off in 2008 • 790–862 MHz allocated to mobile broadband services • Migration of broadcasting from 790 to 862 MHz • Auction of licences in December 2010
India	• Analogue TV switch off in 2015 • 698–806 MHz allocated to mobile broadband services
Japan	• Analogue TV switch off in 2011 • 710–780 MHz allocated to mobile broadband services
Korea	• Analogue TV switch off in 2012 • 698–806 MHz allocated to mobile broadband services • Frequency plan for 698–806 MHz to be developed
Spain	• Analogue TV switch off in 2010 • 790–862 MHz allocated to mobile broadband services • Migration of broadcasting from 790 to 862 MHz • Auction of licences in July 2011
Sweden	• Analogue TV switch off in 2007 • 790–862 MHz allocated to mobile broadband services • Migration of broadcasting from 790 to 862 MHz • Auction of licences in February 2011
UK	• Analogue TV switch off in 2012

[54] Digital dividend: Insights for Spectrum Decision , v90 Geneva, 2012.

Table 20: Variables and Assumptions

VARIABLES	
Number of households	748,326
Number of businesses	50,000
Telephone penetration rates	0.89
Licence rate	0.08
NPV rate	0.1
Price per business customer	8,000
Price per residential customer	4,000
Duration of license (years)	15
Residential customer growth rate	1.14
Residential customer intercept	40,000
Commercial customer growth rate	1.11
Commercial customer intercept	6,599
Number of months	12
Exchange rate	88

Table 20 above gives the parameters of the model. They are developed on the most conservative of estimates. In addition all prices are held in constant 2012 prices. This further demonstrates the conservative nature of these estimates. There are various residential and commercial rates that are available. In determining the price for both residential customers conservative baskets were selected. Both the exchange rate and the prices are held constant which reduces inflationary impacts on the model. The licence fee is calculated as a fixed percentage of gross revenue derived.

However, in conducting the sensitivity analysis the price for the commodities can be varied while holding the exchange rate constant. This would capture increases in real value added from new services. The take up rates for these new services over the 15-year period is also conservative since it is expected that users on other platform are expected to migrate to this new platform.

Table 21 indicates that even with the most conservative estimates of approximately 250,423 residential customers, and approximately 28,455 commercial customers, in the 15-year duration of the licence, the total amount for licence fees is approximately US$96.33M.

Table 22: Computed Indices

Country	USA	FRA	ESP	GER.
Exchange rate US/Euro (2012)	1.223			
Conversion rate	1	0.7	0.48	0.73
Auctioned price per MHz per pop US$	0.980	0.856	0.587	0.893
Converted Prices	0.570	0.559	0.550	0.613
Conversion Indices	0.582	0.653	0.936	0.687
Jamaica's price per MHz US$	**0.57**			

The methodology developed puts the Price per MHz pop to be $0.57. This is much in line with other countries with similar economic infrastructure. There are cost elements that were not taken into consideration in this valuation methodology. These costs may be incurred by the government for the re-farming of these old platforms and for the provision of subsidies to consumers of set-top boxes. To take these costs into consideration a discount of 10–20% could be applied to this estimated price.

Table 23: Estimated Value for Digital Dividend using Price per MHz Pop Method

Sale Price US$	Price Per MHz Multiple	MHz Available	Population
91,112,237.18	0.57	60	2,650,500
82,001,013.46	0.52	60	2,650,500
72,889,789.75	0.46	60	2,650,500

- The introduction of digital television will result in wider island coverage; therefore, some households without television access will benefit from DSO. However, this was excluded from the CBA. This analysis did not attempt to estimate the associated benefits as it would require extensive research to quantify the benefits which are unlikely to substantially affect the outcome of the model.

FTA Broadcasters' Cost and Benefits

The assumptions of the net cost/benefit to existing broadcasters are based on the recommended migration policy. The estimates used in the CBA for this section principally came from experts in the field and were benchmarked with other countries that already went through the implementation process of digital television.

- DSO will have significant implication for broadcasters. They will have to contract the transmission network to a multiplex operator.
- Based on the adoption of DTTV with DVB-T2 and MPEG 4 compression technology, it will cost US$13,430,618 to transition from FTA analogue terrestrial broadcasting to DTTV broadcasting (see Appendix H for details of costing).
- The environmental costs relating to DTTV were not factored in the CBA.
- Saving on analogue transmission and distribution cost is a post migration benefit to broadcasters but we could not determine the savings in this area because the cost to operate analogue transmission for all broadcasters could not be determined because of data limitations.

Economic/Social Cost and Benefits

The government and media regulators will have to play a key role in the transitioning to digital from analogue broadcasting. The benefits and cost that will occur to Jamaica are summarized as follows:

- Public education will play a key role especially in driving the take up of DTTV by switch off. Industry experts estimate that production cost of the DSO campaign at $14,485,000.
- The marketing campaign is estimated to cost $300,000,000, with advertising accounting for the major share of this cost.
- The establishment of a programme management office (PMO) to guide the implementation of the DSO process will cost $55,309,500. This will include office supplies and equipment, staffing, programme cost and other related costs necessary to manage the PMO.
- Internet access through the DTTV platform could increase the broadband penetration by approximately 5% resulting an increase in GDP by JAJA5.7 billion after ASO. This estimation was based on the following:
    - DTT could bridge the digital divide by increasing access to internet services (a total of 24% of the population have access to a computer at home only 15.6% of the 2,200 respondents had access to the Internet at home).[56]
    - DTT will be an alternative to other broadband technologies as most of the broadband technologies available in Jamaica are restricted to Kingston and other high population density areas where it is more economically feasible for them to operate. Therefore, DTT could be used to increase the broad penetration rate as it is expected that DTT will have widest geographic coverage thus reducing the need for significant infrastructure investment.

[56] Caribbean ICT Indicators and Broadband Survey for Jamaica, May 2011. Led by Professor Hopeton Dunn of the Mona School of Business (MSB).

Variation, Consumer Benefits and Cost Estimates

The net cost to DTTV costumers is estimated at $1,838.75 per household for the period; this was based on a take-up rate of 91% by 2016 and a consumer WTP of $900. Table 25 shows the impact on the NPV when we change some of the key assumptions. These values have been calculated by holding other input variables constant at their base values.

Table 25: Sensitivity of NPV to Consumer Input Variables

50% Change in Input	Change in NPV (millions)	% change in NPV	Net Benefit/Cost to DTT subscribers (per household)
Decrease in DTT take up forecast	-$276	-10%	(919.37)
Decrease in the WTP	-$123	-5%	(2,248.25)
Increase in Energy Cost	-$50.6	-2%	(2,007.37)
Convert only Primary TV Set	$328.6	-11%	(744.38)
Subsidy on STB	$348.4	12%	(678.50)

The sensitivity analysis suggests that the viability of the DSO will heavily depend on how the digital dividend is used and the benefits derived from it. The sensitivity analysis also suggests that the success of ASO will depend on the following factors:

- The cost to consumers: The consumer is most sensitive to the cost of STB; a 50% decrease in STB will have a 12% increase in NPV which will translate to a positive change in NVP of JAJA348.4M.
- Broadcaster: Infrastructure cost will have a significant effect on the NPV, a 25% increase will reduce the NPV by $262.8M.
- Use of digital dividend: To a great extent the, positive NPV depends on using DTTV platform to increase broadband penetration. If the broadband penetration should decline by 1% (from 5% to 4%), this will result in a $938M (35%) decline in the NPV. Therefore, the success of the DSO project will depend on the creation of new services that will contribute positively to GDP.
- Change in time horizon: The costs significantly outweigh the benefits for the period leading up to ASO and results in a negative NPV. However, when we extend the CBA model up to 2019 (when the benefits from the 'digital dividend'begin to be realized), the NPV was positively impacted.
- Change in discount rate: The NPV was also positive after the discount rate was increased by 4% (6% to 10%) but the NPV decreased by $482.7M. This shows that even though the NPV remained positive, the NPV is very sensitive to changes in interest rates.

countries mentioned in Figure 18, more recently other countries such as Kenya, Nepal and Sri Lanka have provided tax/duty concessions. In some jurisdictions, the provision of concessions have led to competition law conflicts, with some cases seeming to favour one platform over the other (for example, DTTV over STV).

Unlike STV, FTA TV is a public good, and with the increased coverage of up to 95% of the population with DTTV and the possible additional benefits after ASO including multiple channels, Internet access and MTV. These benefits can help to stimulate economic activity and therefore provide compelling evidence to support FTA.

The government should consider the following to facilitate the rapid uptake of DTTV as the benefits which will be discussed later will accrue after DSO:

- Duty concession on the importation of STB
- Refinancing support to broadcasters and other players in the digital value chain through interest rate reductions via the Development Bank of Jamaica prior to ASO
- Adjustment to the Motion Picture Encouragement Act to include transmission equipment and consumption tax free relief.

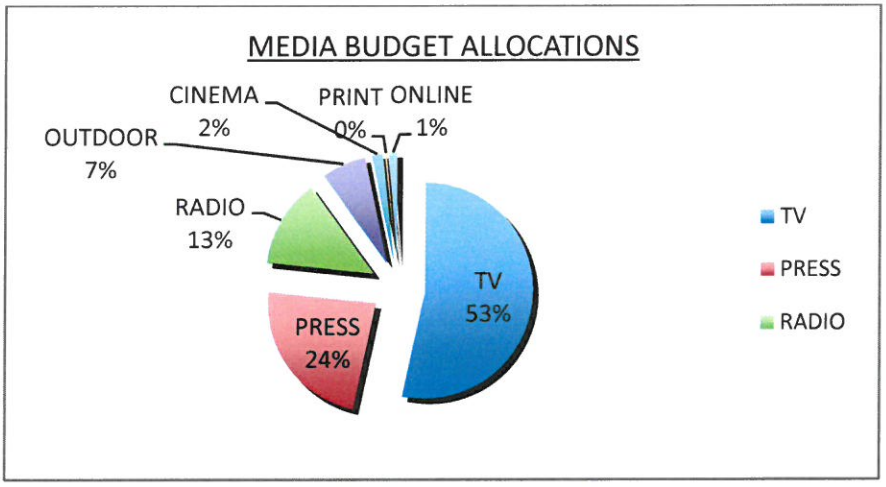
Section 10: ASO Communication Plan

The principle that the majority of customers should have adopted DTTV before ASO takes place must be central to the government's switchover policy. Not only is it politically expedient to avoid depriving people of television signals, but the legitimacy of the government's switchover policy itself depends on the majority of consumers embracing the benefits of DTTV. If a significant minority of consumers does not adopt DTTV, DSO will not be able to take place unless government is willing to either force or pay for persons to get DTTV.[60] Developing a communication strategy to encourage voluntary take up of DTTV will be vital to the success of DSO in Jamaica. It is recommended that a strong media awareness campaign be launched by the government, broadcasters and suppliers to get consumers on board for the migration from analogue to digital. As outlined in the ITU Guidelines, the communication strategy should be based on several successive stages (that is, creating awareness, understanding, influencing attitude etc.). (See ASO Communication Model in Figure 1)

Based on the model, a communication budget was created covering 2012–2017. The total production cost is JAJA14,485,000 (See Figure 21 in Appendix J) and the placement cost is estimated to be $300M over the six-year period. The plan will be targeted to different groups within the population and will apply a mix of communication tools (see media budget allocations below). Among the objectives of the communication strategy is to;

- Limiting the risk of distortion or confusion in the market by communicating based on the principles of impartiality and accountability, responsibility and transparency.
- Selecting appropriate communication tools for each target audience.

Figure 19: Media Budget Allocations



[60] DCMS, October 2004. Persuasion or Compulsion? Consumers and Analogue Switch off.

Appendix A

Table 26: Objectives Outlined in the Request for Proposal (RFP)

OBJECTIVES	ITU GUIDELINES
An economic analysis of the future of the digital TV market in 5, 10 and 15-year spans	3.1
The carrying capacity of the market: - Rate of growth of traditional advertising - Potential for growth in revenues from new services - The level of potential consumer interest in new channels, high definition and/or mobile TV; modelling of new TVs, converters etc. - Take up of the different platforms, based on past trends, comparative analyses of markets that have transitioned and informed projections relative to new digital services, substitutes or additions - Migration costs for customers and service providers - Focus group research to test consumer willingness to pay for new services and/or improved technical quality and results - Analysis of potential impact of ASO - Modelling growth in the satellite and cable markets and realistic expectations of digital terrestrial take up. - Cost of various elements and the model for recovery – market costs - Proposal for grandfathering existing licenses to new digital licences or proposals for other optimal transmission models based on indicated best practices	3.1 3.2 2.15 2.2
A formal CBA for the whole digital switchover process, from launching digital terrestrial through to closing analogue terrestrial	2.15
An estimate of the value of released spectrum	2.1
Cost points and options for funding	2.15
An examination of various consumer propositions which will generate voluntary take up in the market, depending on national and regional/local market factors namely, - a consumer strategy based solely on features, such as HDTV and/or widescreen, which essentially require the purchase of a new TV set (or the equivalent in terms of a new display monitor and STB) and - a consumer strategy based on services, such as extra channels or interactive features which can be based on the purchase of STBs (whether terrestrial, satellite, cable or broadband) working with existing analogue TV sets.	3.2
An examination of issues related to, inter-alia, technology selection, access and usability by persons with disabilities and other vulnerable groups, and environmental considerations.	2.1

- An estimate of the value of released spectrum

Section 2.15 of the Guidelines, Organizational Structures and Entities, addresses, among other things, ASO cost and support, that is, the main categories of ASO associated cost and how government can provide (financial) support.
Mapping section 2.15 to the RFP:

- Cost of various elements and the model for recovery — market costs (inclusive of the cost of natural technology upgrades, sharing the digital dividend and examination of the optimal number of providers vs. free planning 'survival of the fittest' market dynamics)
- An estimate of the value of released spectrum. *This is also examined under Section 2.10.*
- Cost points and options for funding
- A formal CBA for the whole digital switchover process, from launching digital terrestrial through to closing analogue terrestrial
- Access and usability by persons with disabilities and other vulnerable groups

Section 2.2 of the Guidelines examines the Licensing Framework which is the comprehensive set of required licensing, authorizations and permits for a particular market and public introduction of DTTB services. Mapping section 2.2 to the RFP:

- Proposals for grandfathering existing licences to new digital licences or proposals for other optimal transmission model based on indicated best practices.
- Public policy objectives and their integration into market driven considerations with due regard to considerations such as public service broadcasting requirements.

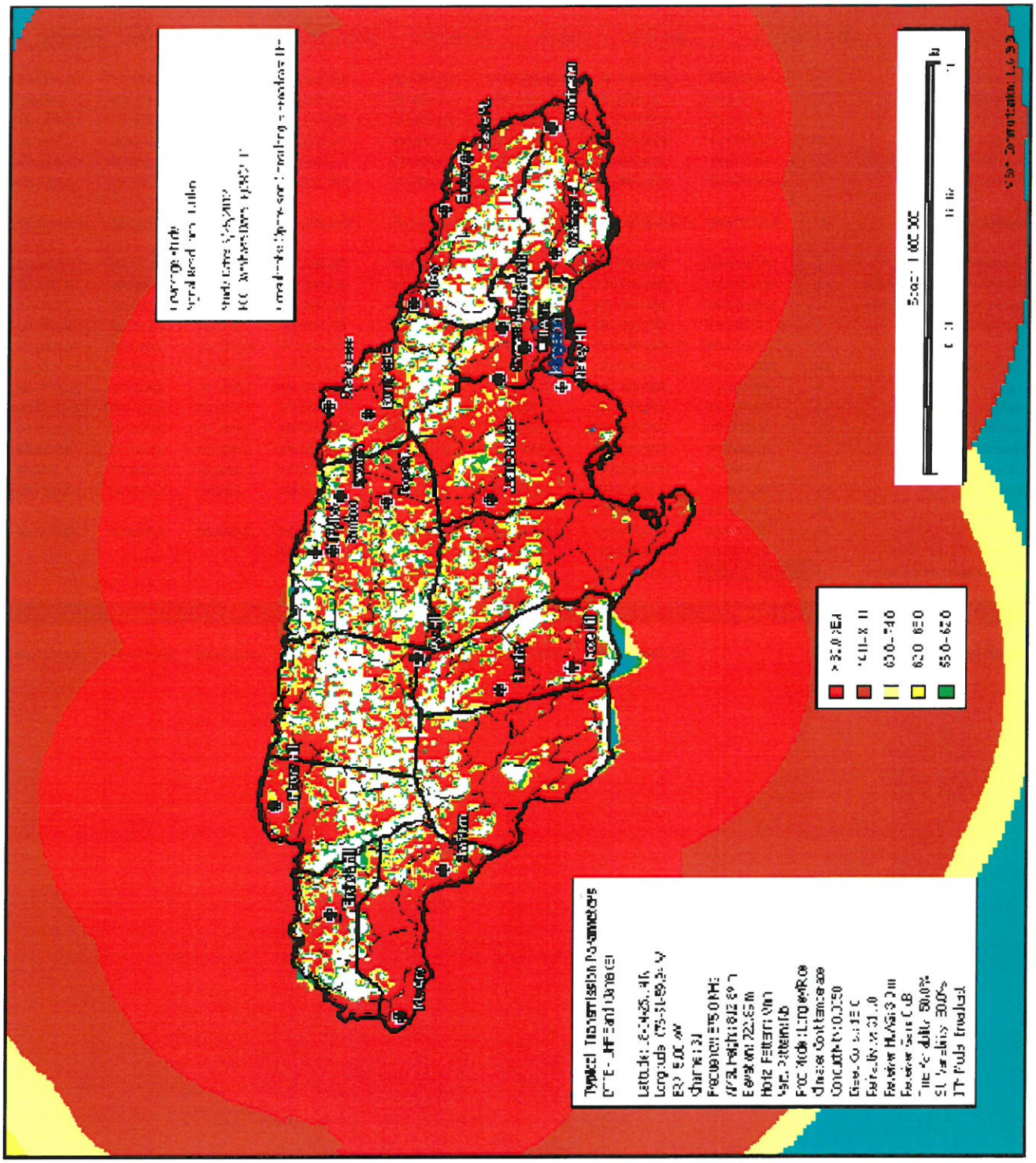
Section 2.1 of the Guidelines examines technology selection.
Mapping section 2.1 to the RFP:

- Issues related to, inter-alia, technology selection

No	Licence Type	Broadcasters' Names	Date of Issue (d/m/y)
27.	Subscriber Television (STV)	Starcom Cablevision Limited	1/7/1998
28.		Stars Cable Company Limited	December 2008
29.		Summit Satellite Systems Limited	11/5/2001
30.		Telstar Cable Limited	1/7/1998
31.		Total Cable Limited	29/3/2006
32.		Tru Star Cable Television Network Lmited	17/7/2009
33.		Unique Vision Cable Company	31/10/2001
34.		Venus Cable Service Limited	12/11/2001
35.		Westar Communications Limited	30/4/2002
36.		Wilson's Enterprises Limited/Satcom Cable Television	1/7/1998
1.	Internet Protocol Television (IPTV)	eMedia Interactive (iVu-TV)	No license has been issued.

Appendix D

Figure 20: Coverage Plot for Jamaica



Appendix F

Table 30: Summarized Projected Cost for ATSC 5SD Configuration

ATSC 5 SD Channel Configuration

QTY	Description	Unit CIF(USD)	DUTIES+TAXES(USD)	Total(USD)
5	Studio(A, B,C,D,E)	2,231,250.00	1,111,162.50	3,342,412.50
1	Mux Headend	420,000.00	209,160.00	629,160.00
23	Delivery + Receive System	1,449,000.00	721,602.00	2,170,602.00
36	Transmission	4,809,000.00	2,394,882.00	7,203,882.00
19	Towers	2,166,000.00	533,748.00	2,699,748.00
18	Shelters	180,000.00	-	180,000.00
18	Plant Energy	283,500.00	141,183.00	424,683.00
1	Transmission Implementation	1,493,530.00	-	1,493,530.00
	Total(Studio+Mux) facility	**13,032,280.00**	**5,111,737.50**	**18,144,017.50**

NOTE:

Require 2 X 6 MHz channels

Available SD Channel is 8

18 Sites for 95% population coverage

Require 36 broadcast Transmitters

Require enhanced antenna+Combiner system

Require closely space channel separation

Portable reception in Urban Centres

Appendix H

Table 32: Summarized Projected Cost for DVB-T2 5SD Configuration

DVB-T2 5 SD Channel Configuration

QTY	Description	Unit CIF(USD)	DUTIES+TAXES(USD)	Total(USD)
5	Studio(A, B,C,D,E)	2,231,250.00	1,111,162.50	3,342,412.50
1	Mux Headend	420,000.00	209,160.00	629,160.00
23	Delivery + Receive System	1,449,000.00	721,602.00	2,170,602.00
18	Transmission	2,068,500.00	1,030,113.00	3,098,613.00
19	Towers	2,166,000.00	533,748.00	2,699,748.00
18	Shelters	180,000.00	-	180,000.00
18	Plant Energy	283,500.00	141,183.00	424,683.00
1	Transmission Implementation	885,400.00	-	885,400.00
	Total(Studio+Mux) facility	**9,683,650.00**	**3,746,968.50**	**13,430,618.50**

NOTE:
Require 8 MHz Channel
Available SD Channel is 11
18 Sites for 95% population coverage
Portable reception in Urban Centres

Appendix J

Figure 21: Production Costing

INTEGRATED COMMUNICATIONS LIMITED

Production Costings

Client: DSO Communications
Campaign: Digital Switch Over 2015

Phase 1 - General Awareness/Preparation	
Concept development agency management	$2,000,000.00
TV ads - Kinetic (1x 60 sec)	$650,000.00
TV ads - situational (3x 30 sec)	$2,500,000.00
Radio ads - advisory (2x30 sec)	$140,000.00
Radio ads - situational (3x30sec)	$255,000.00
Radio Jingle (1x 60sec)	$400,000.00
Flyer design	$60,000.00
Posters in store x 4	$120,000.00
Animated web banners x 4	$150,000.00
Internet Videos/Infomercial x 1 (2 min)	$550,000.00
Press ads x 4	$320,000.00
Outdoor boards, vehicle branding, ambient	$610,000.00
Photography and talent fees/stock image purchase	$650,000.00
Phase 2 Refresh/Preparation	
TV ads - Kinetic (2x30sec)	$600,000.00
TV ads - situational (3x30sec)	$2,000,000.00
Radio ads - advisory (2 x 30)	$140,000.00
"Digitally compliant" branding (stickers and POS)	$120,000.00
"Digitally compliant" press	$80,000.00
"Digitally compliant" radio	$70,000.00
Phase 3 Urgent call to action	
TV ads - Kinetic	$600,000.00
TV ads - situational (2x30)	$1,600,000.00
Radio ads - advisory (1x30)	$80,000.00
Radio ads - situational (2x30)	$160,000.00
Posters in store x 4	$180,000.00
Internet Videos	$450,000.00
"Digitally compliant" branding	
"Digitally compliant" press	
"Digitally compliant" radio	
GRAND TOTAL	$14,485,000.00

NOTE: Costs will vary based on final creative approved

Appendix L

Table 34: Country Indices[64]

	CONVERSION INDICES			
	USA	FRA	ESP	DEU
	0.58162	0.65296	0.93616	0.68678
INDICATORS' NAME		Country Name	Country Code	Indices
GNI per capita, Atlas method (current US$)		Jamaica	JAM	
GNI per capita, Atlas method (current US$)		United States	USA	0.088
GNI per capita, Atlas method (current US$)		France	FRA	0.109
GNI per capita, Atlas method (current US$)		Spain	ESP	0.162
GNI per capita, Atlas method (current US$)		Germany	DEU	0.104
GDP per person employed (constant 1990 PPP $)		Jamaica	JAM	
GDP per person employed (constant 1990 PPP $)		United States	USA	0.171
GDP per person employed (constant 1990 PPP $)		France	FRA	0.194
GDP per person employed (constant 1990 PPP $)		Spain	ESP	0.256
GDP per person employed (constant 1990 PPP $)		Germany	DEU	0.242
GDP per capita (constant 2000 US$)		Jamaica	JAM	
GDP per capita (constant 2000 US$)		United States	USA	0.107
GDP per capita (constant 2000 US$)		France	FRA	0.170
GDP per capita (constant 2000 US$)		Spain	ESP	0.259
GDP per capita (constant 2000 US$)		Germany	DEU	0.160
Computer penetration		Jamaica	JAM	
Computer penetration		United States	USA	0.215856

[64] Data source is the World Bank World Statistics.

Appendix M

Consultations with Stakeholders

Among the stakeholders consulted were:

- Broadcasting Commission of Jamaica
- Columbus Communications Jamaica Ltd
- CVM TV
- Jamaica Association of Community Cable Operators (JACCO)
- LIME Jamaica
- LOVE TV
- Media Association of Jamaica
- RJR Communications Group
- Singer Jamaica Limited
- Spectrum Management Authority
- Unicomer (Jamaica) Limited/Courts