

# TELECOM BUSINESS REVIEW

A Journal of Symbiosis Institute of Telecom Management

**Review of T.R.A.I.  
Recommendations On Components  
of Adjusted Gross Revenue (AGR)**  
Mr. Prasanna Kulkarni

**Service Coverage of Cellular Mobile Service**  
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**Optimization Of The Product  
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& Mr. Aditya Munjal

**Study Of Thin Client Computing Vs  
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**Covered.....But Not Served**  
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**Managed Analytic Services**  
Mr. Ravikanth Ivapuri & Ms. Mugdha Jain

**Tertiary Revenue Enhancement  
in Rural Telephony Business**  
Mr. Nipun Malik & Mr. Deepak Kumar Garg

**Village Virtual Network Operator (VVNO)**  
Mr. Giri Hallur



**Symbiosis INSTITUTE of TELECOM MANAGEMENT(SITM)**

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Phones : +91 20 25674150 / 25671911

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### **From the Director's desk**

It gives me immense pleasure in presenting to you the first issue of Telecom Business Review (**TBR**). This is an attempt by Symbiosis Institute of Telecom Management to bring forth a national journal that would fulfill the cherished ambition for quality research and its results in published papers on various areas of Technology and Business Management. TBR provides a platform for scholars, teachers, professionals as well as students to contribute, showcase their knowledge, experience, study results and findings in the relevant areas of Technology and Business Management.

The TBR is a sincere endeavor to trigger quality studies in field of telecom business management and bring in results that would enlighten and educate.

At the release of this issue I thank all the contributors for their thought provoking articles. I also express my heartfelt gratitude to the members of the editorial board.

Virender Kapoor  
Director, SITM

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## **REVIEW OF T.R.A.I. RECOMMENDATIONS ON COMPONENTS OF ADJUSTED GROSS REVENUE (AGR)**

**By**

Mr. Prasanna Kulkarni  
Adjunct Faculty (Finance)  
SITM  
Email id : prjkul@hotmail.com

The Supreme Court, in an interim order on Tuesday, January 8, 2008 has stayed the TDSAT ruling on the AGR regime on Department of Telecom (DoT) plea. There is a substantial question of law to be decided by the apex court. In the meanwhile, there will be no adjustment by the operators.

### **Abstract**

Telecom service providers in India have to obtain a license from the Government of India. The license fee consists of two parts: a fixed one-time entry fee and an annual fee charged as a fixed percentage of the annual "adjusted gross revenue". Various associations and some individual telecom service providers objected to the definition (computation) of "adjusted gross revenue" which unnecessarily includes some receipts / income unconnected with the telecom business. This has the effect of increasing the annual license fee. On the other hand, some items of costs and expenses, which ought to be deducted from telecom revenue, are not allowed to be deducted. This again increases the charge of the license fee. This article reviews the recent recommendations of Telecom Regulatory Authority of India (TRAI), which has removed many of the above anomalies.

### **Background**

1. Under section 4 of the Indian Telegraph Act 1885, the Central Government has exclusive privilege of '*establishing, maintaining and working of telecommunication*'. Under the proviso of the said section the Government has the right to transfer its privilege by way of license to any person on such conditions and for consideration of such payments, as it thinks fit. Licenses to service providers have been issued under the above provision and the Government is charging license fee on the basis of revenue share. A fixed percentage of revenue share is charged on the adjusted gross revenue (AGR) based on the service for which DoT has issued the license.
2. At present revenue share percentage varies from 0 per cent to 10 per cent, depending upon the nature of the license. Details of prevailing level of annual revenue share license fee are as under:



Type of License	Annual License Fee (% of Adjusted Gross Revenue)
Cellular Mobile Telephone Services	A Circle / Metro = 10%
Basic services	B Circle = 8%
Unified Access services	C Circle = 6% / 5%
National Long Distance	6%
International Long Distance	6%
VSAT	6%
Infrastructure Providers Category II	6%
Radio Paging Services	5%
Public Mobile Radio Trunk services	5%
Internet service	0%
Internet service (with Internet Telephony)	6%

(Source: Annexure 2 and 3 to 'Recommendations on AGR' by TRAI [www.trai.gov.in](http://www.trai.gov.in))

1. The definition of "Gross Revenue" and "Adjusted Gross Revenue" (AGR) as applied and implemented by the Department of Telecom (DoT) for the purpose of levying license fee was challenged by The Association of Unified Telecom Service Providers of India, Cellular Operators Association of India and some Individual Telecom service providers before the Honourable Telecom Disputes Settlement and Appellate Tribunal (TDSAT).
2. The Hon'ble TDSAT in its order dated 7.7.2006 remitted the matter to the Authority and asked the TRAI to make comprehensive recommendations after hearing the representations of all concerned parties, on individual components of revenue, which can be considered as part of AGR.
3. Para 1.11 from TRAI document reads as under:  
 " 1.11 Hon'ble TDSAT also examined the contention of the petitioners that the Government could not levy any license fee beyond the provisions of Section 4 of the Indian Telegraph Act. Hon'ble TDSAT in its Order held that on the construction of Section 4 of the Indian Telegraph Act 1885 it is only the revenue from the licensed activity which has to be included in the computation of AGR. The relevant extracts of the said Order (obtained at pages 23 and 24) read as follows:

*A plain reading of this Section and its proviso shows the Government has the exclusive privilege of establishing maintaining and working of a Telegraph (in this case, Telecommunication).*

*Therefore, this right conferred under Section 4 of the Telegraph Act is confined to establishing, maintaining and working of a telecommunication. The scope of the License does not go beyond the three activities mentioned therein. Proviso to that Section empowers the Central Government to transfer that privilege of establishing, maintaining or working of a telecommunication to any person by way of License for consideration by such payments as the Government thinks fit. A careful reading of the Section indicates that the consideration contemplated, therein is only for the privilege the Government has i.e. to establishing, maintaining or working of a telegraph and not beyond that. Therefore, if the Central Government thinks it fit to transfer this privilege for a fixed sum of money and the Licensee accepts that demand, there can be no further dispute but if the Government chooses to take a percentage share of the gross revenue of the Licensee as its consideration then it is logical to conclude that such sharing can be only of gross revenue derived from the transferred privilege of establishing, maintaining and working of telecommunication. In our opinion, it would be doing violence to the Section if we are to accept the argument of the learned counsel for the 1<sup>st</sup> Respondent that words as it thinks fit found in the proviso would allow the Government to demand and collect a share of revenue from all the activities of the Licensee irrespective of the fact whether such revenue is traceable to the revenue realized from the activities under the License or not."*

1. Pursuant to the above directions of Hon'ble TDSAT, TRAI has issued its recommendations in a document dated September 13, 2006.
2. A summary of the TRAI recommendations prepared for the purpose of a quick understanding, appreciation and review is given below **in a tabular form**. For reference purposes as well as for appreciating the legal / accounting issues in depth, it is necessary to refer to the original recommendations available on [www.trai.gov.in](http://www.trai.gov.in)
3. **Hon'ble TDSAT delivered its judgment on 30 August 2007, extracts of which have been included in bold in appropriate places in the following table.**
4. The judgment is made effective for each petitioner from the date it approached the Tribunal.

Analysis of TRAI recommendations on components of AGR:		
Item	TRAI Recommendation	Reasoning and analysis
Income from dividend	<p>Dividend income <u>should not be included</u> in the AGR</p> <p><b>Affirmed</b></p>	<p>1.Dividend is an income from investments of surplus funds in equity share, preference share, mutual funds etc.</p> <p>2.Fund deployed for investment is not considered to be part of the funds deployed for providing telecom services.</p> <p>3.Dividend income is separately stated in the annual accounts of service providers, and can be easily verified.</p>
Interest Income	<p>1.Interest on refundable deposits be calculated at a rate of SBI's term deposit rate for six months' deposits.</p> <p>2.Any fund raised and income earned on the strength of telecom service will also have similar treatment.</p> <p>3.<u>Only interest so calculated on the refundable deposits should be added</u> to the AGR</p>	<p>1.Security deposits from customers are from telecom business and therefore any interest earned on this need to be included in the AGR.</p> <p>2. For purpose of transparency and ease of verification there was a need to specify a rate of interest for such deposits.</p>



Extract of TDSAT Judgement on Interest Income		
Interest Income	(a) interest earned on investment of savings made by a licensee after meeting liabilities including liability on account of share of the Government in the gross revenue.	
	(b) interest earned on investment of funds received by way of deposits received by licensees on account of security against charges, particularly, from customers using international long distance call service whose bills are heavy; and	
	(c) Interest earned on deposits of funds received by way of deposits from a customer on account of concessions given in the charges payable for using the telecom services.	
	<b><u>“In our view, so far as head (a) is concerned, this income is the same as income on account of dividends and this has been rightly excluded from AGR ....So far as heads (b) and (c) are concerned, we are of the view that income earned on deposits under these heads should form part of AGR as this income is directly related to telecom service which is a licensed activity.”</u></b>	

Item	TRAI Recommendation	Reasoning and Analysis
<b>Capital Gains</b>	<p>Revenue on account of sale of immovable property, securities, warrants or debt instruments, other items of fixed assets <u>should not be part of AGR unless there is verifiable data that the receipts have come from 'establishing, maintaining and working of telecommunication'.</u></p> <p><b>Affirmed</b></p>	<p>1.Capital gains arise on account of sale of immovable property or security.</p> <p>2.The capital gains are in the nature of capital receipt and are not the revenue receipts generated from the operating activities of a service provider.</p>
<b>Gains from Foreign Exchange Fluctuations (FOREX Gains)</b>	<p>Any revenue arising out of upward valuation or devaluation on account of fluctuation of foreign exchange <u>should not be part of AGR.</u></p> <p><b>Affirmed</b></p>	<p>1.Foreign exchange differences arise when rates differ from those at which they were initially recorded in the books. In case payments are to be made to the foreign vendor and rupee depreciates against the foreign currency then it is recognized as expense in the annual financial statement and if it appreciates, it is recognized as gain.</p> <p>2.Forex gain can arise from provisioning of telecom service or from non-telecom activities.</p> <p>3.Forex gain from non-telecom activities can not be included in AGR.</p> <p>4.When forex gain arise on account of telecom services, it has to be considered as part of the telecom revenues, but cost of scrutiny and collection does not justify inclusion of this item in the AGR.</p>
<b>Reversal of Provisions and Vendor's credits</b>	<p>1.Revenue arising out of <u>reversal of provisions</u> like bad debts and taxes <u>should not form part of AGR.</u></p> <p>2.Revenue arising from <u>reversal of vendors' credit should form part of AGR.</u></p> <p><b>"We hold that both (1) and (2) should be excluded from AGR."</b></p>	<p>1.Reversal of provisions is not actual inflow of cash from business activities but only an adjustment.</p> <p>2.Inclusion of revenues on account of reversal of provisions would result in double levy of license fee</p> <p>3.On reversal of vendor's credit revenue does not arise from reversal of items of P &amp; L account but because of reversal of capital expenditure.</p>

Item	TRAI Recommendation	Reasoning and Analysis
<b>Income from Property Rent</b>	<p>Revenue from property rent should be excluded from AGR provided it is clearly established that the property is nowhere connected to 'establishing, maintaining and working of telecommunication'.</p> <p><b>Affirmed</b></p>	<p>Service providers may rent or lease part of their properties and to carry out such activities no license is required. Service providers are also providing staff quarters to their employees and receive rent for staff quarters.</p>
<b>Income from Sale/ Lease of Passive Infrastructure Like Towers, Dark Fibre etc.</b>	<p>Revenue from rent of towers, dark fibre, should be part of the AGR.</p> <p><b>Affirmed</b></p>	<p>1.Capabilities to provide towers and dark fibre on rent emanate from the License.</p> <p>2.The licensees have special privileges, like right of way, which facilitates laying down of ducts and fibre, which are not available to independent companies.</p> <p>3.Therefore, renting / leasing of passive infrastructure by a service provider has to be considered as part of normal telecom activity.</p>
<b>Other Income Including Miscellaneous Income</b>	<p>1.Revenue streams like sale of tenders, forms, forfeiture of deposits/ earnest money, management / consultancy fees, and training charges from the telecom service <u>should form part of the AGR.</u></p> <p>2.Revenue from sale of fixed assets <u>should not be part of AGR.</u></p> <p>3.Payments received on behalf of third party <u>should form part of AGR.</u></p> <p>4.Other items falling under categories of other / miscellaneous income will have to be decided for taking a view regarding its inclusion or exclusion <u>on a case to case basis.</u></p> <p><b>“Such receipts do not form part of the revenue of the collecting service provider and, therefore, should not</b></p>	<p>1.Capital receipts cannot be part of the AGR; as such revenues do not generally arise from provisioning of telecom services. Such items include profit on sale of fixed assets and insurance claims.</p> <p>2.Other/miscellaneous income covers number of revenue streams which could be from the licensed activity or non-Licensed activity.</p> <p>3.It is not possible to include an exhaustive list of all items falling under the category of miscellaneous items. Besides the views given on specific items other items have to be examined on the basis of whether they fall under the category of license activity or not and accordingly decided.</p>

Item	TRAI Recommendation	Reasoning and Analysis
<b>Inclusion Of revenue from one licensed activity in the revenue of another licensed activity</b>	<p>Revenue from TV up linking service and internet service <u>should be part of the AGR</u></p> <p><b>“We hold that revenue from this service is to be excluded from AGR.”</b></p>	<p>1.Now unified access providers can provide internet service under that License.</p> <p>2.It is possible for the service providers to book revenues in such a manner that license fee liabilities are minimized.</p> <p>Perhaps a uniform rate license fee regime could obviate the recourse of diverting revenue from one service and booking it to another where incidence of license fee is lower.</p>
<b>Revenue from sale of Equipment including handsets</b>	<p>1.Revenue from discernible and stand alone sale of handset or telecom equipment <u>which is not bundled with telecom service should be excluded</u> from the AGR.</p> <p>2.Sale of handsets or telecom equipment <u>bundled with telecom service should be part of AGR.</u></p> <p><b>Affirmed</b></p>	<p>1.Sale of equipment and accessories is a trading activity; therefore, revenue generated from such sales should not be part of AGR.</p> <p>When handsets and telecom service charges are bundled then it is not a sale of goods on a standalone basis.</p>
<b>Receipts from USO Funds</b>	<p>Since DoT has already taken a view that receipts from USO fund will not be part of AGR, the Authority recommends that necessary amendments should also be carried out in the License to make it clear that <u>revenues received from USO fund do not form part of AGR.</u></p> <p>This fund is mainly utilized for the implementation of Government's recognized projects and policy inducement.</p> <p><b>Affirmed</b></p>	<p>-----</p>
<b>Receipts from ADC</b>	<p>Revenue receipts on account of ADC <u>should be part of AGR.</u></p> <p><b>Affirmed</b></p>	<p>Revenues from ADC are telecom revenues because the ADC amount paid by other operators compensates for what BSNL would have generated had no restrictions been placed on it.</p>

Item	TRAI Recommendation	Reasoning and Analysis
<b>Items of Costs</b>		
<b>Deduction of Leased line charges, Port charges, Interconnection set up cost, Signaling charges</b>	<p>Costs on account of port charges, interconnection setup charges, leased line, sharing of infrastructure, roaming signaling charges and content charges <u>should form part of AGR.</u></p> <p><b>Affirmed</b></p>	<ol style="list-style-type: none"> <li>1. Payments made to other service providers on account of port charges, leased line charges, are costs for the service providers for giving effective telecom services, expansion of their own network and interconnecting with other operators which is also mandatory under the License. <u>Further, there is no double counting of revenues for the purpose of levying license fee as revenue for providing ports, leased lines etc. is only included in the profit and loss account of interconnection provider. Pass through revenue is always a part of collected revenue from the customer but the costs linked to effective network functioning are not linked to the revenue collected from the customer.</u></li> <li>2. The 'Migration Package' and License Agreement do not have any provision for exclusion of any other cost item including for those items which are paid to the other service provider.</li> <li>3. Costs like roaming signaling charges are fixed costs and are not in the nature of pass through charges, therefore not deductible from the Gross Revenues.</li> <li>4. Input cost of content services is in the nature of cost and therefore not deductible from the Gross Revenue for the purpose of calculation of AGR.</li> </ol>
<b>Exclusion of Bad debts, Waivers, Discounts from AGR</b>	<p><u>Bad debts should not be excluded from the AGR.</u></p> <p><b>“The recommendation of TRAI in this behalf is, therefore, set aside and we recommend that items under this head have to be excluded from AGR.”</b></p>	<p><u>Bad debts should not be excluded from the AGR.</u></p> <p><b>“The recommendation of TRAI in this behalf is, therefore, set aside and we recommend that items under this head have to be excluded from AGR.”</b></p>

Item	TRAI Recommendation	Reasoning and Analysis
<p><b>Inclusion of items of revenue on accrual basis but exclusion of items of cost on actual payment basis</b></p>	<ol style="list-style-type: none"> <li data-bbox="435 226 953 363">1. <u>Service tax should be shown on accrual basis both for inclusion and exclusion</u> from the gross revenue for The purpose of AGR.</li> <li data-bbox="435 405 953 541">2. <u>Interconnection Usage Charge should also be shown on accrual basis both for inclusion and exclusion</u> from the gross revenue for the purpose of AGR.</li> </ol> <p data-bbox="472 646 597 678"><b>Affirmed</b></p>	<ol style="list-style-type: none"> <li data-bbox="997 226 1521 436">1. Service tax is not revenue for the service provider but service provider is only a collecting agency on behalf of the Government. The inclusion and exclusion of this item should be on accrual basis.</li> <li data-bbox="997 478 1521 720">2. Interconnection usage charge is a pass through revenue and the service provider is only collecting interconnection usage charge on behalf of other service providers, therefore, the inclusion and exclusion of this item should be on accrual basis.</li> <li data-bbox="997 762 1521 972">3. The other advantage of allowing accounting of service tax and interconnection usage charge on accrual basis is that these would be easily verifiable from the annual accounts of the service providers.</li> </ol>



## Service Coverage of Cellular Mobile Phone Service

By

Prof. Dr. P. J. Joglekar

Consultant in Electronics, Thane

Email id : pjoglekar@hotmail.com

### Abstract

One of the most important parameters of Quality of Service of Cellular Mobile phone service is the strength of the signal received by a mobile subscriber in the service area of the service provider. A benchmark was introduced in July 2005 by TRAI with respect to this parameter, which is called Service Coverage. TRAI has published several quarterly performance indicator reports but surprisingly has not reported any figures with respect to this parameter. However a simple program called Cell Track is available on Internet, which can be downloaded on a GSM mobile, set with Symbian OS Series 60 and this would display the signal strength in dBm on the screen of the mobile phone. A group of 5 students of the 2005-2007 batch worked on this project under the guidance of this author. Consumer organizations can carry out more detailed surveys for specific localities and point out dark spots to the service provider. The information collected from such surveys may also be useful to subscribers to decide as to which service provider gives stronger signals in which areas.

With the number of mobile subscribers in India showing exponential growth pattern, the quality of service of this type of service is a crucial matter. One of the most important parameters is the strength of the signal received by a mobile.

Subscriber in the service area of the service provider. A benchmark was introduced in July 2005 by TRAI with respect to this parameter, which is called Service Coverage.

TRAI had clarified that this parameter would be measured through a drive test on a sample basis for assessing the network coverage in cities where the service of the operator is available. It was further clarified that this parameter was not to be reported to TRAI by the service providers. The assessment of the network converge was to be done by TRAI itself during the drive test of the mobile network.

The regulation specified that at least **one quarterly comprehensive drive test** of the city tests was to be conducted to check the network performance of the whole city. TRAI has published several quarterly performance indicator reports but surprisingly has not reported any figures with respect to this parameter.

Since the quality of service very much depends upon the signal strength of the base station at the location of the mobile hand set, it is instructive to understand this parameter and how the subscribers themselves can measure it.

TRAI had proposed this parameter in its Consultation paper published prior to issuing the regulation. Unfortunately there was no detailed discussion about it in the consultation paper; this has given rise to ambiguities. More

specifically, TRAI has not stated how the statistical variations of signal strength with time (fading) and locations have to be taken into account. In all radio propagation documents, ITU (International Telecommunication Union) specifies the signal strength by graphs for various percentages of time and locations. For example there are separate graphs starting with 50% of locations 50% of time to 90 % of locations 90% of time.

The Benchmark proposed in the consultation paper was

Indoors  $\geq -75$  dBm

In-vehicle  $\geq -85$  dBm

Outdoors- in city  $\geq -95$  dBm

And the same was adopted in the regulation. But the explanatory Memorandum thereof did not throw any further light. There was also no mention of statistical properties.

A little thought will make it obvious that in mobile communication we should have satisfactory signal strength at 99% of locations 99% of time.

The consultation paper had stated that the Methodology of the drive test for Service Coverage was the same as explained for the new parameter End Point Service Performance. It is therefore necessary to look at the recommendation with respect to measurement of End Point Service Performance.

“This assessment is proposed to be done from the view of what the customer gets from their end. End points are defined as the interface between the customer and the equipment providing access to the service. End points Service Availability (ESA) is defined as the percentage of time a usable call can be established and maintained between two end points.”

Methodology for the ESA testing shall be as follows: -

a) ESA testing shall be by way of static tests and system drive tests in the ratio 30:70.

b) The test call sequence for both tests shall be as follows: -

- (i) Call holding time set to last 120 seconds with not more than an interval of 15 Seconds between calls;
- ii) If any call is blocked or dropped the test system shall stay idle for the rest of the call duration and interval until the next call attempt is made.

For ESA testing, the terminating end point shall be a test number attached to a Mobile Switching Centre.

**System drive tests shall be conducted as follows: -**

At least **one quarterly comprehensive drive test** of the city tests shall be conducted to check the network performance of the whole city in the following manner:

- i) **Indoor locations** – at least 10 location per quarter, one residential and one residential and one commercial each from North, South, East, West and Central zone of the town;
- ii) **Outdoor locations** - all major routes in city (main roads and some of the other lanes) covering all the BTS sites in that city;
- iii) **Highway drive** – the operator should also cover at least a 10 Kms distance starting from the out skirts of the city in all the highways connecting the town to other cities;
- iv) Operator must also cover the entire “**Blackout**” areas identified in the previous quarter drive.

Each area where the tests are conducted should cover not less than 200 KM or 5 hours driving time. The dedicated originating and terminating mobile unit’s antenna shall be placed at the same height and in the same vehicle. **The minimum sample size shall be 100 test calls.**

A proper measurement of signal strength requires a calibrated RF field strength meter.

However a simple program called Cell Track is available on internet which can be downloaded on a GSM mobile set with Symbian OS Series 60 and this will display the signal strength in dBm on the screen of the mobile phone. This program can be accessed by typing Cell track in the search engine.

A brief description is given below:

#### **CellTrack 1.18**

##### **For Symbian OS Series 60**

CellTrack is a program to collect some phone information about the cell you are connected to - like the net monitor.

#### **Main window**

The main screen shows the GSM information.

**Cellid:** the id from the actual cell

**LAC:** the Location Area Code from your cell

**Net:** the net you are moving in.

**Name:** the name of the cell.

**Signal:** shows the quality of the receive signal. The percentage value is taken from the Nokia phone API. The dBm values are shown.



### PG Research Project in SITM

A group of 5 students of the 2005-2007 batch worked on this project under the guidance of this author.

To start with, as a pilot survey they carried out a relative signal strength measurement between Pune and Lonavla by traveling in a train from Pune to Lonavla with the guide.

They had 3 mobile phones served by three service providers viz., Airtel, Idea and BPL.

A mobile phone shows the signal strength by a bar graph. The bar graph readings from the mobile sets were read at various places on the way and manually recorded on a laptop.

Subsequently, they loaded the Cell track software on their mobile sets and went around the city of Pune on a drive test for 8 hours by a pre-determined route and recorded the signal strength observed at various locations in dBm.

When these values are plotted on the map of Pune city it gives a clear picture of the pattern of service coverage.

A drive test carried out by a service provider measures the signal strength of a particular base station along the route and generates useful information for the planning of the network. The information by the Cell track software is for the base station, which is serving the mobile set at that location. When the hand-off takes place the Celltrack records the dBm value for the new base station. This information is obviously more relevant from the subscribers' point of view.

## **Recommendations**

TRAI should publish results of the drive tests with respect to the parameter Service Coverage for the benefit of consumers.

Consumer organizations can carry out more detailed surveys for specific localities and point out dark spots to the service provider. The information collected from such surveys may also be useful to subscribers to decide which service provider gives stronger signals in which areas.

## **Mobile TV *The Groundbreaking Dimension***

### **By**

Mr. Raghav Anand  
Sr. Consultant, Risk & Business Solutions  
Ernst & Young (India)  
Email id : raghav.anand@in.ey.com

Mr. Kunal Bhatia  
II<sup>nd</sup> year Student MBA- TM  
(Systems & Finance), SITM  
Email id : kunal.bht@gmail.com

### **Abstract**

Today's mobile networks, with their increasing transmission rates for wireless Internet access, enable a wide variety of multimedia services. These include multimedia messaging, news, travel information, navigation, numerous portal services, on-demand services, streaming of audio and video files, and live broadcasts via online streaming. Multimedia services are not only deployed by mobile operators but also by broadcasters and independent publishers and content providers. Mobile operators tend to regard mobile TV and video as 'must have' multimedia services. Broadcasters, however, are facing, for the first time, a major change in their environment and are seeking to generate additional revenue streams from their content offerings through multi-channel distribution strategies. This article makes a comprehensive analysis of the various factors that are important for the successful deployment of Mobile TV services.

### **Objective**

To identify the Business and Technological Challenges & Opportunities in the deployment of Mobile TV services in India and providing an ideal roadmap for the same.

### **Methodology Implemented**

The approach involved the following steps:-

- 1) Identify and understand the business trends in Mobile TV deployments world over.
- 2) Understand the underlying technologies in these Global Deployments.
- 3) Assess the *status quo* in India and the opportunities in the Indian Market.
- 4) Identify and understand the Business and Technological Risks & Challenges in the deployment of Mobile TV in India.
- 5) Provide recommendations to all the major stakeholders and hence suggest an ideal roadmap for Mobile TV Deployment in India.

### **Definition of Mobile TV**

"Mobile TV is a name used to describe a service to subscribers via mobile telecommunications networks, most probably the mobile phone carriers." It combines the services of a mobile phone with television content and represents a logical step for consumers, operators and content providers.

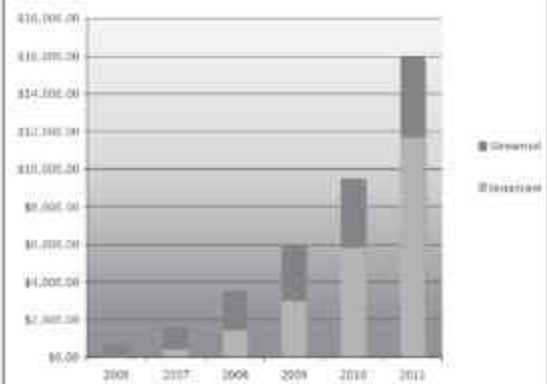


Emerging technologies are making it possible for the wireless industry and its business partners to consider providing mobile TV services that would mirror the profitable (and highly popular) broadcast and subscription services offered to consumers today for their home or office TV sets. These technologies would effectively expand the universe for television by allowing it to become no longer just a stationary activity, but one that lets consumers view television while on the go. Mobile digital broadcast TV combines the two best-selling consumer products in history: TVs and mobile phones. As a result, mobile TV applications hold great promise as the next “killer app” for the wireless industry—a way for network operators to achieve significant increases in average revenue per user; for content providers to expand the audience for their programming; and for equipment makers to drive sales of next-generation handsets. Mobile TV allows viewers to enjoy personalized, interactive TV with content specifically adapted to the mobile medium. The services and viewing experience of mobile TV differs in a variety of ways from traditional TV viewing.

## Section II: Market Scenario

### Drivers for Mobile TV Acceptability & Market Growth Estimation

1. Anytime, anywhere access to Mobile TV services
2. Enhanced personal and intimate viewing experience
3. Seeking time and location specific information
4. Filling empty time during the day
5. Creating/Sharing personalized content



**Figure 1: Total Revenues for Streamed and Broadcast Mobile TV Services, 2006-11 (\$m)**

(Source: Juniper Research Report, July 2006)

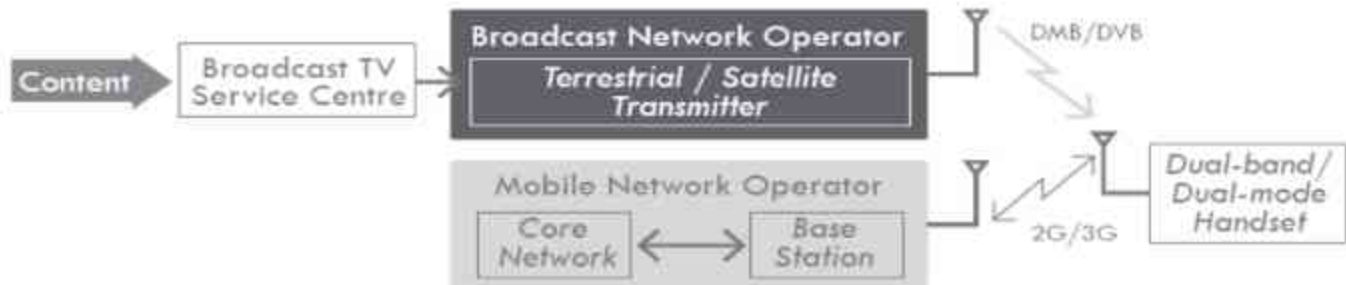
Stakeholders	Challenges	Key Issues
<b>Broadcast Operators</b>	Transmit programs from the TV stations to the handsets.	Transmissions must be cost efficient and high quality.
<b>Content Creators &amp; Television Stations</b>	1) Audience for traditional media 2) Advertising revenues are declining	1) Need to create mobile- friendly content. 2) Generate significant audiences and new avenues for Advertising.
<b>Cellular Service Operators</b>	Average Revenue Per User challenged by increasing competition.	Need to generate as many services as possible for Mobile TV so usage will increase (and would compensate for loss of revenue from decrease in phone calls).
<b>Equipment Vendors</b>	1) Sell higher-end handsets with High-Quality displays, to increase sales margins. 2) Sell new network infrastructure	Multiple barriers will create a barrier to deploy mass market services.



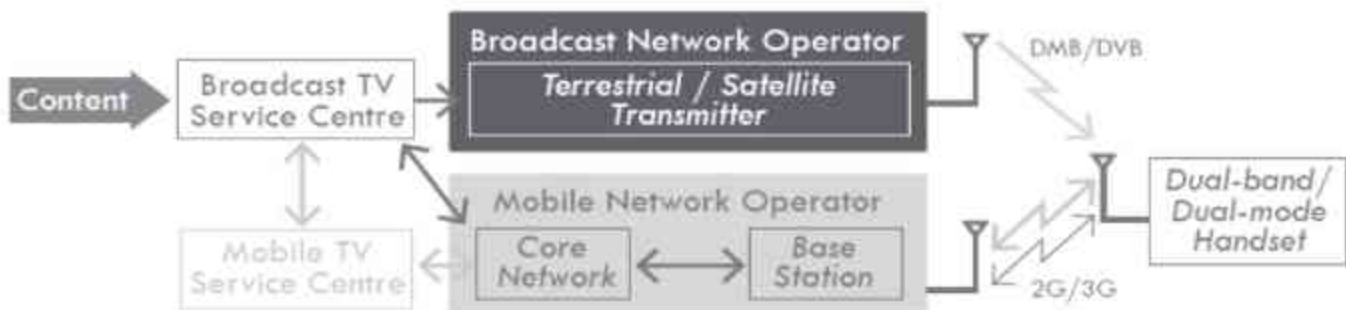
## Section IV: Business Aspects

## Various Business/Network Models for Mobile TV Deployment

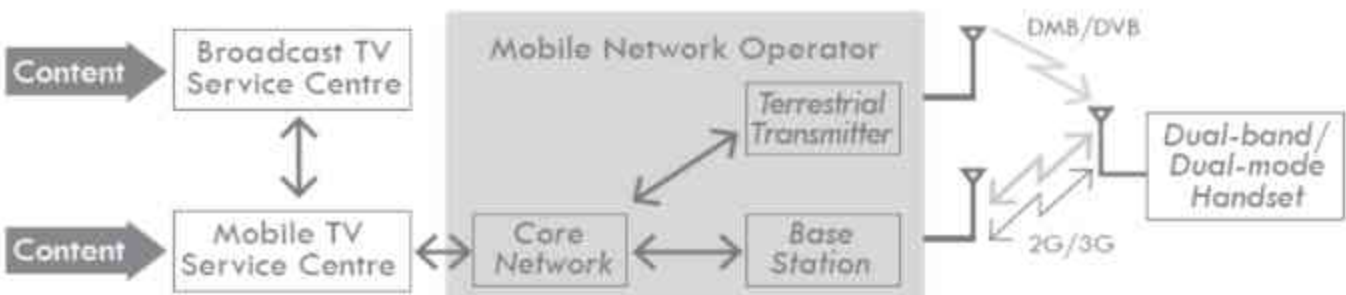
## (a) Separate Networks



## (b) Shared Networks



## (c) Integrated Network



## (d) Single Network

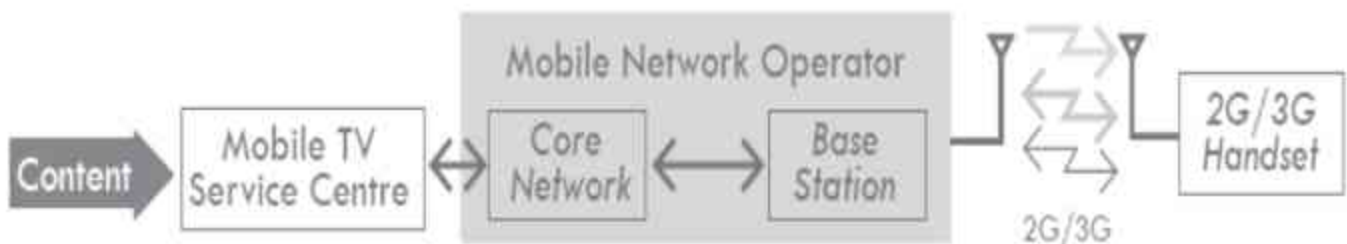
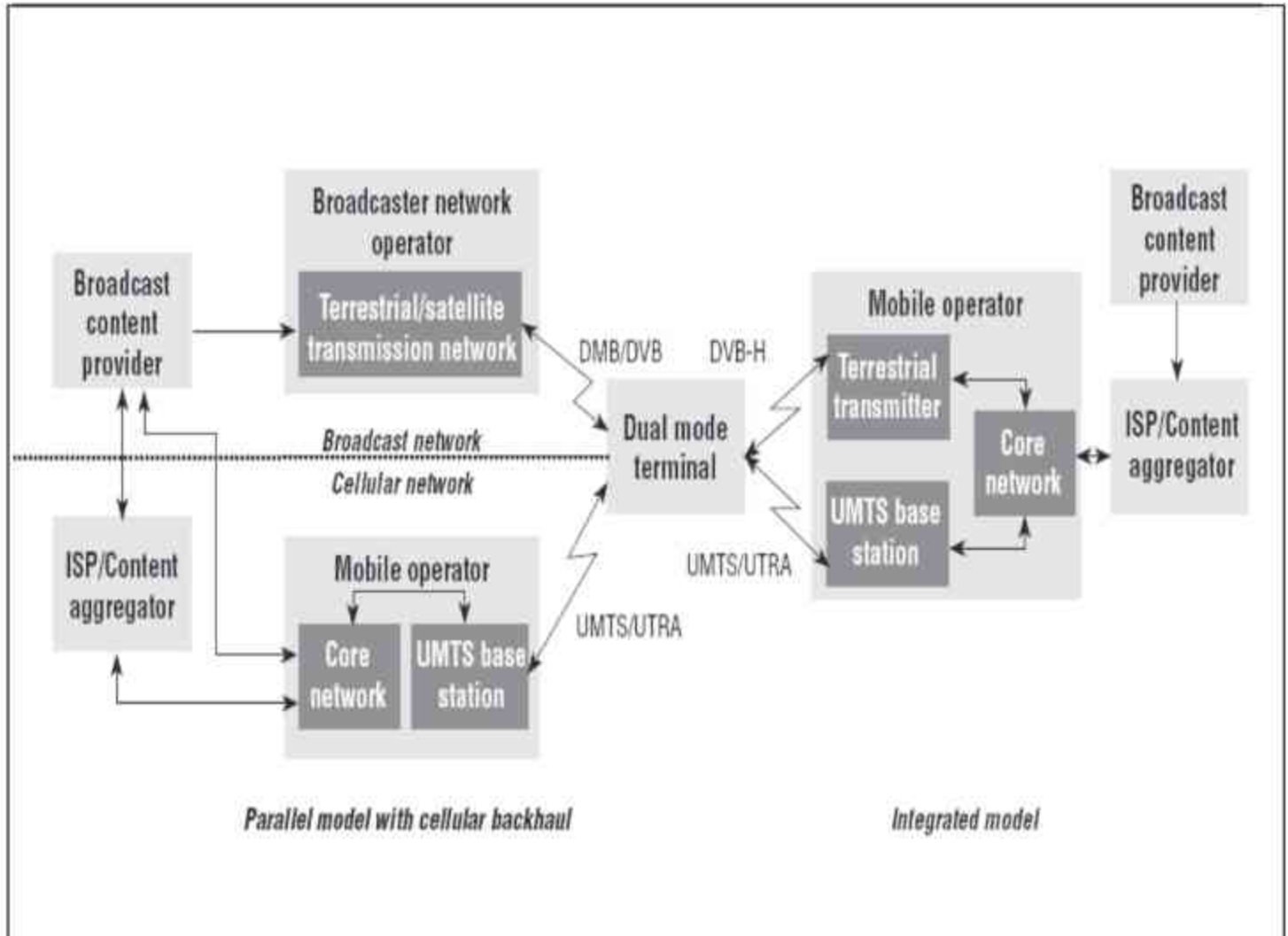


Figure 3: Business/Network Architectures (Source: Yankee Group Report, 2006)



### Integrated Business Model

The combination of a mobile and an overlay broadcasting network enables user/content interactivity, widely considered key to further growth and essential for mobile operators to generate revenues from their mobile networks. This can be executed via a parallel model; both the broadcaster and operator will be able to send signals to the mobile user, with a cellular backhaul (the return channel).



**Figure 4: Integrated Model for Mobile TV Services**

Alternatively, an integrated model may be used, in which the operator is responsible for sending both cellular and broadcasting signals to its subscribers, and gets its content from broadcasters, content providers, content aggregators or other media parties.

## Section V: Deployment Challenges & Roadmap

### Key Considerations in Mobile TV Deployment

Business Model	Technology	Content	Marketing	Regulatory
<input type="checkbox"/> Broadcaster Led <input type="checkbox"/> Mobile Operator Led <input type="checkbox"/> Hybrid Model	<input type="checkbox"/> DVB-H <input type="checkbox"/> MediaFLO <input type="checkbox"/> DMB-T <input type="checkbox"/> MBMS	<input type="checkbox"/> Type <input type="checkbox"/> Format <input type="checkbox"/> Rights <input type="checkbox"/> Security	<input type="checkbox"/> End-user ownership <input type="checkbox"/> Subscription types <input type="checkbox"/> Payment options	<input type="checkbox"/> Spectrum Allocation <input type="checkbox"/> Licensing <input type="checkbox"/> Infrastructure Sharing

### Recommendations to Stakeholders

**Telecom Service Operators:** The telecom operators should invest in technologies and strategies that add worth to the mobile TV value chain. They should *collaborate with media companies, advertisers* and other potentially disruptive companies and avoid trappings of WAP content service rollouts. Rather than investing (at least in the short term) in an expensive broadcast TV platform, operators should leverage their existing 3G networks and use them for what they were originally envisioned for delivery of multimedia services to help lower costs to end users for mobile TV services.

**Content Providers:** Build a mobile content portal UI that is based on best practices from Web 1.0 companies and that requires fewer clicks to discover and purchase content. They should also embrace new business models that drive content sales.

**Broadcasters:** The broadcast network operator is well suited to serve as the intermediary between the various service providers. Given the limited spectrum resources available, it is likely that only one multiplex will be dedicated to DVB-H providers will need to share the available capacity and may prefer to rely upon an independent operator to manage the network.

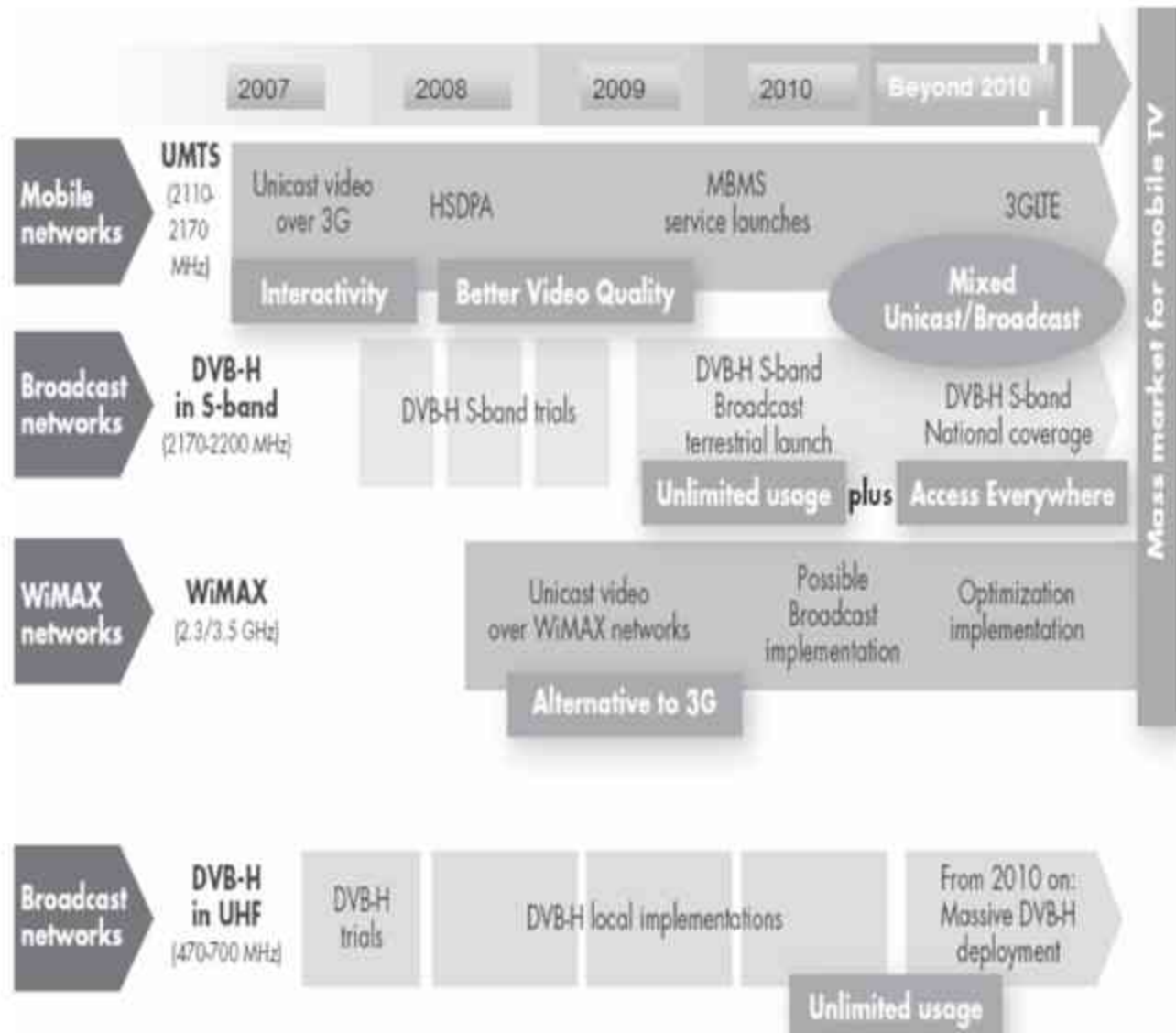
**Handset Vendors:** These organizations should collaborate to create more unified software products for DVB-H. Vendors should intend to pursue a consumer electronics channel in addition to the more traditional cellular or mobile TV operator channel to sell their technology.

### Roadmap & Timeline for Mobile TV Deployment in India

For a mobile operator, the likely migration path over the next five years will see their upcoming 3G unicast-based mobile TV systems initially boosted, in terms of capacity, with the deployment of HSDPA capability and the switch on of additional 3G carriers.

Afterwards, adding a parallel broadcast capability to broadcast more popular channels will allow the operator to transparently migrate most of the urban and rural unicast mobile TV load and hence enable continued 3G growth without resorting to cell splitting.

The most likely scenario of delivering broadcast video on a handheld mobile device would use a combination of different technologies, with an evolution over time - starting from current unicast streaming using current 3G technologies to finally arrive at mass broadcast using DVB-H based overlay networks. Rollout of commercial terrestrial DVB-H services is not expected before end of 2008, since the regulatory environment and business model still need to be clarified.



**Figure 5: Mobile TV Timeline**  
(Source: Alcatel Strategy Whitepaper, 2006)

In most countries, the unavailability of UHF frequencies may prevent going beyond multi-city coverage before 2010/2012. In parallel, DVB-H in S-band systems is expected end 2009 for terrestrial urban use, extending in 2010 with the launch of dedicated satellites to offer nationwide coverage. In the next several years, unicast services (i.e., streaming and video over 3G networks) which leverage existing cellular networks and handsets will continue to attract more subscribers than broadcast and multicast services. EV-DO Rev. A and HSPA upgrades should improve the quality (i.e., the streaming bit-rate) of video and programming delivered over 3G networks.



## Conclusion

Handheld devices, mobile communications and conventional media are converging. Clearly, for mobile TV to succeed as a commercial venture, it will involve many players in the wireless sector: mobile phone carriers, broadcasters, handset manufacturers, content providers, infrastructure groups, base station OEMs, government and licensing bodies.

The quest to maximize the bottom line will ultimately reveal which network model, technology platform and frequency band combine to form the most viable option for a specific country or market. And it will be dependent on which provides the most attractive and accessible model for consumer uptake. Whatever the outcome, it will represent a true convergence of multiple technologies. From this will materialize the true meaning of mobile TV.

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## **Optimization Of The Product Development Process Of An OEM**

### **By**

Mr. Satheesh Thomas (Head, EPM)  
Tejas Networks India Limited  
Email id : satheesht@india.tejasnetworks.com

Ms. Sonali Sharma  
II<sup>nd</sup> year Student MBA- TM  
(Systems & Finance), SITM  
Email id : sonalisharma83@gmail.com

Mr. Aditya Munjal  
II<sup>nd</sup> year Student MBA- TM  
(Systems & Finance), SITM  
Email id : hozai4u@gmail.co

### **Abstract**

The objective of the project was to analyze the program and functional delays for an Original Equipment Manufacturer (OEM), thereby focusing on reducing the cycle time and increasing efficiency, by suggesting ways of improving the processes across all functions. This also included studying the various processes that are involved in a Product Development process, and continuous monitoring and tracking projects as part of the EPM (Engineering Program Management) team.

One of the most important tasks was to understand the working of each department, its deliverables and the contribution towards the product development process. Working on live projects gave a thorough understanding of how and on what basis the activities are scheduled. The plan had to be prepared after consulting different departments. The project also gave an understanding of how different activities are interrelated and any slip or delays in some critical activities can contribute to delay in the entire project.

### **Literature Review**

In order to achieve the objective of the research, the following literature review was involved:  
A thorough study of the product portfolio of the company, in order to have a clear understanding of the area of focus.  
Project Management guidebook, in order to get an insight into the techniques involved in the process.

### **Methodology Used**

To identify the issues related to product development, the first step involves the study of various departments involved in the process, with emphasis on:

- The functions performed in order to contribute to the product development
- The internal structure
- The relationship with other departments
- The deliverables pertaining to the product development

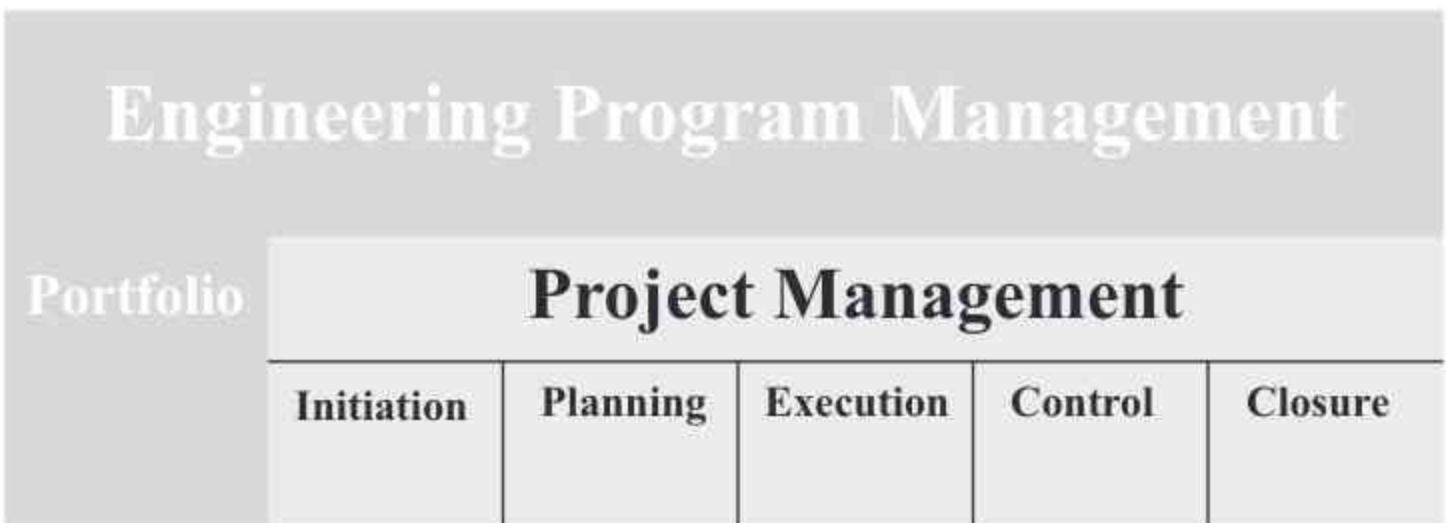
Once this was done, work on live projects started, the products being service access nodes, which are bandwidth-provisioning equipments. A plan for product development was prepared, and then by coordinating with the various departments, tracking and monitoring of activities according to that plan was done. At the same time, delays and risks were recorded at various stages of the process, and analyzed. This was accomplished by analyzing the critical paths in the product development plan. By continuously communicating with various departments, reasons for

program and functional delays were identified, and at the same time methods for improving the cycle time and increasing efficiency were suggested as part of our recommendations.

### Engineering Program Management

In any product development organization, a product lifecycle goes through the following five stages- initiation, planning, execution, control and closure. Managing the five stages along the process is done by a team of people who closely monitor the activities pertaining to that particular project. This team of people is the Project Management team.

However, these days organizations do not develop just a single product, rather they develop a whole line of products. So, in order to manage the entire portfolio of products being developed, another team of people is appointed to carry out this task, known as the *Engineering Program Management (EPM) team*.



There is immense competition today among the product development companies. So, in order to deal with and survive competition, organizations are going for improvement in their strategies, as well as scaling up their processes. In such a scenario, the role of EPM is very significant, since it helps organizations to achieve efficiency in operations. This is one of the reasons why the EPM has an important role to play in Tejas Networks.

In Tejas Networks, many products are developed simultaneously. The job of the EPM team is to effectively monitor and track all activities related to the various products being developed, and at the same time be able to manage the process in order to meet the requirements of all the customers of the organization.

One of the primary responsibilities of the EPM team is to plan the projects. This planning is done in such a way so as to keep in mind all other projects that are occurring simultaneously, so that none of the projects face obstacles later such as resource constraints, time or cost constraints. Thus, one of the important functions of the EPM team is also coordinating and prioritizing resources across projects, departments, and entities.

Therefore, the EPM team should very diligently plan out the various projects so as to efficiently meet customer needs, and also continuously track and monitor activities along the process so as to ensure that the final objective is achieved successfully.

## Product Development Process

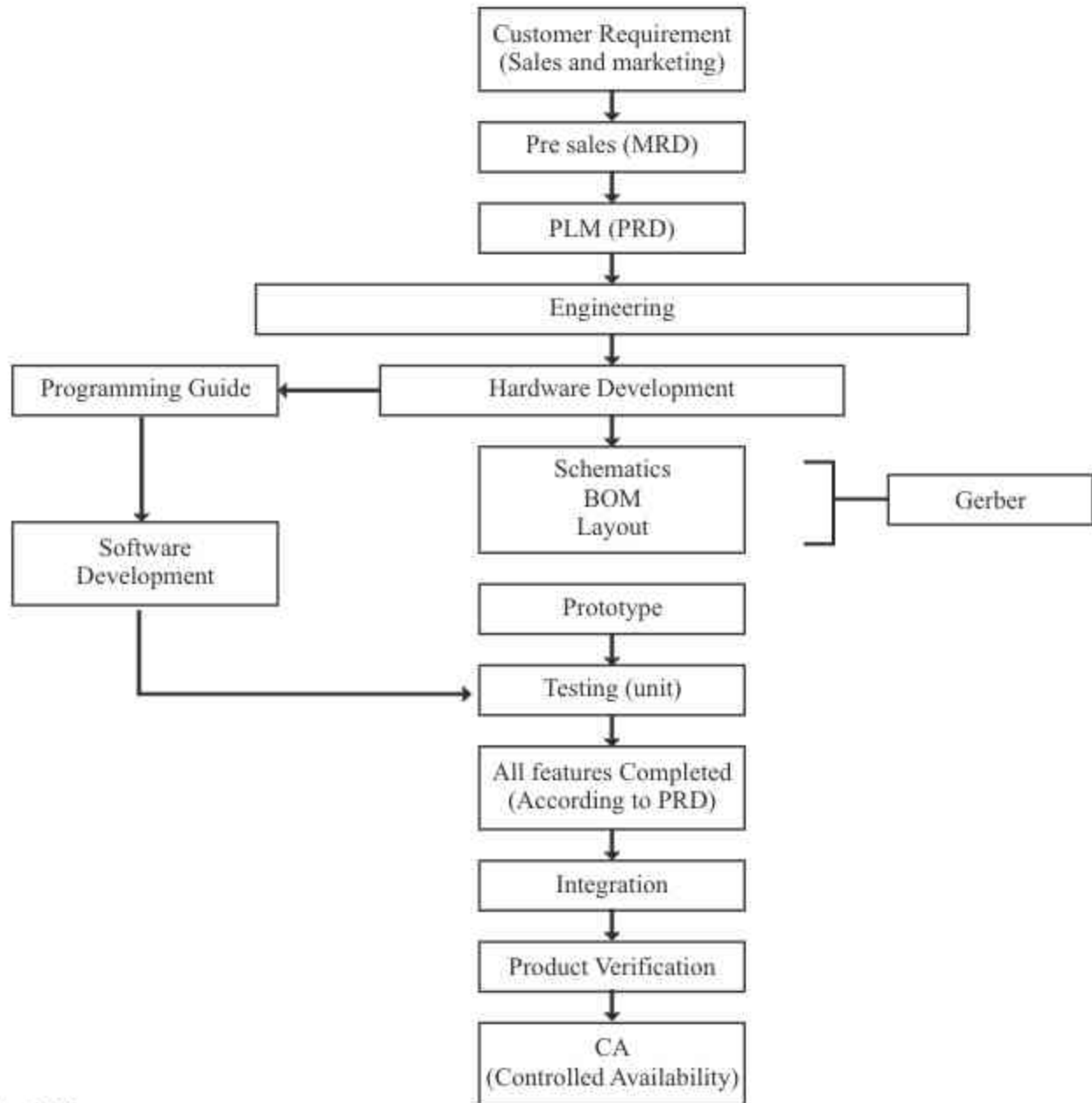
The product development process involves the following

At Tejas Networks, a typical project lifecycle occurs as illustrated above in the flowchart.

The process begins with gathering the customer requirements. This is done by the Sales and Marketing team. Once.

## PRODUCT DEVELOPMENT PROCESS

The product development process involves the following:



Activities :

\* PLM: Product Lifecycle Management  
PRD: Product Requirement Document

The customer requirements are known, they are communicated to the Pre-sales team, which comes under the Product Management team. The role of the Product Management team is to prepare a Market Requirement Document (MRD), which will be used further for the Product Lifecycle Management (PLM).

At this stage, the Product Requirement Document (PRD) is prepared. This document specifies the particular requirements for the product to be developed. Therefore the PRD encompasses various aspects of the requirements for a product development. It includes either or all of the following three architecture development:

SYAD (System Architecture Development)

SAD (Software Architecture Development)

HAD (Hardware Architecture Development)

Once the PRD is prepared, it is given to the Engineering Department. The Engineering department comprises of the following teams:

All teams under engineering department refer to the PRD throughout the product development process. The first step, after PRD is released, is to determine the various components that need to be developed or procured. For each component, the schematics and layout are prepared, and a BOM (Bill of Materials) is released, followed by the Gerber release.

The long lead items are generally referred as Class A or the Active components. These are usually ordered in the initial stages of product development process, as they take around 12 weeks time for availability. This is referred as the First BOM. After this, the Procurement BOM is released for the components that take around 8 weeks to arrive at Tejas. Finally the Gerber or Final BOM is released, when the complete requirements for the product are frozen and a three-dimensional view is available. These require 3 to 4 weeks for availability. So by the end of 12 weeks, all prototypes are available. All these processes are part of the Hardware development.

Once the prototypes are available, they are tested to see if any rework is required. The Software development activities are also initiated simultaneously with Hardware development activities. Usually a Programming Guide is prepared, according to which the software development activities take place. At the end of hardware and software development, the prototype testing is done. This is to ensure that the development is as per the specifications of the PRD. If any errors are found during testing, they are fixed and tested again.

After this, Integration engineering is done, where the hardware and the software are integrated and tested. This is followed by product verification during which, if any errors are found, then problem reports (PR) are prepared and the problems are dealt with, until finally the desired output is achieved.

The final stage of this entire process is the Controlled Availability (CA), which is a state at which the product development is complete, along with the entire documentation, and is ready to be delivered to the end customer.

## **Analysis**

In a product development process, there are several issues that occur during the process, which can cause delays. We analyzed such aspects during the research, which are as follows:

One of the most critical issues is hardware procurement, which is usually the cause of delay in most projects. The component manufacturers are overburdened with so many orders that it is not possible to deliver components on time, which in turn affects the completion of projects.

Another issue is resource allocation and resource crunch. With a large number of projects running simultaneously, there are not as many experienced and skilled engineers as required, which results in delay in resource allocation and subsequently leads to project delay.

Sometimes projects get delayed as the requirements from customers keep on changing even when the development activities have begun. This results in loss in terms of effort, time and cost.

When there are many projects running at a time, then projects are assigned priorities, according to which they are executed. Sometimes lower priority projects tend to face serious delays if the high priority projects are delayed.



## Recommendations

As part of the objective of the project, we analyzed the various processes that go into the process of product development, and on the basis of the analysis, made certain recommendations, which could help in improving the processes to a certain extent, and therefore improve efficiency of operations. Few of the recommendations are as follows:

When a project starts, the requirements and scope of the project should be available to the Program Management team, as all planning for the project depends on the scope, which if not fixed, causes continuous changes in the plan, thereby leading to unnecessary delay.

When resources are allocated for a particular activity, then the current status of resources should be considered while assigning them to the tasks. Resource planning should not be based on future resources, which would be available later, since unavailability of these resources afterwards causes a bottleneck for projects.

Once the resources for a project are fixed, then the same resources should not be triggered simultaneously for other activities, especially in the case of hardware activities. There should be well-defined gaps, so that an activity starts when the previous one finishes, this will ensure that resource availability will not be an issue in meeting project deadlines.

The manufacturing process for prototypes should be strengthened for faster turnaround of prototypes, since this also is a reason for delays.

A well-defined strategy for after sales support of so many projects should be planned in advance, and these field issues can be sorted to a great extent if the product verification (PV) and development activities are improved.

A method should be implemented for Inventory Tracking, such as a software module, which can track all the inventory of the organization. This can help save a lot of effort, time and cost for the company.

There should also be performance-linked incentives with the severity and quality of PR (Problem Report) fixes. If a PR goes invalid or a fixed PR is reopened or SLAs are not met, it should be negatively reflected on the concerned team or individual performance.

## Conclusion

India is one of the fastest growing markets for mobile telecom, having immense opportunities for manufacturing services. With a population of over one billion people, India represents one of the most exciting and fastest growing areas for telecom OEMs. A new product development involves large number of interdependent teams, synchronizing the development efforts and coordinating between these teams is a big task. In the dynamic nature of today's organizational environment, program management is an important concept and tool to understand and effectively implement projects.



# Study Of Thin Client Computing Vs Traditional Computing Experience

By

Ms. Vibhuti Mehta  
 II<sup>nd</sup> year Student MBA- TM  
 (Marketing & Finance), SITM  
 Email id : mehta.vibhuti@gmail.com

## Introduction

The author believes that thin clients can enable computing to be delivered as a service, akin to a utility such as electricity or water. The idea is to make computing available to customers as needed and charge them for specific usage levels.

The objective is to provide cheap computing to the people who otherwise cannot experience it because of issues like high cost of computers, manageability and security issues.

### 1. Thin client: What is it?

A thin client is a computing device that represents a significantly scaled down PC with little local processing, RAM, or data storage capability.

It is a server-based network where the majority, if not all, of the processing is done by the server rather than by the individual client machine as a result, the cost of the computer falls down, thereby making it affordable to the masses. This is illustrated in the following Figure 1.

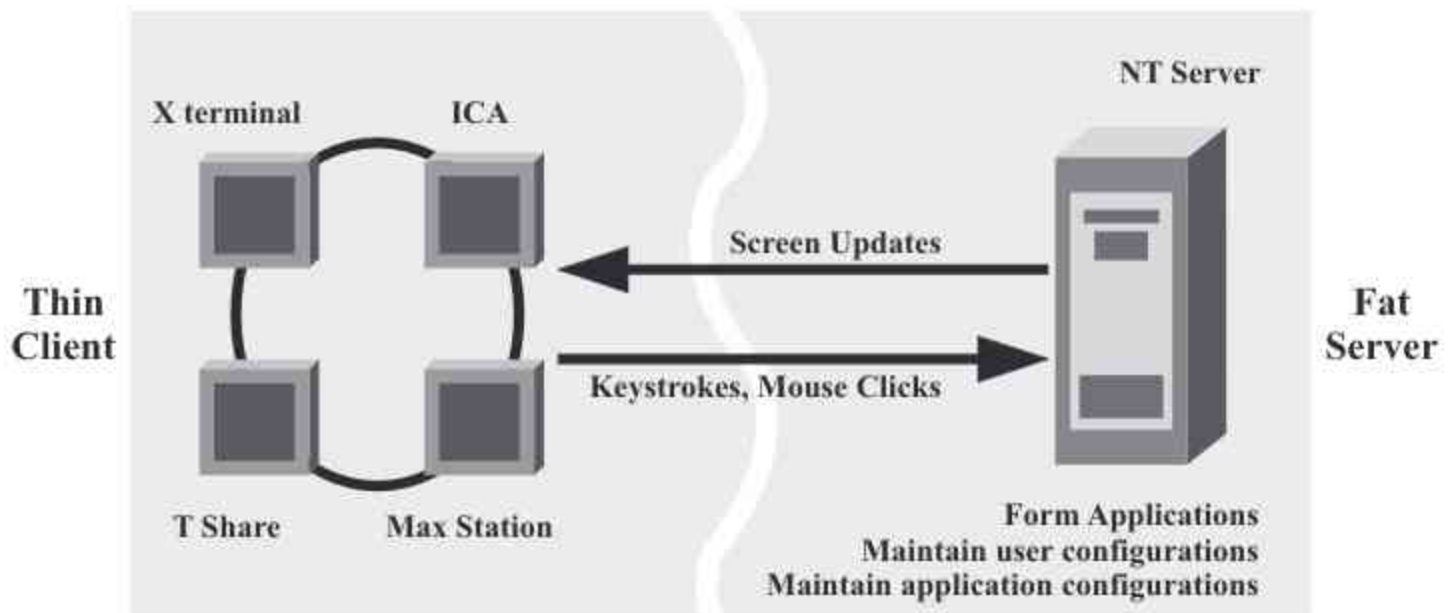


Figure 1: Basic Thin Client Architecture

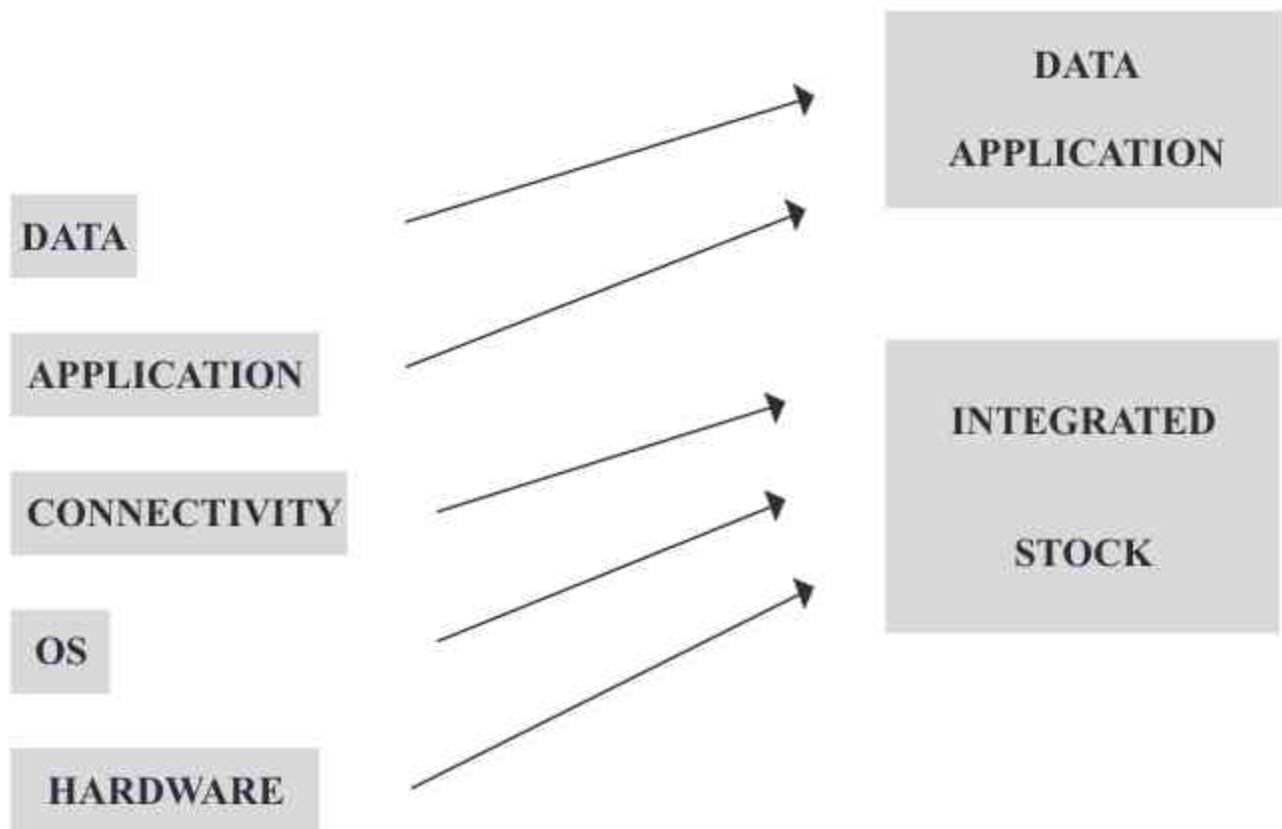


Figure 2: Thin Client Computing Stack

## 2. Computing in India:

In a developing country like India with a population of 1.1 billion, PC penetration is under 3%. Factors such as increasing personal income, education, public awareness, and changing business dynamics will lead to faster PC adoption but this will still fall short of broad penetration similar to that of developed markets

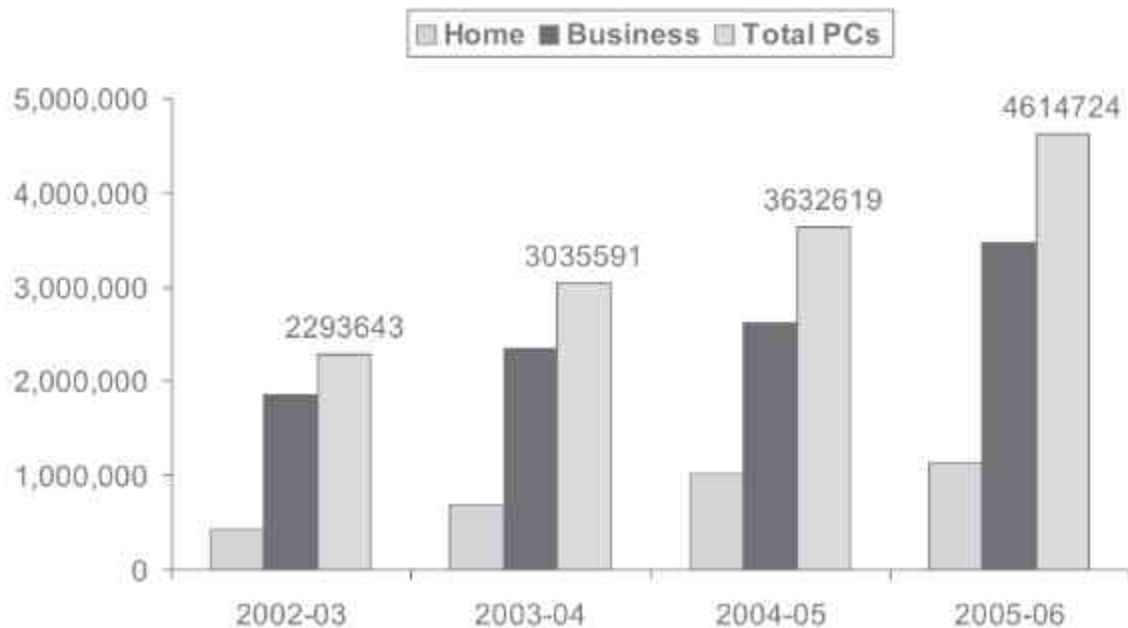


Figure 3: PC Penetration

### 3. Challenges faced by consumers / Solutions Provided by Thin Client

We believe low PC penetration is due in part to these key factors:

- **Affordability:**

It remains the primary challenge to widespread penetration of this customer segment. Over the past 5 years, the average cost of PCs has dropped significantly from \$800 (in 2000) to around \$400 (in 2007). But in emerging countries, this is still too costly for the mainstream consumer. To a customer, affordability can mean a combination of any of the below:

- a. Reducing TCO (Total Cost of operation) for the life of the PC
- b. Reducing the up-front cost of owning a PC
- c. Matching periodic payments to customer income flows
- d. No-commitment ownership of a PC

- **Manageability:**

Customers, in many cases 1<sup>st</sup> time PC users, are concerned about the ease of managing a PC. They are familiar with the challenges of keeping a PC up to date and secure, and have experienced these through friends or Internet cafés. Many times these challenges are due to pirated software or inadequate security software.

- **Desirability:**

Many customers are not able to find or afford relevant software and content for their PC even after purchase. Beyond a few basics, customers are not sure what type of applications they would like to have on their PCs, and are often left to try out various pirated software packages. Distribution and channel difficulties compound this problem.

- **Accessibility:**

Is the service easily available? Ready to use. One of the reasons why mobile has grown is because of the distribution and easy provisioning of the service from a consumer perspective.

- **Security:**

The issues of security need to be tackled satisfactorily so that customer data is secure and not available to others. Hacking and eavesdropping should be prevented definitely.

#### **Advantages of Thin Client:**

- Lower IT admin cost
- Easier to secure
- Lower hardware costs
- Lower energy consumption
- Protection against thieves
- Capability to work under hostile conditions
- More efficient use of resources.
- Manageability
- Security
- Administrator control
- Ease of up gradation/reduction of downtime

**Limitations of Thin client deployment:**

- Inflexibility
- Reliance on the server
- Bandwidth issues
- Lack of disc drives
- Use of peripheral devices
- Poor multimedia performance
- Too thin software: loss of functionality

**4. Methodology used:**

First and foremost a study of thin client was done. Later a thorough market analysis was done to understand the needs of target market segment. The aim was to collect their valuable user experience and examine their feedback to meet out their expectations from the service. For this, thin client as a pilot project was deployed in one of the cyber cafes of Chennai. The results were then analyzed and recommendations were then made based on that information.

***We carried out Thin Client development in the following phases:***

- ***Phase 1:*** Lab testing stage.
- ***Phase 2:*** The market survey and business model formulation
- ***Phase 3:*** Further deployment and commercialization.

**5. Study of consumer perspective:****Background of problem:**

The author believes that thin clients can enable computing to be delivered, as a service. The idea is to make computing available to customers as needed and charge them for specific usage.

**Objective:**

The aim of survey is to collect the consumer perspective of the service “thin client pilot” and thereby structure out their expectations from the service, what features the consumers are looking at, what price they are ready to pay for it, etc. and thereby formulate business model and pricing model accordingly.

**Research methodology:****Discussion of information needs:**

With our market survey the aim is to study:

- The target market segment
- The profile of consumer
  - Income,
  - Education,
  - Family Status
  - Literacy of family members

- Computing Life cycle stage
  - Computer proficiency
  - How long has he been using?
  - Usage statistics (How many hours per session/How often etc)
  - What does the person do with the computer?
  - What kind of applications does the user experience?
  - Where does he access the computer/internet?
- Value proposition
  - Have they thought of buying a computer at home?
  - Reasons why they have not bought one so if answer to Question 1 is Yes.
  - What are the reasons for having a computer at home vis-à-vis a cyber café?
  - How much does the user pay today for computing?
  - How much would he be willing to pay for a service at home?

#### **Places visited:**

The thin client technology was deployed as a pilot project in one of the cyber cafes of city. {In adyar, Chennai}. The Internet users visiting the cyber café were requested to experience the new service and pen down their remarks on the questionnaire. Their feedback was of immense help as we could get a clearer picture of customer needs and expectations out of the service.

#### **Research design:**

A questionnaire was used, as a research instrument to get idea of customer needs and thereby provide them desired features in the new service.

#### **Sources of data collection:**

**Primary source:** The source of data collection was through surveying people and getting questionnaires filled.

#### **Questionnaire developing and pre testing:**

To ensure the correctness of questionnaire we got our peer group surveyed before and made required changes in it.

#### **A part of the Questionnaire is as follows:**

Please rate your Internet experience on the Net PC, on a scale of 1-5 (with 5 as good an experience that you have been used to while using a regular PC) for the following activities :



	1	2	3	4	5	Did not use
How does the computer desktop appear?						
How would you rate the experience of saving a file / creating a file / finding a file that you have stored on the PC?						
How do you rate the experience while using basic applications like MS word, MS excel, etc?						
How would you rate your browsing experience while using e-mail?						
How would you rate your browsing experience while browsing the Internet for information like say news, jobs etc?						
How do you rate the experience using an Instant Messenger like Yahoo or MSN messengers?						
How do you rate the experience while playing online games on sites like Yahoo games or Zapak?						
How would you rate the experience of watching a video clip/file?						
How would you rate the overall experience of using the Net PC?						

## 6. Results and findings:

- ✓ We tried to survey varied age groups. From our study we know that a majority of people we surveyed were of age group "19-25". Thus, the information revealed is basically reflective of needs of this age group more than that of teenagers and children.
- ✓ Majority of those surveyed were male. Thus, the experience of males is reflective in the survey.
- ✓ People from diverse work profiles were put on survey.
- ✓ Almost  $\frac{3}{4}$  of people surveyed were using internet for more than 3 years. Thus this estimate reflects the maturity of internet in India and also of its users.
- ✓ Half of the people surveyed use internet for "more than 5 hrs a week". Thus it reflects the high scope of providing "internet - as a service" to these heavy internet users.
- ✓ More than 50% people surveyed use Internet cyber cafes to access net from. Thus our new service can be deployed in cyber cafes first then in homes to get the organization more revenues.

- ✓ On surveying people we got a mixed response where 33% people spent more than Rs 300 a month. Thus the statistics reveal that customers will be ready to pay anything above Rs200 or above Rs 300 as well for the new service on additional features provided.

#### **Rating of service offering:**

- ✓ The figures on “*desktop experience*” reveal customer delight with the new experience.
- ✓ People rating “*file saving*” as “above average” indicates good performance of thin client network.
- ✓ More than half of sample size rated the service in terms of “*basic applications*” it supports as average. But best part is a big percentage of people rate the service as above average and as good as a computer use.
- ✓ The most satisfactory part was the analysis that nearly  $\frac{3}{4}$  people rated the “*browsing experience*” as 4 or 5 {on a scale of 1-5}.
- ✓ Slightly less than  $\frac{3}{4}$  of people did not experience “*gaming*” on new net PC so their feedback could not be collected. But amongst those who experienced this service, rated it as 3 on a scale of 1-5. A few of them did not find it as good as computer experience.
- ✓ A majority of people did not experience the “*videos*” through utility computing but amongst those who used this application, rated it as average. A small percentage also rated the experience as not very Delighting.

#### **Experience of new/old users:**

The new users found the experience very good and rated the service overall as “above 3”. They were however few in no. and also did not experience videos, games, news, etc hence the results are more reflective of views of old users.

The best part is the new users also rated the service as good as a computer experience. However a portion of them also rated low on video and game downloads.

Also a majority of people found problems with the current technology since it presently does not support USB drives, printers and scanners. Later, if this feature is put it would be a more satisfactory experience.

#### **Overall rating of service:**

- Perhaps the most encouraging part of the survey was that people liked the new service and majority of them Rated it above average i.e. above 3. They found the experience to be as good as a personal computer.

#### **Opportunity:**

- The real opportunity lies in providing browsing services. Since people found the browsing experience over e-mail, chatting, news search etc as good as a computer experience ....these features can be provided in our Service.
- The other best part is also that since people spent little time on games and video downloads...the current technology can satisfactorily address the needs of this group of people.
- The results have been very positive and satisfactory. The study reveals that thin-client, as a service would be Beneficial to the organization.

## 7. Limitations and caveats of survey:

- The opinion of new users and home users could not be collected.
- The experience of all age groups of people could not be collected, especially teenagers.
- Female opinion was less reflected in study.
- Some of the applications like gaming and video downloads were not used much by people so their experience couldn't be gathered.

## 8. Suggestions and recommendations:

- ✓ **Slow-motion benchmarking:** It is quite an accurate method of evaluating thin client deployments. In slow-motion benchmarking, network conversations between the thin client and server are captured while a conventional benchmark is run. Delays are inserted throughout the benchmark so that client-side screen refreshes have enough time to complete; in this way, the full output of the thin-client technology can be examined.
- ✓ **Aim at performance enhancement:** By considering network latency, fluctuating usage, contention for server resources by other applications and administrative processes such as backups network performance can be increased.
- ✓ **Addition of servers alone is not enough: optimize caching:** Adding more servers isn't the be-all and end-all of thin-client scaling while a number of standalone applications improve performance by providing highly optimized caching of data between thin-client server and client. These caches are built into existing protocols like RDP which we are using with the intention of eliminating the need for frequently-used data or screen elements to be continuously rebroadcast. RDP uses a 1.5MB RAM cache and 10MB disk cache for storing graphical objects.
- ✓ **Unique way to improve thin client performance:** Wyse, for example, in recently launched Expedian, a Windows Terminal Server add-on that seeks to improve server performance by keeping frequently-used application DLLs in memory so they don't have to be reloaded when many users are running the same applications. Such devices if used can ensure better performance of thin client.
- ✓ **Software upgradation after commercialization of the project:** Wyse has recently launched version 4 of its Rapport thin client management technology, which allows for software upgrades across a large fleet of hardware thin clients. In later stages of project it might be useful.
- ✓ **Aim to reduce capital outlay costs for both servers and telecommunication links:** Effective compression, combined with caching performance can help in doing this. This will also help in increasing ROI.
- ✓ **Tackle security issues:** use of VPN will ensure data security over the network
- ✓ Try to reach one set of applications and tools that suit all users.
- ✓ **Simplicity of scalability:** Thin FY should focus on attaining scalability. I.e. the aim should be to put more and more clients on a single server.
- ✓ Making server able **to handle larger applications smoothly:** Tarantella, which is Unix-based thin-client software, can support nearly 2000 users per standard Intel-based Linux server can be used in future as an option.
- ✓ What needs to be understood is that thin clients are definitely not a one-size-fits-all proposition so **customization** would become need of hour in future.
- ✓ To understand in depth that the performance of thin-client environments depends on :
  - The number of servers put.
  - The number of **simultaneous users**.

- The number and complexity of the applications running on the server.
- The **bandwidth available** between server and thin clients.
- **Interference** from other applications running across the network.
- ✓ use of server tools to get **continuous feedback** as to how things are going. After deployment we need to review of whether what's being delivered is adequate.
- ✓ Build support **for USB printers** into the thin client and include the necessary printer drivers.
- ✓ Studying **performance problems** faced by customers on a regular basis.
- ✓ To **monitor application servers** and considering bandwidth availability is important.
- ✓ Estimating the **exact no. of servers to be deployed** would be essential at later stages of the project.
- ✓ **Share server resources** to reduce maintenance and support costs.
- ✓ Ensure **session mobility**
- ✓ Measure the total time required to download the web page sequence as a means of **web browsing performance** of the system

### Conclusion:

The results have been very positive and satisfactory. The study reveals that thin-client, as a service would be beneficial to the organization. The need of the hour is to further understand the market needs and applications people are looking for, what price are they ready to pay for the service and what quality of service people want at that price or simply that it provides "value".

The organization should focus on marketing skills like customization of service as per work requirements of people and on technical side they should focus on performance enhancement, Slow-motion benchmarking, not just addition of servers but by optimizing caching, Software up gradation and tackling security issues could be implemented during commercialization of project.

The technical and marketing knowledge of the organization if used to the best would ensure providing cheap computing access to the people who otherwise cannot experience it.

## Covered.....But Not Served

### By

Mr.Akash Pethiya  
Management Trainee,  
Vodafone Essar.  
Email id: pethiya@gmail.com

### Abstract

The Government, Telecom Companies, FMCG giants all are targeting the rural India, as it is perceived to possess immense growth potential. But, in spite of this huge opportunity what is it that stops them from serving the customer? Many have already broken the myth of low disposable income in rural areas. What are the technical issues that come in the way, and what are the bottlenecks in the processes adopted by the government and the telecom companies? We are one of the fastest growing economies of the world and telecom acts as a catalyst for further growth. Therefore it is necessary for us not only to increase the reach, but also to utilize the existing telecom infrastructure to the full.

### Present Scenario

Rural India is on every one's radar and this fact is clearly demonstrated by the fact that about 90% of the USO fund is being given to Bharat Sanchar Nigam Ltd (BSNL) alone to bridge the ever widening urban - rural digital divide.

This article sets aside the classical debate of why & how to improve rural penetration by additional investments, new business models etc. It focuses entirely on efficient utilization of the already deployed network for the rural community and more so through the BTSs installed on the highways.

The next wave is, of wireless as it is cost effective in reaching larger geographies. The myth of rural India with less disposable income has also been shattered by both FMCG and the consumer durable players like HLL and LG and at least the demand for connectivity with respect to telecommunication is now visible on the surface both for the handsets and the connectivity.

The major issue that is holding back the private operators from deploying network in the rural areas is the Return on Investment. The rural teledensity needs be divided into two parts, namely one under network coverage and other uncovered. Wherever the network is already deployed it should be fully utilized to boost both the ROI and to meet the government's teledensity targets. The definition according to census of India categorizes 70% of the Indian population as rural. So how much of the said rural is under coverage has to be determined as most of the villages that are found adjoining the outskirts of the bigger cities and on the highways are under some or the other network coverage.

So is it the availability of both the service and the network that increases the teledensity? Are the private operators doing enough to know which villages are under their coverage, small or big and are they taking efforts to serve them? As it may happen, the service provider does not fully know what percentage of area in a given circle are under his coverage as the mobile signals are not geographically bound and some times reach the remotest of place.

A rural customer is said to be more brand loyal and would be least bothered about the quality of service and number portability issues. He is interested in connectivity on demand and is ready to pay for it.



The life time schemes have added to the teledensity target and are slowly contributing towards the increase usage of the airtime as the calling rates are almost double, compared to other normal plans and the availability of recharges in small denominations also ensure that both urban and rural customer end up spending the same amount of money at the end of the month.

### Issues

At many places, there is still an issue of inter connectivity between different operators, which impacts the mobile penetration targets. BSNL has its landlines in 90% of the villages but if the congestion at the Points of Interconnect (POI)s is not brought under control, especially in the rural areas, then it will end up into two virtually separate networks, isolating one from the other. The result would be that the rural customer would not go in for a mobile connection even if network and service were available as he would not be able to stay in touch with his family members despite of having a cellular phone due to the above-mentioned issues.

Secondly the ROI needs to be shared with distributors and the dealers of the service provider. The FMCG approach of reaching the maximum number of approachable places can be taken as a reference to suggest that even the remotest places across the country can be served.

Thirdly the issue of Quality of Service (QoS) as prescribed by TRAI is also to be taken into account. As with the cost of current Infrastructure, providing the same QoS as in the urban areas will become a stringent step for the service provider. So can the regulator to begin with, prescribe slightly lower standards of QoS and POI congestion for the rural areas to support the service providers?

### Financial Aspect

Looking into the financial view, an example of villages those are under network coverage but not under our distribution network for some or the other reason. If we are able to find just 20 villages with population of 5000 and above we will get a population of more than a lakh to serve. Taking 10% penetration level with average recharge of 200 Rs per month we get the following: -

$$\{100000(\text{pop}) \times 10(\% \text{ penetration}) \times 200(\text{ARPU}) \times 12(\text{months})\} / 100 = 2,40,00,000$$

Rs. **TWO CRORE AND FORTY LAKH** of revenue without any network investment with just 20 small villages, and it's worth reminding that India has 70% rural population.

The idea is to serve the maximum number of consumers under the current coverage and eliminate the inter network congestion to serve the masses in the rural areas as one operator in partnership. The infrastructure sharing is one step, which could be the catalyst to the same along with support from the government.

### Conclusion:

The operators in an attempt to increase rural penetration should invest in setting up new infrastructure but at the same time should explore areas under incidental coverage. To serve these incidentally covered areas as shown above, will not involve any capital investment on the part of the operator. They will in fact help the operator to unlock the hidden value so as to enhance his ROI from the existing infrastructure.

**All operators therefore should explore such areas that are covered but not served.**

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## Exploring Customer Perceived Value in a Technology Intensive Service Industry

**By**

Ms. Sujata Joshi  
Adjunct Faculty (Management)  
SITM  
Email id : sujatarj@rediffmail.com

**Abstract**

The services sector of Indian Economy has brought much success in the recent years. It contributes a major share in the total Gross Domestic Product. The growth rate of services sector in India is faster than any other sectors. It constitutes more than 50 percent of the total GDP in the country.

The services sector in India has become a larger source of revenue for the country. Today all service providers are under intense competitive pressure to provide superior services at lower costs. Inefficient delivery of services is not only costly; it threatens brand integrity. Customers are an indispensable part of service delivery process because they can actually control or contribute to their own satisfaction. A customer's service experience is also influenced by the presence of other customers who are receiving similar service from the same service provider. In such a case, these "other customers" can either *enhance* or *detract* from customer satisfaction and perception of quality.

In today competitive marketplace, these perceptions are becoming much more important for gaining sustainable competitive advantage. This article makes an attempt to discuss how companies can create positive customer value in the marketplace and create sustainable competitive advantage by discussing several case studies from the Telecom domain.

**Background**

In today globalizing economy, competition is getting fiercer. That means it becomes more difficult for products and services to differentiate themselves from other offerings than ever before. Not only is the number of competitive offerings rising due to globalization of production, sourcing, logistics and access to information but many products and services face new competition from substitutes and from completely new offerings or bundles from industry outsiders.

Customer behavior has become more hybrid. On one hand, customers are increasingly price sensitive - searching for bargains at marketplaces like eBay or buying their groceries at discount markets. On the other hand they enjoy branded and luxury goods. One and the same person may plan a weekend trip with a no-frills airline and a stay at a five-star-hotel. For many offerings the balance of power shifts towards the customer. Customers are widely aware of their greater power, which raises their expectations on how companies should care for them.

Bringing it all together, it becomes ever more difficult to differentiate a product or service by traditional categories like price, quality, functionality etc.

In this situation the development of a strong relationship between customers and a company could likely prove to be a significant opportunity for competitive advantage. This relationship is no longer based on features like price and quality alone. Today it is more the perceived experience a customer makes in his various interactions with a company (e.g. how fast, easy, efficient and reliable the process is) that can make or break the relationship. Problems during a single transaction can damage a so far favorable customer attitude.

**Value:**

Value is seen primarily as a combination of QSP (quality, service and price) called the customer value triad.

Value = Benefits = Functional benefits + emotional benefits +

Costs            Monetary costs + time costs + energy costs + psychic costs

E.g. services of doctors, lawyers, consultants, beautician, entertainment industry etc.

Every brand delivers at two levels. First there is value, which is a combination of price and quality. This is tangible part taken for granted. Then there is an intangible or the value added part which is the perception of the brand. Both the tangible and the intangible make up the perceived value.

Take the example of a Birthday cake. Would you appreciate a cake with nothing written on it or one with your name on it? Obviously the perceived value in the latter would be higher because of the blend of tangible and intangible. The cake is the tangible part and the message the intangible part. Both together deliver the perceived value to the customer.

What organizations or marketers, especially service organizations, are interested in is how to create positive customer perceived value for their offerings? Let us take a look at how some technology intensive service organizations in telecom sector have been able to create positive perceptions about their services and hence become successful brands.

***Customer is not looking for a product he is looking for a solution to his problem:***

Today Motorola is a global leader in wireless and broadband communications technologies and related electronic products. Why? It is because they are trying to meet the customer needs by coming out with innovative products.

The cell phones have attractive design, have excellent call quality, are easy to use, and have value added features including music player, games, camera, and video feature, high quality, reliable products. Motorola has partners such as MTV, with high quality sites providing diverse and entertaining content. 3G (third generation) phones offer much more effective access to music and video downloads, because the networks they work on provide faster connections for downloading content than previous generations of phones.

Text, Picture and Video messaging is phenomenally popular and is likely to become more so. Motorola mobile phones are increasingly being used to capture and share experiences, in addition to making arrangements, tell jokes, and flirt without the personal nature of a face-to-face or voice-to-voice contact.

***Consumers look for perceived value in brands:***

Nokia is the number one brand in mobile handset in many markets around the world, effectively dislodging Motorola from that position.

Nokia has succeeded in lending personality to its products, without even giving them a name. In other words, it has not created any sub-brands but has concentrated on the corporate brand, giving individual products a generic brand personality.

Product design is clearly critical to the success of the brand, but how does Nokia manage to inject personality into product design? The answer is that it gives a great deal of thought to how the user of its phones will experience the brand, and how it can make that experience reflect its brand character. The large display screen, for example, is the "face" of the phone. Nokia designers describe it as the "eye into the soul of the product". The shape of phones is curvy and easy to hold. The faceplates and their different colors can be changed to fit the personality, lifestyle, and mood of the user. The soft key touch pads also add to the feeling of friendliness, expressing the brand personality. Product design focuses on the consumer and his needs, and is summed up in the slogan, "human technology".

*When you customize a product it becomes a service and when you customize a service it becomes an experience:*

### **The Vodafone case:**

How has it managed to become the largest mobile telecommunications network company. It is the largest mobile telecommunications network company in the world by turnover and has a market value of about £86 billion (November 2006). At 30 June 2006 Vodafone had 186.8 million proportionate customers in 27 markets across 5 continents. On this measure it is the second-largest mobile telecom group in the world behind China Mobile. Vodafone's strategy has always been to deliver best experience to its customers.

Vodafone UK operates over 300 of its own stores. Customers are able to see and handle products they are considering buying. People are on hand to ensure customers' needs are matched with the right product and to explain the different options available. There are over 800 outlets retailing Vodafone goods & services. Service Centers are located inside many Vodafone Dealers and Retail stores. If your Vodafone mobile needs repair you can drop it off at one of these convenient outlets.

Vodafone is expanding its retail presence beyond the high street with the roll-out of a new concept store for railway stations, tailored to suit commuters. Another advantage is that all handsets on display are actually live devices, not the plastic mock up ones we see in other stores. Impressing 50 inch touch screen to explore and interact with a wide variety of Vodafone products and services.

Also its brand ambassadors communicate positive perception about the brand. Vodafone works with icons such as David Beckham to communicate its brand Values. Its sponsorship of Ferrari, with the immensely valuable media coverage that Formula 1 attracts, helps Vodafone to achieve this objective. Vodafone has over 100 million customers worldwide, spanning five continents and 28 countries. Formula 1 offers Vodafone high profile exposure in a sport that commands a worldwide television audience of 360 million people for each race.

### ***Every business is a service business:***

Players in any business should ask themselves this very important question: Does my product / service bring a smile on the customers face?

Marketers have typically two choices in face of competition: Either reduce cost of the product / service or add value. This added value is "service".

### **The Comcast case:**

Comcast Corporation, based in Philadelphia, Pennsylvania, is the largest cable company and the largest broadband (second overall) Internet service provider in the United States. Comcast now serves a total of 24.1 million cable customers, 12.1 million digital cable customers, 11 million high-speed internet customers, and 2.1 million voice customers. They develop broadband cable networks and are involved in electronic retailing and television programming content. The company employs over 87,000 people.

**Feature Set:** While Comcast only offers cable connections, they do a wonderful job providing perks that many ISPs do not offer. This family-oriented service includes seven email accounts, parental controls, a firewall and web filtering. They offer home networking so the entire family can be connected. And one of the favorite features is wireless; you can take your laptop anywhere within 150 feet of your cable outlet, even to the hammock in the backyard, and still enjoy the Internet. Other features include click-and-play news clips, music videos, movie previews, games, a photo center and video mail. Video mail allows you to send video messages to anyone with an email account.

Comcast provides online space so customers can store and access files from any computer connected to the Internet. You can also build a personal homepage for no extra cost.



Comcast offers a broadband cable connection that is super-fast compared to dial-ups; even those who use accelerators are still not in the same ballpark. When it comes to download and upload speeds, cable connections are the bar that others are striving to reach.

Comcast provides several options to address service and installation questions. They offer a FAQs page, user manuals and toll free phone support. Comcast offers blazing speed with several security features and tons of fun features. Comcast is one of the best services you can get.

### ***In marketing generalizations fail, specifics succeed***

In marketing, target market selection is very critical. Strategically, one should identify a specific consumer need, cluster a set of consumers having similar needs, and then provide the much sought after benefits.

The I-mode offering from DoCoMo is the perfect example of the innovative execution of a simple idea. At the time DoCoMo was planning to launch its services, the penetration of the World Wide Web was rather low in Japan. Unlike most countries where internet browsing was famous, Japanese people were yet to explore this new avenue fully. *DoCoMo realized that the core offering of any telecom player was "connectivity"*. Mobile phones are an extremely handy way to letting one remain accessible at all times to one's near and dear ones.

Working on this premise and factoring in the potential of the internet to enable customers to be in touch as much as possible, DoCoMo launched I-mode, wherein it offered users of its mobile services, Internet connectivity on their handsets. The technically advanced I-mode was supported with many service innovations that were in tune with the Japanese culture as well as the latest trends. Needless to say the company never looked back.

Akio Morita, Sony's founder, once proclaimed that "Sony doesn't serve markets Sony creates market". The walkman is a classic example. In the late 1970's Akio Morita was working on his pet project, a portable cassette player he called the Walkman, engineers discouraged him saying there would be little demand for this product. But Morita persisted. By the 20<sup>th</sup> anniversary of the Walkman, Sony had sold over 250 million in 100 different models.

### ***Innovation is a key to success:***

#### **AT&T (American Telephone & Telegraph Company)**

AT&T Inc. is a premier communications holding company in the United States and worldwide. It is recognized as the leading worldwide provider of IP-based communications services to businesses and the leading U.S. provider of wireless, high speed Internet access, local and long distance voice, and directory publishing and advertising services. What is the key to this success?

AT&T is respected industry wide for innovative products and services that deliver high customer impact, financial return and operational efficiency. The company continues to make substantial investments to continue its tradition of providing top-rated products and services, as noted by the following awards.

The merger of AT&T and BellSouth, along with the ownership consolidation of Cingular Wireless and YELLOWPAGES.COM, will help the organization to speed convergence, competition and continued innovation in the communications and entertainment industry thus creating new solutions for consumers and businesses.

AT&T has earned the customer trust and loyalty because of continuous commitment to the deployment of innovative products and services, reliable, high-quality service and excellent customer care.

AT&T Labs is a successor to a heritage that produced seven Nobel Prizes.

BellSouth was the first major communications provider to commercially launch wireless broadband using pre WiMAX technology and a leader in fiber deployment with fiber-to-the-curb facilities to more than 1.3 million



homes.

Cingular is a leader in third-generation wireless technology, launching the first widely available service in the world To use HSDPA technology. It launched the world's first commercial deployment of wireless services using EDGE, a third-generation high speed mobile data and Internet access technology.

Researchers and engineers at AT&T Labs have developed some of the world's major technological inventions, including the transistor, the solar cell, the cell phone and the communications satellite. These groundbreaking technologies have enabled today's computers and electronic devices, wireless phones and VoIP.

AT&T Labs has been an industry leader in the development of DSL and other broadband Internet transport and delivery systems, wireless data networks, and new technologies and applications for networking and enterprise business needs. AT&T's predecessor companies pioneered new technologies and developed promising new products and services in a wide range of areas, including IP network management and VoIP.

AT&T Labs will continue this commitment to developing and delivering meaningful innovation across market groups, from residential to small business to enterprise.

### **Conclusion:**

When the customer makes his buying decision, he evaluates the benefits he perceives from a particular product and compares them with the costs. The value a customer perceives when buying and using a product or service go beyond usability. There is a set of emotional values as well, such as social status, exclusivity, friendliness and responsiveness or the degree to which personal expectations and preferences are met. Similarly, the costs perceived by the customer, normally comprise more than the actual price. They also include costs of usage, the lost opportunity to use another offering, potential switching costs etc. Hence, the customer establishes an equation between perceived benefits and perceived costs of one product and compares this to similar equations of other products.

Based on this, customer loyalty can be understood as to how customers feel about a product, service or brand and whether their perceived total investments with it live up to their expectations.

The important point here is the involvement of feelings, emotions and perceptions. In today competitive marketplace, these perceptions are becoming much more important for gaining sustainable competitive advantage.

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## **A Business Model for Fibre To The Home (FTTH)**

### **By**

Mr. Vipin Gupta,  
Manager, Network Solutions,  
Sterlite Optical Technologies Ltd.

Mr. Mohit Kataria,  
II<sup>nd</sup> year Student MBA- TM  
(Marketing & Finance), SITM  
Email id: mohitkataria@yahoo.com

### **Abstract**

Service providers want to create new revenue streams and simplify existing infrastructure, while content providers need world-class ready-made infrastructure to provide highest level of standards to their customers and reduce costs. How can all these parties get what they want? A strong relationship and partnership has to exist between an operator, vendor, application developers, and the independent companies that write applications. One of the main drivers for the evolution of attractive applications could be the input from third party developers.

More to that, companies have to focus on the ways to reach the break even as soon as possible due to the increasing competition in the market. For this purpose a business model is a key element to enable future business success.

It has to be created to ensure a win-win situation for both the parties in the present scenario and adopt a business model, which is just right for the right period. The evolving business model of revenue sharing is another aspect whose feasibility is to be analyzed when it comes to sharing on applications with third party for different access technologies and access media. All these are covered keeping in mind the importance of bandwidth that has risen tremendously and is expected to grow further due to introduction of more killer applications which demand high bandwidth. This has brought forward various questions regarding access technologies and access media. Here we have dealt with a wired access technology, namely FTTH (fiber to the home). Optical fiber is a single wire providing internet, voice and video at lightning-fast speeds.

### **Introduction**

Growing demand for high speed internet is the primary driver for the new access technologies which enable experiencing true broadband. Today, majority of broadband connectivity is offered through Digital Subscriber Line (DSL), Cable Modem and, to a limited extent, with Wireless technology. Traditionally telecom companies have been offering T1 lines and DSL to small businesses, homes for applications such as voice services, high speed data, internet and video services. T1 lines are often expensive and DSL's performance issues limit availability of these services. DSL Copper networks do not allow sufficient data rates due to signal distortion and cross talk. The various wireless technologies such as Satellite and Wi-Fi also fall short on bandwidth due to weather and latency issues. Fiber to the Home (FTTH) is the only solution that can meet current and future synchronous data demands of the wired home network. A Fiber to the Home (FTTH) network is residential communications infrastructure where fiber optic cables run all the way to the subscriber premises. FTTH is intended to be a flexible communications infrastructure that supports present as well as future services. Unlike the telephone and cable networks, which were initially designed to carry a particular type of service, FTTH is designed to be a full-service networking platform. FTTH offers services with data speeds ranging from 155 Mbps to 2.5Gbps Down stream (Network to User) and 155 Mbps to 1Gbps Up stream (User to Network), enabling delivery of a greater range of services owing to high bandwidth on offer. Though the field trials and technology development for fiber in the access loop started in late

1980s, real deployments did not happen as the deployment costs were very high at that time. In the last 20 years enormous progress is made in optical networking equipment and production of high quality optical fibers associated with falling prices are driving forces for FTTH and making FTTH deployment an affordable choice for the telecom operators that result in long term returns. FTTH is future proof solution for providing add-on services such as Video on demand, Online Gaming, HDTV etc. Table below shows some potential future residential applications and their bandwidth requirements.

Application	Bandwidth
1 High Definition Video Session	20
2 Standard IP Video Session	7
1 Web Surfing Session	1
1 Internet Gaming Session	2
2 Video Conferencing Sessions	2
4 High Quality Audio Sessions	0.5
<b>Total</b>	<b>32.5</b>

Table 1: Future residential applications and their bandwidth requirements

### FTTH Architectures

Active and passive are two commonly used FTTH architectures for FTTH deployment. Active Architecture is also called as Point 2 Point (P2P) and Passive Optical Network (PON) architecture is called Point to Multi Point (P2M). Choice of active or passive architectures for deployment depends on the type of services to be delivered, cost of the infrastructure, current infrastructure and future plans for migrating to the new technologies.

#### ACTIVE Technology

Active Ethernet also called Ethernet Switched Optical Network (ESON) provides fiber to the customer's side from the central office exchange. It is a very simple network design. Since the fiber is dedicated, operation, administration and maintenance of the content and trouble shooting become easier. Since the distances of the central node and remote sites are known, estimation of power budget, trouble shooting the faults in the network would be easier. In Active Network Architecture Components Core switch, Aggregation switch and Optical Network Terminal (ONT) are main building blocks.

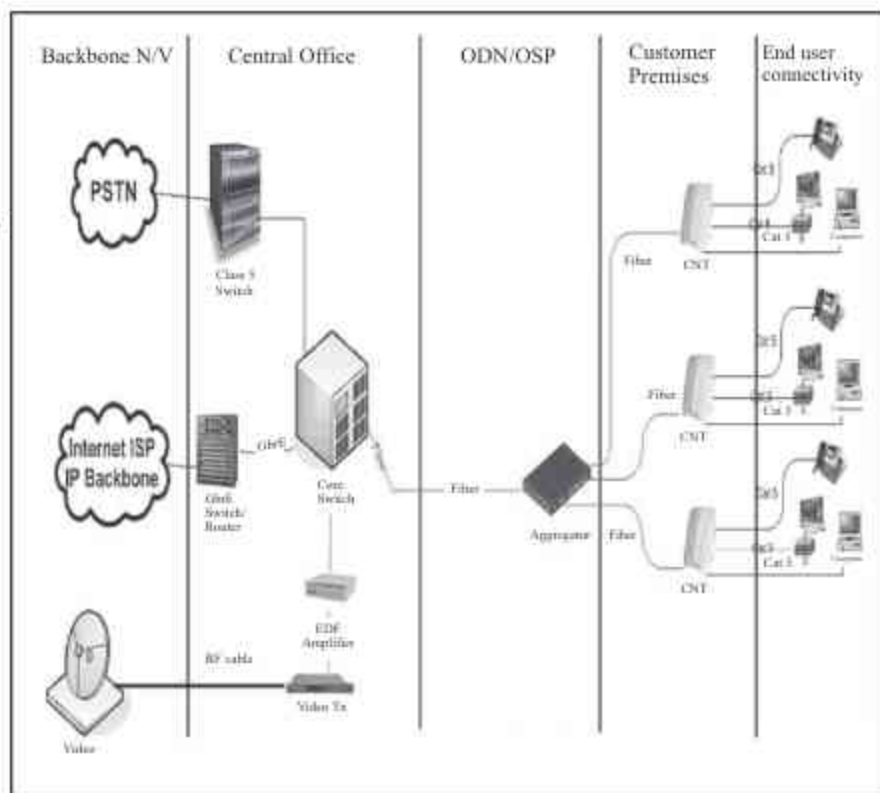


Figure 1 : Active Ethernet FTTH Typical Architecture

## PON Technology

Each customer is connected into the optical network via a passive optical splitter, therefore, no active electronics in the distribution network and bandwidth is shared from the feeder to the drop. The advantage of FTTH PON is the fact that they use purely optical passive components that can withstand severe and demanding outside plant environment conditions without the need to consume energy between in the central office exchange and the customer premises. The benefit to telecom operators is that low maintenance requirements of these passive optical components will significantly reduce of the cost of upgrades and operating expenditures. There are different PON Technologies available today.

### APON/BPON

ATM Passive Optical Network, APON was initiated in 1995 by ITU/FSAN and standardized as ITU-T G.983. In 1999, ITU adopted FSAN's APON standard. APON was the first PON based technology developed for FTTH deployment as most of the legacy network infrastructure was ATM based. Since the services offered by this architecture are not only the ATM based serviced but also video distribution, leased line services and Ethernet access and to express the broadband capability of PON systems APON was renamed as BPON. Broadband Passive Optical Network (BPON) was standardized by ITU recommendations G.983.1, G.983.2. BPON has two key advantages, first it provides 3<sup>rd</sup> wavelength for video services, and second it is a stable standard that re-uses ATM infrastructure.

### EPON

Ethernet equipment vendors formed Ethernet in the First Mile Alliance (EFMA) to work on architecture for FTTH as Ethernet is a dominant protocol in Local Area Network. EPON based Wavelength Division Multiplexing Passive Optical Network (WDM PON) is the next generation in development of access networks and offer highest bandwidth. . In WDM PON architecture ONTs operate on different wavelengths and hence higher transmission rates can be achieved. Much research was focused on enhancing WDM PONs ability to serve larger numbers of customers in attempt to increase revenue from invested resources. As a result, some hybrid structures have been proposed where both WDMA and TDMA modes are used to increase the number of potential users.

### GPON

Gigabit Passive Optical Network (GPON) standardization work was initiated by FSAN in the year 2001 for designing networks over 1Gbps. GPON architecture offers converged data and voice services at up to 2.5 Gbps. GPON enables transport of multiple services in their native format, specifically TDM and data. In order to enable easy transition from BPON to GPON, many functions of BPON are reused for GPON. In January 2003, the GPON standards were ratified by ITU-T and are known as ITU-T Recommendations G.984.1, G.984.2 and G.984.3. The GPON's uses Generic Framing Procedure (GFP) protocol to provide support for both voice and data oriented services. A big advantage of GPON over other schemes is that interfaces to all the main services are provided and in GFP enabled networks packets belonging to different protocols can be transmitted in their native formats.



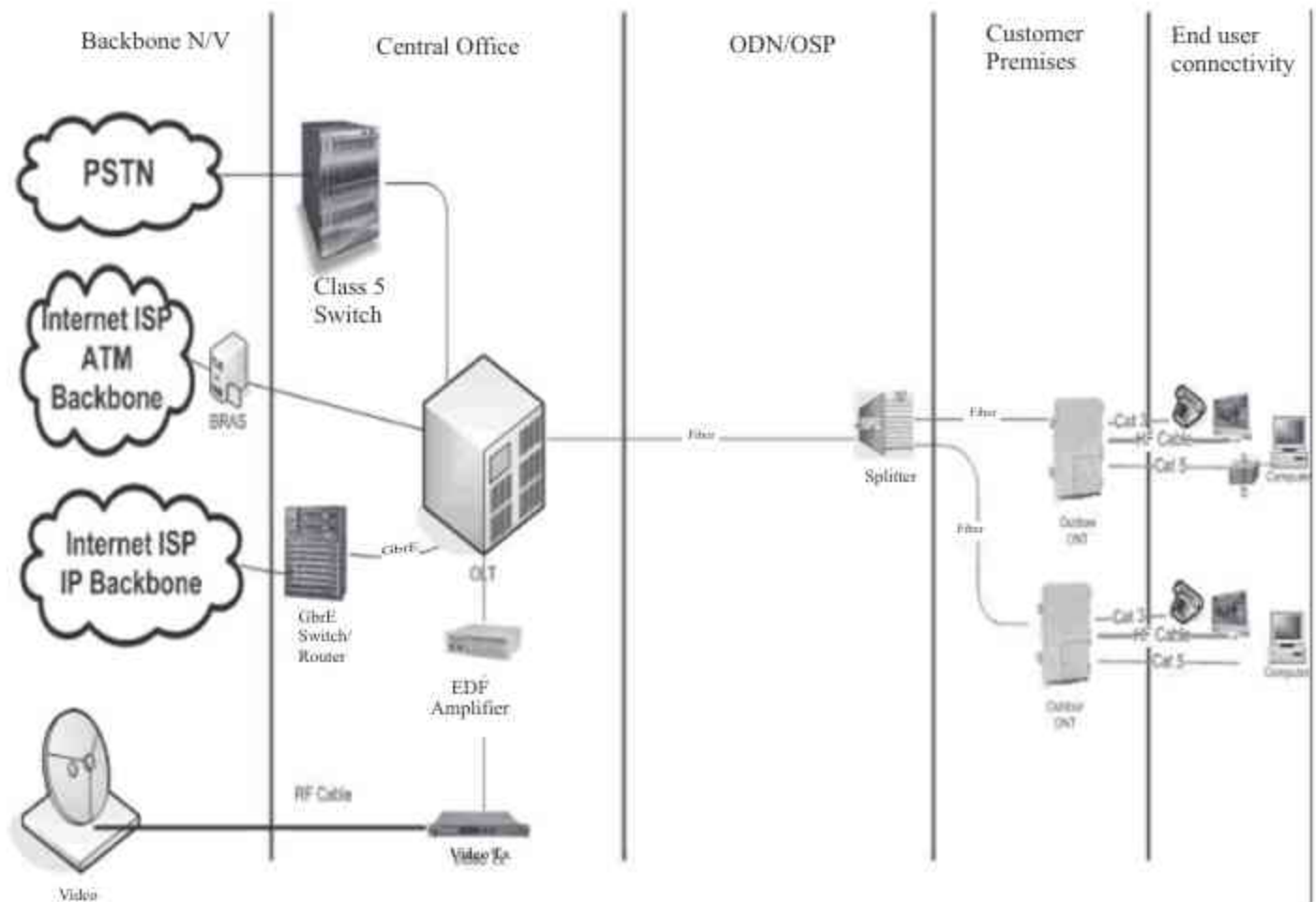


Figure 2 : Typical PON Network Architecture

### The Need for FTTH

FTTH is ideal fiber-optics architecture. In this architecture the fiber is carried all the way to the customer's home. Following are the reasons why it was required.

The traditionally used Copper and Coaxial cable are now replaced by optical fibers:-

- 1) To provide the most robust, secure and cost-effective solution for bringing truly high-speed broadband to individual homes.
- 2) To fulfill the consumer demand for the vast demand of multimedia services and applications.
- 3) To offer unlimited bandwidth.
- 4) Flexibility to meet customer demand for two-way, interactive, video based services.
- 5) Optical fibers provide high security in comparison to Coaxial and Copper cables.
- 6) Optical Fibers require significantly less maintenance and have longer life time.

After traditional broadband technologies Fiber-Optic Technology delivers:-

- a) Internet, voice and video at lightning-fast speeds - from 2M to 100M bit/sec and beyond.
- b) On a fiber-optic network, data is transmitted as light impulses.
- c) Unlike copper cabling, Optical fiber is not subject to electromagnetic interference because it uses light, not electricity.
- d) Fiber optics can transmit data over much longer distances; 6.2 to 49.6 miles over single-mode Fiber-optic cabling vs. a few thousand feet for copper cabling.



## Risks in FTTH Deployment

### Risks involved regarding revenue

#### 1. Market Size

Where the potential number of customers is very low, the high fixed costs make it very difficult to make a feasible business case. The greater the number of potential customers, the less the fixed central costs are an issue in any business case. Whatever the method of building fiber around a town or city, the average length of fiber per home passed will have a serious effect on the financing. Individual homes will clearly be the highest cost to connect whilst large apartment blocks will be the cheapest.

#### 2. Market Prices

The average revenue per user will be dependent upon broadband, television, phone and some additional services which might be provided. The per capita income of the customer plays a major role as the customers should have the potential to afford the services which are provided otherwise there is no point in launching and providing the services to that particular segment. The target market segment should be people with high per capita income.

#### 3. Competition

The competitors can not only be the other FTTH players in a matured or a new market but an established rival cable television network is a potentially much more serious competitor. Also the dominant direct to home i.e. DTH is another competitor which can be a risk to the FTTH deployment.

#### 4. Market Maturity

If there are no more killer applications which have been introduced in the market and customers are not demanding more bandwidth i.e. they have reached the saturation on consumption of bandwidth then it is a potential risk to the fiber to the home whose backbone lies in the fact of providing unlimited bandwidth to the customers.

### Risks involved regarding Operations

#### 1. Construction Methodology

Connecting a central office to individual homes and businesses is a major part of the Capital expenditure in a fiber network. Although there is always a fiber between the central hub and the customers, the way that this is routed will have a major impact on construction cost.

The lowest cost solution where there is no existing build is an aerial route, where power (or similar) poles are used to string the fiber between. This clearly plays into the hands of any utility companies that want to be part of a fiber based business. A similar approach that may be used in some countries for short lengths connecting buildings to the passing trunk fiber is stapling. Here the fiber is literally passed around the outside of the building and stapled in place. Where the above is not possible, the fiber will need to be dug. This can be done using a shallow digging approach called micro-trenching (at about twice the price per meter of aerial) or a deeper, full trench method (doubling the price again at least). The state of the existing pavements will impact these costs for digging. If ducts are already in place for part of the route, then blowing fiber through them will eliminate most of the cost over that length.

## 2. Operations assessment for IT Systems

We have seen many larger operators waste millions on IT systems and are still not able to operate in the way they wish. For smaller FTTH projects it is less of an issue but with multiple partners or your own services to develop, bill and value added features like video on demand to provide for, then there is potentially an awful lot of complexity which generally means large fees to IT consultants.

The telecom OSS (operations support system) space is mature and highly competitive, and so many specific elements or indeed the whole system may be outsourced or have already been created somewhere else.

## 3. Complexity of Competitive Offerings

There is a hidden cost of complexity faced by multi-service operators. Where you only have one product offering, the amount of training required for the customer support team is limited and the complexity of the IT systems is similarly reduced. As more variations are added for each service, the potential for subscribers wishing to change their service or simply having a question is increased. The time required for explanations on the phone go up. There is more time needed to stop one service and start the next one for a subscriber. Bills, websites and all systems are more complicated. Overall, the potential for errors goes up. For these reasons, the simpler the competitive environment you are entering, the better it will be for your project. The more you intend to spend creating perfect systems or low utilization assets for advanced services, the more risk prone the project could become.

## Recommendations for FTTH Deployment

### 1. Revenue Generation

In the context of a new fiber network, ARPU may be built up from up to three elements:

- Broadband
- Phone
- Television

Each of these may include some fixed element and then extra cost for additional services. Each of these elements will have their own ARPU trend. Phone ARPU's are in decline as Voice over Internet Protocol (VoIP) and IP telephony erode the copper line based revenues of traditional telecoms players. ARPU's for broadband are expected to begin to fall in future. Television's ARPU trend will vary from country to country but there is frequently a belief that revenues for Video on Demand will supplement normal multicast programming. So focus on revenue has to be from Video on Demand.

### 2. Channels or Existing Customer Base

In selling directly to residential subscribers, there are typical costs that companies pay to acquire new customers (advertising, leafleting, PR, sales commissions). It is rare for these costs to amount to less than a month's revenue and more usually the cost is equal to two or even three months revenue. A company that has an existing customer base has a two-fold advantage in that they have a reputation already and have opportunities to publicize the new fiber services. The twin benefits of familiarity and lower costs to inform the customer are an advantage compared to a completely new brand. This advantage results in lower operating expenses to acquire new customers, perhaps in higher take-up and improved margins.

### 3. Choosing the Right Market

The maturity of broadband and triple play local markets varies greatly across Europe. On the one hand, in Greece there is no cable television and ADSL only became widely available and affordable in last few years. On the other hand in Sweden there are many areas where FTTH and cable compete and ADSL has been squeezed

out as the accepted definition of broadband has become 100 MBit/s.

In general, it is easier to gain traction in a growing market, it is also entirely possible to migrate a local market from lower broadband speeds to true broadband. At least customers appreciate the proposition.

#### **4. Construction scenario**

It is efficient to lay sufficient fiber during initial construction to support all subscribers in a community, even if only a fraction of them initially sign-up for service. The cost of trenching or making poles ready (for aerial built) is prohibitively high to go back and retrofit fiber as more homes subscribe to the service. By contrast, the drop loop and the Optical Networking Unit (ONU) can be provisioned as users sign-up for service. OLT and remote node electronics can also be deployed based on penetration.

#### **5. Initial Projects**

An initial pilot must be in the large apartment blocks or the city's "enterprise zone," in the heart of the business district, where city offices and business need are most common. That's an intelligent way to start, getting the biggest bang for the buck in high-density areas.

### **Proposed Business Model for FTTH**

#### **Build Own Operate (BOO) + Revenue Sharing**

With the build-own-operate, the company is granted the right to develop, finance, design, build, own, operate, and maintain the project. So company will be acting as a network provider here and will come in revenue sharing agreement with the service provider for using company's infrastructure.

#### **Operation and Maintenance**

The operating expense will be taken care of by the company. It will maintain the infrastructure so provided. The benefit is that these passive optical components have low maintenance requirements.

#### **Revenue Generation**

The company will act only as a network provider; the share on revenue that company will demand from the service provider is the revenue for it.

Revenue resources are proposed through deployment of FTTH through fiber in future where current broadband services are provided through copper cable. The enhanced data rates will surely get more customers. The revenue sharing is the feasible option with the service providers. The sharing terms can be worked out on the basis of negotiations. It's the task of service provider to come in agreement with the content provider and this third party involvement for the company will not be a problem as it will add into the revenue.

Here, in case the service provider comes in revenue sharing terms with a content provider, then company will have nothing to do with the terms and conditions of the third party revenue sharing. It will act solely as a network provider and will keep taking its 50% revenue share.

#### **Suggestions**

The network used here can cater to 2000 homes with the only extra cost being involved is that of PON cards. One PON card can cater to  $4 \times 32 = 128$  homes, i.e. to say that network can be expanded without much cost being involved. The cost of a single PON card is Rs 700000. Therefore for every 128 homes, the only cost involved from company's side is that of this small amount compared to the potential revenue that can be generated.

## Business Case

In this case, deployment of Fiber to the Home (FTTH) in a Greenfield project i.e. an apartment having 200 flats is considered. So the company will be providing FTTH infrastructure to 200 homes. It is assumed that the monthly payments are made by all the flats.

The Customer Premise Equipment (CPE) cost is supposed to be collected from the builder while giving 2 options to pay back, either one time full payment or in installments. So this will remove the company's CPE cost from the Capex and will not be considered in calculations. It will also add up as an additional source of revenue for the company, but it has not been included in the calculations.

Here, the company is a network provider and it will partner with a service provider who will be providing services like high speed broadband, IPTV, Time Shifted Television, Video on Demand, Online Gaming. The Company will be getting into a revenue sharing agreement where it will be collecting 50% of the revenue. The Break Even will be achieved within a span of 3 years as shown in the calculations below:

Material Description	Amount
Splitter (1*4)	425000
Splitter (1*8)	87500
Fiber Termination Boxes-2f	440000
SC-APC pigtail	46000
Fiber Distribution Management System	62500
OLT and Allied Accessories	2500000
PON Cards	1400000
Optical Transmitter	35000
Optical EDFA- 18dBm Amplifier	50000
SC-APC patch cords	4200
UTP patch cords	3000
Layer 2 LAN Switch	250000
VOIP Gateway	1500000
SIP PROXY	72000
Optical Fiber Cable 12 core	80000
Optical Fiber Cable 6 core	66000
Installation and Commissioning of OLT and ONU equipment + Equipment Testing and demonstration of services	300000
Optical Fiber Cable Laying, Fiber splicing, Fiber termination etc.	600000
Misc. Expenditure	30000
<b>TOTAL CAPEX</b>	<b>8221200</b>

<b>TOTAL OPEX</b>	1000000	1000000	1000000	1000000	1000000
<b>TOTAL CAPEX + OPEX</b>	9221200	1000000	1000000	1000000	1000000
<b>Source of Revenue</b>					
No. Of Homes	200				
Charges per home per month	3300				
Charges per annum	7920000				
Company's Share (50% of the Revenue)	396000	396000	396000	396000	396000
<b>Company's Cumulative Profit</b>	<b>Year 1</b> -5261200	<b>Year 2</b> -2301200	<b>Year 3</b> 658800	<b>Year 4</b> 3618800	<b>Year 5</b> 6578800
Partner's Revenue(50%)	396000	396000	396000	396000	396000
Partner's Cumulative Profit	396000	7920000	11880000	15840000	19800000

## Conclusion

Here, a company is able to reach break even within a span of 3 years, which is considered to be a competitive period for a company of this field.

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## WiMAX for Rural Connectivity

### By

Mr. Arvind Puri  
 II<sup>nd</sup> year Student MBA- TM  
 (Marketing & Finance), SITM  
 Email id: puriarvind@gmail.com

### Abstract

The telecom network in India is the fifth largest network in the world meeting up with global standards. Presently, the Indian telecom industry is slated to an estimated contribution of nearly 1% to India's GDP. Switching away from copper lines, wireless mobile networks have come to the forefront and are still dominating the Indian telecom market. The already sunshine industry is seeing the appearance of WiMAX in India.

India with its diverse geographies and huge demographics is forcing operators to consider the WiMAX route, which offers lower costs, easier time to deploy, better bandwidth, and greater coverage areas. As of now, WiMAX deployments have been taking place in the 3.3 GHz spectrum, and mostly in trial mode. Some operators have some corporate clients.

### Literature review done before starting the Project

The various reports of Confederation of Indian Industry(CII) were studied thoroughly before starting this project like the report on 3G Networks, Broadband Vision 2010, Yearly reports of the Aspen Institute USA and India and many other similar reports undertaken by Confederation of Indian Industry from time to time. These reports enabled us to gain a holistic view of the rural connectivity needs and extrapolate the existing models to tailor made solutions for Rural Coverage.

### Background

India started its economic liberalization program in 1991. In 1994, the first step to opening the telecom market to privatization was taken. The first private sector wire line and cellular licenses were issued in 1995. From then on, Indian telecom has seen several milestones crossed and suffered many stumbles on the way that provided valuable lessons. The effective telecom tariff for domestic voice service has dropped from Rs 14 per minute to about Rs 0.50 per minute in the last 10 years. The result is that the number of telephone connections (wireline and wireless lines) has doubled in the past three years, to about 200 million. The Ministry of Telecom has set a target for 2007 of about 250 million connections and mobile coverage for 85% of the country's geographical area, from about 30% today. India now has crossed the 200 million subscribers including both fixed subscribers and mobile subscribers early in 2007. That may seem like a large figure, but with a population of 1.08 billion, it translates to just 14 phones for every 100 people. And that number is skewed by the relative wealth of the cities - while urban teledensity is around 31 percent, just 2 percent of the rural population has phone lines. With India's expanding middle class, demand for telephone services is growing beyond carriers' ability to keep up.

With respect to rural connectivity, the government's objective is to reach about 50 million rural connections, or one phone per three rural households, by 2007 and about 80 million rural connections, or one phone per two rural households, by 2010.

### Methodology Used

The project work was carried out mainly through Secondary resources. Most of the project data has been attained by reviewing the market research available on broadband wireless access in India, including:

- Confederation of Indian Industry reports and surveys

- Numerous articles in magazines and newspapers
- TRAI website
- Indian ISP Association
- WiMAX Forum White Papers
- And many more sources mentioned in the report

Apart from this, the business model was proposed based on an interview with Ms. Sonia Garga of Telsima Communications Pvt. Ltd.

## Analysis & Proposed Business Model

### Explanation

- 1) The business model was made for covering atleast 10 villages from two base stations with 2 MB/s backhaul each.
- 2) Initially in the Year 1, it is proposed to put up 2 Base stations which are four sector high gain antennas, so as to have maximum coverage area.
- 3) The target for the first year is 25 consumers spread over around 15-20 villages. Mainly these consumers would be the village kiosk operators, as individual ownership is difficult in these areas.
- 4) Then the increase in customer base would be due to addition of Primary Health Centers (PHCs), Village Schools and educational institutes and lone individual customers.
- 5) The bandwidth would be taken from BSNL on lease basis.
- 6) The equipment used is of Telsima Communications Pvt. Ltd. and the rates are taken as tentative ones, as stated in an interview with Ms Sonia Garga, Telsima Corporation.
- 7) It is proposed to have two base stations, which would cover a radius of about 12-15 kilometers.

Service Area Information	Year 1	Year 2	Year 3	Year 4	Year 5
No. of Consumers(hit rate)	25	35	50	60	65
Fixed revenue per subscriber per month(Rs.)	1500	1500	1500	1500	1500
Voice Revenue Per Kiosk (considering 15 kiosks in 1st 2 years to 35 kiosks in last 3 years) (Rs. 100 per day per kiosk)	45000	45000	105000	105000	105000
<b>Equipment Pricing</b>					
4 sector high gain base station price(Rs.)	1200000				
price reduction - base station(in%)	0	0	0	0	0
base station price with price reduction	1200000				
back haul link per base station(Rs.)	200000				
NMS(Rs.)	4500				
<b>Equipment required Incremental</b>					
No. of base stations	2				
backhaul	2				

<b>Funding required</b>					
Total BTS	2400000				
Backhaul	400000				
Bandwidth tariff(2 MBps for 15Kms)	66688	66688	66688	66688	66688
<b>OPEX</b>					
Salaries	100000	110000	121000	133100	146100
Power Backup per BTS per month(Rs.)	10800	10800	10800	10800	10800
Total Power Backup for total BTS	259200	259200	259200	259200	259200
site required(for total no. of BTS)	144000	144000	144000	144000	144000
Office rent(per annum)	100000	110000	121000	133100	146100
Misc. Expenditure	100000	100000	100000	100000	100000
<b>Total CAPEX + OPEX</b>	3574388	789932	811888	836088	873508
<b>CUMULATIVE CAPEX + OPEX</b>	3574388	4364320	5176208	6012296	6885804
<b>Revenue</b>					
revenue-incremental	990000	1170000	2160000	2340000	2430000
revenue-cumulative	990000	2160000	4320000	6660000	9090000
<b>PROFIT</b>	-2584388	-2204320	-856208	647704	2204196

### Analysis

1. Based on the type of area (Urban, Suburban, and Rural) will determine your cell height. The cell height and topography (dense trees, desert, flat, hilly, etc) will determine your cell radius. In rural areas for providing wider coverage, we will have to deploy high-rise antennas.
2. There are risks involved for companies who are the first to enter the market: releasing services that aren't technologically mature.
3. Despite tremendous hype around WiMAX, the WiMAX chipset market has a relatively small number of established players like Intel, as the market is quite nascent.
4. Carriers cannot take the risk of deploying a product or solution that promises to reduce its cost sometime in the future and not right away.
5. Handheld devices are expected to be in the higher price range of around Rs.40, 000.00 initially, which does not justify the migration to Mobile WiMAX.
6. The market opportunities for WiMAX will take time to develop while the economics and performance of the technology, in particular in a mobile environment, are less certain.
7. Unlike Wi-Fi, the initial adoption of WiMAX and the subsequent trend toward attractive price points and more widespread usage is heavily dependent upon the success of the operator business model.

8. WiMAX deployments in rural areas can help to tap in the unserved demographic and geographic segments. These network rollouts have to be backed by new and innovative content development, especially the region specific content in the local language.
9. Companies may have to work on very meager returns initially, though the returns are expected to grow with increase in both quality and quantity of services offered.
10. Addressing the rural market a good business decision, as the investments are low and the break-even periods are not very high.
11. License free spectrum can be used in rural areas but it encourages more competition as well as the QoS is not guaranteed.
12. As the licensing is given on the basis of circles and not region wise, therefore the cost of the licensed spectrum can be recovered from the urban areas itself. Thus serving the rural areas gives added advantage to the operators by boosting their profits.

### Conclusion & Recommendations

1. Deploying WiMAX equipment today provides carriers with the time and flexibility to choose the WiMAX profile (802.16d or 802.16e) whichever best suits their business case. There is also a provision of dual compatibility given by some equipment vendors which enables operators to use the same equipments for both "d" and "e" standards.
2. If an operator chooses to cherry-pick regions for deployment, the lower density and underserved areas require less initial investment, provide a faster payback and can be deployed with license-exempt spectrum with minimal risk of interference. This also provides a new operator the opportunity to build a reputation for quality of service in a low risk environment before deploying in the more highly competitive urban areas.
3. In rural areas without ADSL it is easier to gain market share, however the users per square km are low. In these areas it is suggested to deploy Fixed WiMAX with high Gain Antennas at the CPE to enable a large cell radius. Even though this will involve additional installation costs for an outdoor antenna, it may reduce the overall Opex per subscriber since more subscribers could be added per site (due to the larger cell radius).
4. For covering the rural areas, government should give incentives to the private operators to encourage them to take the initiative. Adequate use of USO fund is the imperative of the hour on the part of the government.
5. Government subsidized CPEs can be provided to the rural consumers so as to encourage the use of WiMAX by more and more of population. A standard subscriber station or a CPE cost anywhere around Rs. 12,000.00 to Rs. 15,000.00 and it is expected to come down to around Rs. 4,500.00 in coming years.
6. Subsidy can also be extended to the computer equipment required for accessing Internet. Easy loans from government banks should also be made available so as to help increase the PC penetration.
7. Efforts to make the new generations literate should also include computer literacy programmes, so that the majority of Indian population can enjoy the fruits of ICT.
8. Encouraging of e-governance, telemedicine, VoIP services, etc. would act as an enabler for proliferation of the ICT services via WiMAX in rural areas. The problem here is that most of the projects are in the pilot stages and even though some of them are very successful; the same model is not replicated and does not become scalable. Example of 'Bhoomi', a project of Karnataka government for digitization of land records was a big success; but the model was not taken up on a larger scale to other states. The need of the hour is to make these pilot projects scalable with the help of ICT.

## Managed Analytic Services

By

Mr. Ravikanth Ivaturi,  
Process Consultant,  
Siemens Information Systems Kolkata

Ms. Mugdha Jain,  
II<sup>nd</sup> year Student MBA- TM  
(Systems & Finance), SITM  
Email id: mugdhajain2002@gmail.com

### Abstract

Managed Analytics is an integrated set of offerings of managed services aimed at improving companies' ability to acquire, grow and retain the right customers. As such, it becomes an integrated platform solution for companies seeking profitable organic growth. By utilizing the measurements garnered from Managed Analytics solutions, marketers can then offer fact-based recommendations that can be applied directly to a company's overarching marketing strategy and/or to an agency's client list. For example, marketers can suggest how to best attract and retain customers, enhance products, prioritize sales efforts, price effectively and much more.

In the information flow of any organization the data is acquired from various data sources and extracted using various data warehousing tools given by various users and departments. But in such a flow the manual part of data processing is very significant which affect the time line, cost and revenues of any organization. When the analytics piece is added to the whole flow any automated part increases the speed up to 60 times. And the whole cycle of extraction, planning, execution and analysis is accelerated not only reducing the whole time line but also increasing revenues and reducing OPEX.

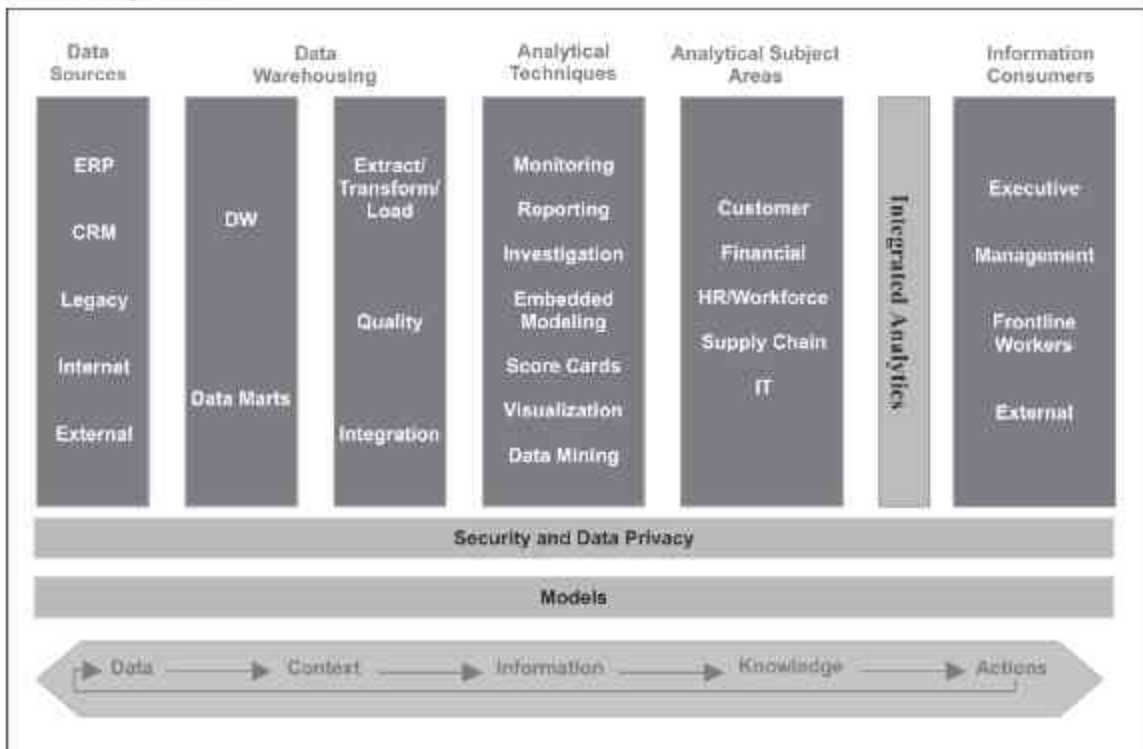


Figure1. Analytics Work Flow Model



With analytics implementation in an organization there can be a refined data management and results that can be better analyzed and produce better results. With sectors like telecom and finance dealing with huge data, they need tools to manage data as well as interpret that data accurately and take right actions at the right time. At the same time the job needs to be done with very less cost of ownership and reduced OPEX and should increase the revenues noticeably. The solution can be outsourcing the job of managing the IT resources to a managed service provider who provides managed analytic services with more expertise and less cost. The companies can concentrate on their core processes outsourcing the support processes to the managed service provider. Similar models have been followed by various telco operators in India like Bharti Airtel and Idea, outsourcing their IT operations to IBM. There exists more opportunity in Tier 2 or Tier 3 markets than before, because now more than ever it is possible to create software that's scalable to companies of any size. Tier 3 an increasingly attractive market will look to lower price points through managed services or outsource models for the solutions they've deployed at Tier 1s.

The scope of managed analytics is growing due to the following reasons:

- Faster Return on Investment
- Reduced OPEX
- Increased Revenues
- Low Cost of Ownership
- Reduced churn rate
- Better decision making

The categorical growth of BI tools and application is shown below. The major part is in applications and is driven by the BI applications in the applications category. While the analytic tools with modules specific to supply chain, services, CRM, BPM, etc. also shows a noticeable growth year on year. As seen in the figure the year on year growth of analytic applications, the predictions are obvious. The Business tools and applications market is predicted to grow to 26.6 billion by 2010. The Indian BI market is pegged at \$47.4million by Frost and Sullivan lead by BFSI (41 percent), IT/ITeS (14 percent) and telecom (12 percent) verticals. With the first stage of IT adoptions by the Indian organizations, they are now looking at analytical tools like BI. India remains the key market after China in the APAC region. There is also a rapid adoption of contact center speech analytics applications, with a growth rate of 120% in 2006 and 100% in 2007.

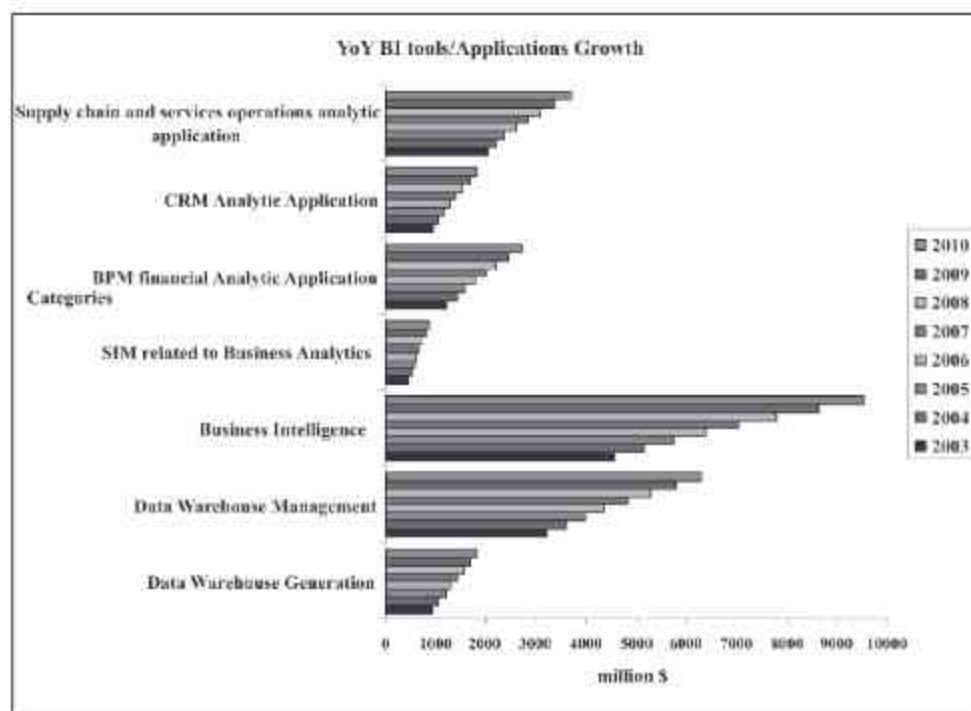


Figure2.

Source: IDC#203654 October 2006

There are many areas where analytic services can reduce the cost of operations and help in increasing revenues. The customer churn is increasing day by day, as well as the data reporting. Querying and analysis is a very humongous task when dealing with large data, contact centers require new ways to service customers, score carding, finding premium customers, etc., billing operations need to find the revenue leakage points. So telecom operators need various kinds of services like data analytics, contact center analytics, billing analytics, customer analytics, marketing analytics, financial analytics, churn analytics, work force analytics, etc.

The strength of BPO's is also increasing day by day as well as the data they need to manage ranges from 10 terabytes to 20 terabytes. Each person approximately takes 600 calls a week. So the data managed by contact centers is huge. Using analytic tools reduces the time required by ten times for customer and contact centers data management.

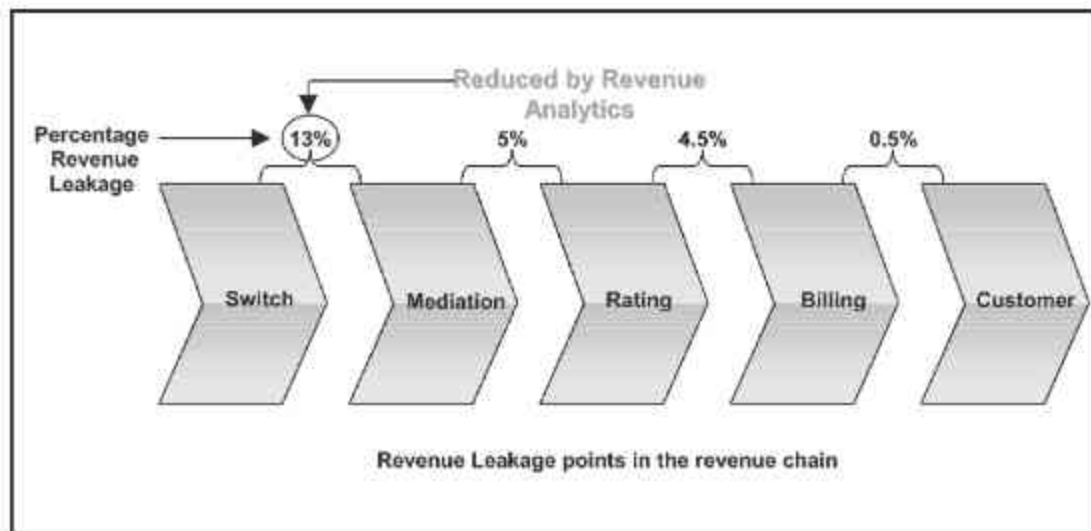


Figure 3

The large number of OSS and BSS systems, along with the introduction of new technologies is combining to create a chaos, which is increasing the proportion of revenue leakage. The industry currently cites a figure of 30% revenue leakage for data communications networks used by wireless operators, and 15-19% leakage in flat rate charges for wire line operators. When payment based on volume and type of content begins, however, the problem is expected to worsen. In short, most leakage is due to failures in collecting and analyzing information, incompatibility between systems such as OSS and BSS, etc. The major leakage is between switch and mediation i.e. 13% leakage and this loss can be reduced using revenue analytics.

Although 80% of telcos have rolled out Inbound Customer Marketing (ICM) systems at call centers, only 21% and 25% have employed similar methods via Web and retail channels respectively. An integrated, best-of-breed approach to ICM has been proven to be highly effective, with a leading mobile operator achieving sales conversion rates of 50% for its inbound marketing campaigns. An enterprise marketing system can be implemented to provide multi-channel, multi-wave campaign management and to help design, test, execute and analyze market programs and grow campaign volume by 20%. Though sophisticated marketing methods are available today and they can target some of the biggest business challenges telcos face, such as low ARPU, high customer churn, and long time-to-market for new offers, yet operators are still missing a trick here. So it can be said that though the ICM can be changed into sophisticated marketing but due to unwillingness of telcos to adapt to those, the churn rate is still maintained. The scope of marketing analytics can be seen here where the analytic service provider, keeping into consideration the prevailing churn rate can change the marketing processes.

The monthly churn rate that Indian operators grapple with ranges from 3.5% to 6%. That means around 3.5 - 6% of

wireless customers move from one operator to another every month. The study found that it costs 133% more to sell new accounts than retaining existing ones. Taking a hypothetical example:

Caption	Value
Subscriber Base	30mn
Annual Churn [%]	30%(2.5% per month)
Annual Churn [# Subscriber Base]	1.5mn
ARPU per Six Months	\$270(\$45 per month)
Total Revenue Loss Per Year	\$405mn
Total Customer Acquisition Cost	\$310
Total Revenue Loss Per Year	\$465mn
Total Bottom Line Impact Of Churn Per Year	\$870mn

Figure 4.Effect due to Customer Churn

So the percentage increase in cost due to cost incurred in acquiring new customers does the subscriber base generate 10.75% of the total revenues.

Companies deploying advanced customer acquisition platforms (customer analytics) generally see a return on investment (ROI) across multiple performance dimensions.

#### Examples of customer acquisition ROI

- 50% increase in annual postpaid activation rate
- 35% reduction in manual review rates
- 15% reduction in application processing costs
- 15% reduction in risk and fraud rates
- 25% faster implementation of business policy changes

The benefits of analytics are seen in various areas:

#### 1. Marketing benefits

Several campaigns have achieved double-digit response rates. Overall profit per booked account is up by 35% and profit per campaign by 10%. The companies can also boost gross adds and new revenues by increasing campaign frequency from 2-3 per month to 15-20 per month, the reason being the decrease in cycle times for data integration and campaign planning, execution and analysis.

#### 2. Customer acquisition benefits

It can achieve a 50% reduction in fraud losses and a 38% reduction in net bad debt. The company's account charge off rate may drop from 3% to 2.75%. In addition, a 10% increase in approval rate and a reduction in application processing costs by 30%.

#### 3. Customer management benefits

Ongoing detection enables the companies to reduce net bad debt by 38% and fraud by 50%. ASL reassessment may increase profit per account by 12%. The company's churn rate improves by 20% and its retention costs are down 50%. Retention and cross-sell initiatives boost ARPU by 5% in 12 months. Monthly collections operating costs may go down

by 35%.

#### 4. Operations benefits

With the ability to act before network problems occur, the company will now be able to reduce network down time substantially. The company can identify and correct, or prevent, substantial revenue leakage.

So, to conclude the customer can increase the revenues by the various analytic services by paying only a very small portion of the revenue. Reducing the customer churn and acquiring new customers is the first requirement of any competitive market operator. It is no wonder, given the importance of the decision and all the challenges affecting it, that customer acquisition is one of the best places for service providers to focus analytics and decision automation technology. By adjusting the levers of profitability within the customer acquisition process, providers can achieve significant results. In fact, companies deploying advanced customer acquisition platforms generally see a return on investment (ROI) across multiple performance dimensions. On the other hand the managed analytic service provider earns the same by owning analytic solution, which can be used for various customers simultaneously.

#### Literature review done before starting with the project:

The study is done using the statistics of telecommunications industry all over the world. The market growth of analytic services is studied considering all parts of the globe. The financial analysis is done taking industry standards as certain assumptions. The inputs for the analysis are taken according to India. The case study is done using the statistics of Indian telecom market. The service offerings of various solution vendors and service providers are studied not specific to any particular region.

#### Methodology:

The study is based totally on secondary resources (Siemens, Internet and Industry Research Reports). To complete the study it is necessary to understand SaaS and different services provided under it. Analytics as a service offering,





## Results and Analysis:

Analytics play a direct role in decreasing the OPEX and increase the revenues which are a major cause of concern of various telcos. The key areas where the revenue impact can be seen are

- Customer Churn: Cost of acquisition is very high, revenue per user is lost
  - Revenues increased due to analytics is 1.5%
  - Cost reduced due to analytics is 4.8% (by reducing 2% churn rate).
- Subscriber Acquisition Cost: Reduced Application processing cost, increased decision automation, risk management (decrease in bad rates), increased approval rates
  - It can reduce the SAC for a wireless operator up to 30%
- Better Customer Management
  - Revenues increased due to analytics is 2.8%
- Decreased revenue leakage: 7-25% of provisioned services are not billed and the revenue loss due to failure of billing one call per month per subscriber is 1.5%. SO one can realize the revenue leakage in the revenue chain where major leakage of 13%, which accounts to be the cause of 56% of the leakage is between the switch and mediation.
  - Revenues increased due to analytics is 3%
- Marketing Analytics: Increasing campaign frequency, automated decisioning, segmenting and targeting are The results of marketing analytics which results into the following
  - Overall profit per account is up by 35%, profit per campaign is up by 10%.
  - Revenues increased due to analytics is 1.6%
  - Sales conversion rates of 50% when operators are using Inbound Customer Marketing

## Conclusion:

The result shown above is the immediate future of the telecommunications industry. The way the above business is carried on is the way leading carriers are beginning to operate with greatly improved precision, insight and control despite ever-increasing change, complexity and speed. The company, which carries out such a kind of business, is created on the basis of the capabilities and benefits analytic services are delivering today.

Telecommunications companies today are undergoing a transformation that will enable them to thrive amidst new markets, business models, services and competitors. To compete aggressively for market share, the companies must be able to make complex decisions about individual customers in real time with extreme accuracy. To achieve the requisite cost structure and improve earnings, they must also streamline processes across the customer lifecycle and ensure booked revenue is showing up on the bottom line.

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## Tertiary Revenue Enhancement in Rural Telephony Business

### By

Mr. Nipun Malik,  
II<sup>nd</sup> year Student MBA- TM  
(Marketing & Finance), SITM  
Email id : nipunmalik@gmail.com

Mr. Deepak Kumar Garg  
II<sup>nd</sup> year Student MBA- TM  
(Marketing & Finance), SITM  
Email id : erdeepleo@gmail.com

### Abstract

India has a total of 6,38,499 villages out of which about 44,856 villages are uninhabited as per 2001 census. Around 594,000 inhabited villages' account for 72% of the total population of India. Till date, only 60% of India's geography in terms of telephone penetration has been covered, and a large part of rural geography is yet to be covered. Infrastructure support for mobile services will act as a catalyst for rural growth. The USO initiative of providing services will help in increasing footprint in rural areas.

To augment the penetration throughout India, DoT formed USO Fund which was funded through Universal Access Levy charged @ 5% of Adjusted Gross Revenue (AGR) of telecom service providers. The USO Fund became part of the statute through a 2003 amendment to the Indian Telegraph Act (ITA) 1885, Section 3 (1A) of the ITA, relating to definitions, states: "Universal Service Obligation means the obligation to provide access to basic telegraph services to people in the rural and remote areas at affordable and reasonable prices." Section 9D (2) of the Act states: "The Fund shall be utilized exclusively for meeting the Universal Service Obligation."

As of 30<sup>th</sup> April 2007, a total of about Rs. 15,000 crore had been collected from various operators on account of USO Levy. Out of this, about Rs. 5,100 crore was allocated all of which was disbursed.

USO Fund status as on 30.04.2007			(in Rs. Crore)
Year	Collection	Allocation and Disbursement	Cumulative balance
2002-03	1,653.61	300	1,353.61
2003-04	2,143.22	200	3,296.83
2004-05	3,457.73	1,314.59	5439.97
2005-06	3,533.29	1,766.85	7,206.41
2006-07	4,211.13	1,500.00	9,917.54
<b>Total</b>	<b>14,998.98</b>	<b>5,081.44</b>	<b>9,917.54</b>

Source: Telecom Live- July' 07

Note: For the year 2007-08, Rs. 10.08 crore disbursed against an allotment of Rs. 225 crore out of Rs. 1,800 crore announced in the parliament.

As for the disbursement, Bid among the various cellular operators took place and finally an agreement was signed with BSNL, Reliance Communications Ltd., TTSL and TTML in March'05 for 1685 Short Distance Charging Areas (SDCAs).

One out of the above-mentioned operators won the bid in 42 Secondary Switching Areas (SSAs), out of which 3 SSAs were in Punjab. Under the USO obligation, this operator covered 12 SDCAs in these 3 SSAs. The proposition realized the operator's vision of a substantial growth in demand for its Fixed Wireless Telephones in rural areas, which in turn increased its total Market share.

A unique product was launched under Rural Telephony Business with entry cost of Rs 1,000. Under FWT with life - time incoming free, 33 Paisa INR credit on daily basis for 2 years along with other features. The operator achieved 120000 FWT target under USO by 31<sup>st</sup> March 2007 in one year.

### The problem

Though the operator was able to achieve its target of Direct Exchange Lines (DEL) installation, it was confronted with a unique dilemma. Around 42% of the people in these SSAs having FWT were not recharging their phones and had a balance of less than Rs.5. This was a huge revenue loss for the operator.

Revenue from Recharge Coupon Vouchers is the bread and butter for the Cellular operators and due to various unknown reasons these proceeds were going down for RTB business in Amritsar Cluster. The question, Can operator with these conditions be able to sustain its profits and QoS in villages, had to be answered.

Through this study, we have tried to find out the various causes as to why customers covered under Rural Telephony Business are not recharging their phone sets, which is further causing revenue loss to the operator.

SDCA	Total Customers Activated	Balance Less than Rs. 5/ customer	%age Gap
Batala	14655	6186	42%
Pathankot	10575	4603	44%
Gurdaspur	13477	5426	40%
Quadian	8449	3901	46%
Dinanagar	5711	2235	39%
	<b>52867</b>	<b>22351</b>	<b>42%</b>

### Drop Sheet for Amritsar Cluster

The adjoining table shows the problem faced by the operator in Rural Telephony Business. Out of 7,26,915 Rural Direct Exchange Lines (RDEL)s activated by this operator through out India, 1,17,345 were activated in Punjab. Out of these 1,17,345 RDEL's in Punjab circle, 52,867 we activated in Amritsar cluster.

Out of the total activation in Amritsar cluster, around 22,351 were not regularly recharged which is around 42% of the total activations.

The break up of this 42% gap is also shown in the adjoining table.

The table clearly shows that the maximum gap is in the region of Quadian, which has a gap of 46%. Quadian is closely followed by Pathankot and Batala SDCAs, which accounts for 44% and 42% respectively followed by others.

## **Literature read before starting the project**

- Reports in the behavior of the rural consumers.
- Rural telephony scenario given by TRAI reports.
- Operator's consumer data sheets.
- Detailed reports of non-recharging by the consumer.
- MS Excel data sheets of customer profile for FWP.
- Cellular Network reports for the Punjab region.
- Distributor wise analysis for drop in tertiary revenue.
- Retailer drop out rate in the villages.
- Geography of locations in areas close to International borders.

## **Methodology**

An extensive Market Research was undertaken to find out the various reasons for non-recharging of RTB sets in this circle.

Many villages in the following Tehsils were extensively covered and Individual feedback was taken from the customers as to why are they not recharging their phones.

-Batala      -Dinanagar      -Gurdaspur      -Pathankot      -Quadian

### **1. Criterion for selecting the target segment:**

- Counting cases of most affected villages from MIS
- Short listing based upon high no. of cases
- Selection based upon most critical villages and distributors in the cluster
- Uniform selection of cases from the cluster to reduce sampling error
- Focus to have 3-15 cases per village based upon total no. of cases
- Selecting retailers for mystery calling for various parameters.

### **2. Data gathering through Market survey**

Selected villages in the Amritsar cluster were divided for efficient collection of data in route plan or called beat plan. As the territory covered in the survey was geographically large as some of the villages were at a distance of around 55Km away from the distributor center, an effective planning for deciding route plan for action was very important. As some of the villages were in vicinity of Pakistan border, appropriate care was exercised to avoid any unforeseen circumstances. To reach our target segment effectively and to save time, junior engineers/ Runners was convoyed. RTB customers were directly contacted at their residential locations.

### **3. Quantitative analysis.**

### **4. Arriving at the conclusion.**

### **5. Suggesting the recommendations.**

**Questionnaire RTB**

DEL no. \_\_\_\_\_ Name of customer: \_\_\_\_\_

Profession: \_\_\_\_\_ SDCA: \_\_\_\_\_

1. For how long are you using the phone?

0-3 months ☐ 4-6 months ☐ 7-9 months ☐ 10-12 months ☐

2. Why do you use the phone?

Only for Incoming ☐ Incoming as well as Outgoing ☐

3. What is/are the reason/s for your non-recharging of the phone?

Non-availability of the RCV ☐Problem with the equipment ☐Poor Network Coverage ☐High call rates ☐Others ☐

4. What do you consider about the quality of the network?

Good ☐ Average ☐ Poor ☐

5. Is Operator's retailer present in your area?

Yes ☐ No ☐

6. Are recharge coupons vouchers readily available with these retailers?

Yes ☐ No ☐

7. Are you facing any problem with your phone set?

Yes ☐ No ☐ Sometimes ☐

8. Do you think that RCVs should be available in Rs.10/20/30/50 denominations?

Yes ☐ No ☐

9. Do you use a connection from any other Service Provider?

Yes ☐ No ☐

10. Do you get regular repair service on your call within specific time?

Yes ☐ No ☐ Sometimes ☐

11. Any other suggestions?

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

\_\_\_\_\_

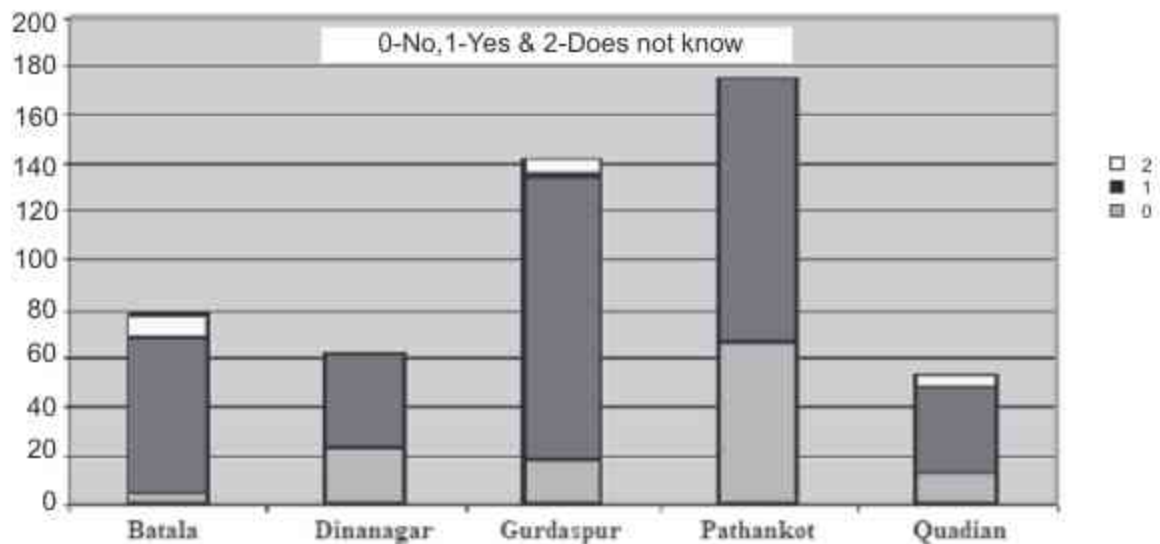
## Results/Analysis

The following were the various causes for non-recharging that came out as a result of the Market Research:

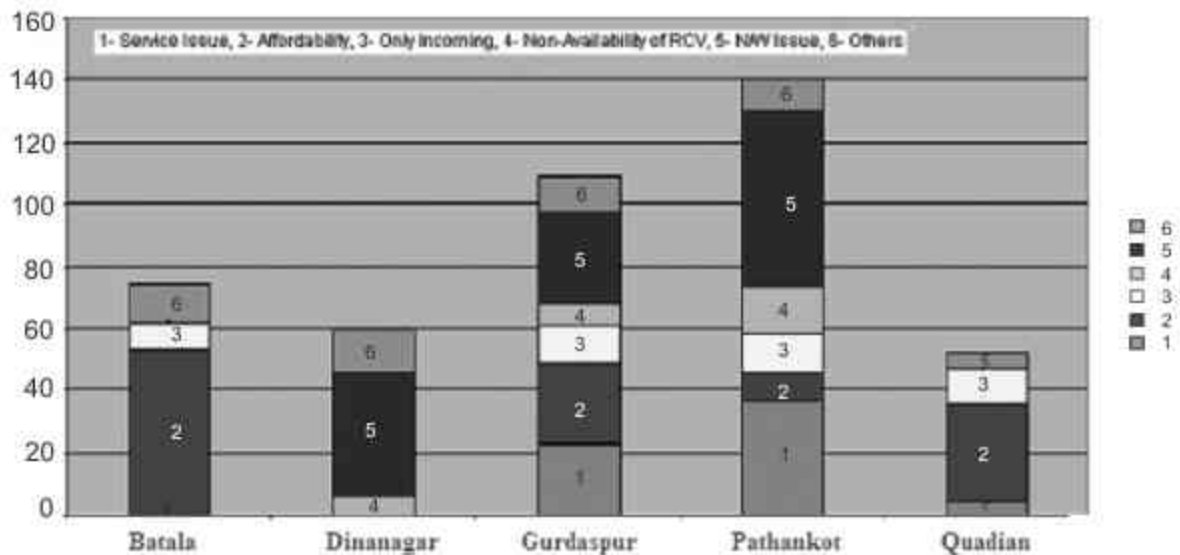
1. Absence of the Operator's retailer in the village.
2. Poor Quality of Operator's Network in the village.
3. Trouble with Phone Set.
4. Non-Availability of Small RCVs (10/20/30/50 denominations).
5. Monetary Problem of the customer.
6. Outsiders/ Neighbours make outgoing calls.
7. People use their Mobile Phones for outgoing calls.
8. Word of Mouth Negative publicity in the villages.

### Some of the graphical representations based upon the research:

#### ► Availability of Recharge coupons vouchers with the retailers



#### ► Problems faced by the various respondents in the Amritsar Cluster:





## Recommendations

- Launch of RCV of Rs. 50 denomination.
- Opening more retail counters as per the requirement.
- Improvement in MarCom.
- Up gradation of the network and enhancement of its quality.
- Replacement of faulty sets.
- Check on Black Marketing of RCVs, Chargers, Di-Poles etc.
- Quick availability of RCV with Retailers.
- Motivation of the Ground team e.g. incentives/awards etc.
- Initiation of e-recharge.
- Proper Accessories availability.
- Collaboration with local NGOs for micro-financing the FWTs.
- Infrastructure Sharing to reduce costs.

## Conclusion

There have been very few telecom networks based applications in rural markets, which can benefit the local community. Unequal access to communications, leading to a huge digital divide between rich and poor, the urban and the rural populace, has only increased the existing divide. Also, different rural geographies display considerable heterogeneity calling for a rural specific and region specific strategy.

Launching services in the Indian hinterland will be a total new experience for the operators. The challenge lies in understanding rural consumers and bringing services specific to that rural audience. A detailed region wise strategy should be formulated and specific targets must be set for rural markets. The Indian Government, along with the cellular operators, has to devise the innovation at rural level and hit a 700 million Bottom of Pyramid market.

High technology at a cheap price along with supply chain support and effective MarCom will definitely drive the volume. Telecom operators can choose from corDECT, WiFi, WiMax, or other technologies for providing access to rural areas. It is true that the rural market has traditional problems of accessibility and availability but once they are empowered with better technology and products, unlocking of the potential revenue in the rural areas will be the prime source of revenue for operators. For now, the service providers have to deliver and wait...

## Village Virtual Network Operator (VVNO)

### By

Mr. Giri Hallur  
Asst. Professor (Telecom)  
SITM, Pune.  
Email id: gghallur@gmail.com

### Abstract

Although as Indians, we can boast of an exponential growth in the number of mobile subscribers, there is, however, a huge disparity in the rural Vs urban teledensity figures. Urban India prides itself at achieving a teledensity of about **45%**, whereas the rural areas display a dismal teledensity figure of about **2%**. The overall teledensity is presently **23.89 %**. (As per Dec 2007 figures released by TRAI)

The Government in association with the regulator i.e. Telecom Regulatory Authority of India (**TRAI**) and the Universal Service Obligation (**USO**) Fund has planned and is implementing a series of measures to lessen the Urban-Rural Digital Divide.

In its recommendation to the Government titled “**Growth of Telecom services in rural India -The Way Forward**” dated October 3, 2005 the TRAI has suggested the following points (i) Govt aid for creation of basic wireless infrastructure through USO Fund (ii) Infrastructure sharing and incentivising Infrastructure Providers for building basic telecom infrastructure in the rural areas (iii) Introduction of a new “Niche Player” license (iv) Reduction in both spectrum as well as transponder fees for VSAT terminals. (v) Reduction in taxes & levies for operators doing business in rural areas.

Inferences from the FMCG experiments for eg ITC e-chaupal in the villages suggest that the rural population also has a considerable amount of disposable income. So, like their urban counterparts they too can pay for the telecom services but, presently because of low teledensity the rural market falls short of the required critical mass for an operator to make the investment worthwhile. This paper proposes a model to solve the above-mentioned problem by suggesting the concept of Village Virtual Network Operator (VVNO).

### Introduction:

There is a positive co-relation between the teledensity and the GDP of a country as the growth in the telecommunication sector has linkages to the other sectors of the economy. It is therefore, imperative that the telecommunication sector in the country grows at a rapid rate so that the access is available in all parts of the country including rural and remote areas.

Bearing this fact in mind the Government from time to time on recommendations of the TRAI has made the necessary policy changes. The efficacy of these policy initiatives is reflected in the fact that we add on an average 6.5 million wireless subscribers every month. In terms of absolute numbers the A circles lead the way, but if we consider % growth figures the C circles come out as leaders. But the concern emanates from the fact that both in A as well as C circles the rural areas are still not connected adequately. And so is the fear that they might lose out on the IT revolution that the rest of the country is benefitting from.

**Reasons for low penetration of telecom services in rural areas:**

1. The population in villages is scattered over a larger geographic area so extending coverage to all parts becomes expensive. To add to that, the minutes of usage of telecom services there is very low, so, return on investment is slow.
2. The inaccessibility of some remote regions makes installation and maintenance of telecom equipment very difficult and expensive. Non-availability of local village based technicians worsens the situation.
3. The demand for data services is nonexistent in the villages due to illiteracy. Absence of websites showing local language based relevant content adds to the woes of the operators.
4. The inability of the telecom regulator in providing a clear policy about the use of other media, like the cable television network for provision of telecom services.

**The concept of VNO**

The concept of Virtual Network Operator (VNO) is generally adopted in mature telecom markets to serve a niche category of subscribers. An operator who owns the network sells bulk airtime minutes to another operator whose core business is not telecom but some allied area of business. The latter is called the VNO. The parent operator has to ensure that the VNO's line of intended telecom business does not cannibalize his own existing subscriber segment. Generally the parent operator allows the VNO to operate in a segment where he perceives himself to be weak in. Thus it is a symbiotic relationship between the operator and the VNO.

Although TRAI has recommended VNO concept to the Government it has not yet been accepted. So, so far there is no provision for awarding of a separate VNO license. But interested companies can form a JV\* and start operations but the license will be held only by the parent company.

Significant Studies available on the Internet suggest that India is an appropriate market for VNOs with some metro cities (Delhi, Mumbai and Chennai) appearing to display ideal market conditions for VNO launch. **But the author feels that the villages form a more ideal market.**

**Present Scenario**

Presently a lot of NGOs and self-help groups are engaged in extending the reach of telecom in rural area.

**Profit Driven Projects:**

ITC e-chaupal, N-Longue, Drishtee (using existing telecom infra-structure)

**Grant/aid driven:**

1. MS Swaminathan Center (in Pondichery, focused on agriculture and fishing applications).
2. Tara-haat (focus on rural enterprises)
3. Akshaya (in Kerala with Government support).
4. Gyandoot (in M.P. with focus on e-Governance)- operated by n-Logue.
5. Rural E-Seva (in East Godavari District of AP with focus on e-governance)
6. Warana Village (in Maharashtra by NIC) operated

But none of these projects have involved a Telecom operator; this means that we have missed out on a crucial piece in the jigsaw puzzle.

**The proposed solution:**

The problem of urban-rural digital divide can be addressed by following method

- **The Operator-NGO Village Virtual Network Operator**

## About Vigyan Ashram

The above method can be understood by studying the work done by an NGO working in Pabal, a village near Pune, Maharashtra. Vigyan Ashram develops a complete program for giving vocational training to the youth in rural and urban areas. Vigyan Ashram developed several innovative technologies and successfully commercialized them by training school dropouts.

Vigyan Ashram started by Dr Kalbag works with the villagers of Pabal, a village on the Pune Nashik highway. Vigyan Ashram along with n-Logue Communications, a company started by a group of professors from IIT Chennai works towards the provision of telecom services in Pabal. The indigenous technology "Corpect" developed by IIT Chennai is used to provide Internet connection and the voice communication is provided through Tata Indicom's cellular network. Thus, Vigyan Ashram was able to reach the remotest of the villages and provide telephone connectivity there.

Through their joint initiative Vigyan Ashram, N-Logue & Tata Indicom have overcome the two major reasons for low rural telecom penetration:

- 1) Volunteers of Vigyan Ashram initially did the installation and maintenance of the customer premise equipment and gradually villagers were trained to do the same. So, telecom operator did not incur any incremental cost for repair & maintenance. The delay involved also is avoided as it is done locally in the village. This ensures that the instrument remains in working condition most of the time, leading to more use of telecom services. This in turn increases the minutes of usage adding to the profitability of the operators and finally culminating into faster return on investment employed.
- 2) The project involved the setting up of villages Internet cafes called as kiosks. These are managed and run by entrepreneurs from the village itself. With help from IIT Mumbai local language based relevant content was made available to the villagers for eg information about farming or animal husbandry. This means that the villagers surf more on the net adding to the income of the kiosk owner. This in turn has led to increased demand for bandwidth. With assured demand for bandwidth other operators also set up their network. This has led to the overall development of telecom services in the area.

So, an operator like Tata Indicom can form a JV with a local NGO where the NGO can be called as **Village Virtual Network Operator**. The area of activity of the two should be clearly demarcated.

The operator should look after: **(i)** Holding of Telecom License **(ii)** Network deployment, maintenance & billing **(iii)** Marketing & Advertising done by the operator on the national level.

The NGO should look after: **(i)** Provision of local customer care centers (either mobile or resident) for addressing issues like customer complaints, ensuring the availability of recharge vouchers, bill collection centers etc. **(ii)** Volunteers of the NGO should impart training to the villagers on upkeep of the customer premise equipment and also provide repair service incase the villagers are not able to handle it. **(iii)** A customer care call center meant for four to five villages with executives responding in the local language.

A revenue sharing agreement should be signed between the operator and the NGO.

What does the operator gain out of this arrangement?

- 1) The capex\* involved in the rollout of rural network has been brought down by **(i)** Infrastructure sharing encouraged by USO **(ii)** Tower companies offering passive infrastructure on rental basis.
- 2) The opex\* involved in providing the services is shared by the NGO.
- 3) There is no business threat to the operator from the NGO as telecom business is not the core activity of the latter.
- 4) This arrangement can go on till the time the rural market doesn't gather the critical mass for it to be a viable full-fledged business venture. Till such time the operator can focus fully on important issues like network optimization etc.

- 5) In the present operator-distributor-retailer arrangement availability of recharge coupons to rural subscribers is not always possible due to (i) difficult terrain or (ii) Low value of the sale makes the trip of the retailer unviable. The NGO with its local presence can deal with this situation.
- 6) Most of the operator's call centers are based in the cities. Many a time call center executives are unable to help a rural subscriber due to ignorance of local problems. The NGO's rural call center will employ locals who they can help the rural subscribers in a better way.
- 7) With the rural market properly taken care of by the NGO, the operator can focus totally on the fiercely competitive urban market and with the declining voice ARPU\* the operator can put in all efforts on launching of new value-added services to pep up the data component of the ARPU.

#### **What does the NGO gain out of this arrangement?**

1. The new assignment can be done while managing its core activity and so it does not have to invest time separately. But by doing this additional assignment the NGO will earn sufficient revenue to finance other projects for which there might be some funding problems.
2. The entire customer care activity can be done by the volunteers during their usual interaction with the villagers. The volunteers just need to carry with them things like recharge vouchers, bills etc.
3. As the extent of telecom penetration influences the economic prosperity of the region, the NGOs job of ensuring this becomes easier with the backing of a corporate entity.

#### **Conclusion:**

With the involvement of the telecom operator, his technical expertise, advantages of economies of scale, experience in other parts of the country and overall financial capabilities can be fully utilized in the project.

The other version of the VVNO concept may also involve a local cable operator with similar revenue share arrangement.

Thus, this model of the VVNO if implemented has the potential to solve the big problem of the Digital Divide.

#### **Road map for effective implementation:**

1. In some areas the NGOs may not have the desired technical bent of mind and so the operator may have to invest into the training of the NGO staff. In such cases organizations like Marathi Vigyan Parishad can help in imparting training to the NGO volunteers & the villagers.
2. The Government has not yet accepted the VNO concept and so proactive regulatory initiatives by the government will greatly help the effective implementation of this concept.

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#### **Acronyms used**

1. JV\*- Joint Venture
2. capex\*- capital expenditure
3. ARPU\*-Average Revenue Per User.
4. opex\*-operational expenditure



## **Guidelines For Submission Of Papers/Articles**

**Manuscripts of the Papers:** The format of the paper/article must be of **Font size 12, (Times New Roman)** in **double-space** (on one side of A4 paper in case of hard copy) with **margins of one inch on all sides**. Microsoft Word for windows is the preferred software for submission. Ideally the length of the paper/article should **not exceed 3000 words**, including tables, references, etc.

Paper/article should cover technical as well as business aspects of the telecom industry.

**Cover Page:** Paper should have a cover page providing the title of the paper, the name(s), address(es), phone, fax, email of all the author(s), and acknowledgement, if any.

**Abstract:** Following the cover page an abstract must be provided, containing summary of the paper not exceeding 200 words. The main text of the paper should start from the next page.

**References:** Proper and complete references should be given. At the end of the text, references should be listed in the alphabetical order of the last names of the authors, with a title "REFERENCES". Websites that may have been referred to should be included under the same title.

**Footnotes, figures, tables and graphs:** These should be in standard format. They should be numbered serially and should appear at desirable places in the text itself, with proper reference made in the text. Wherever necessary, the source should be indicated at the bottom.

### **Contact person:**

Mr. Giri G. Hallur  
Asst. Professor (Telecom)  
Symbiosis Institute of Telecom Management, Pune  
5<sup>th</sup> Floor, Atur Centre, Gokhale Cross,  
Model Colony, Pune- 411016.

Email id: gghallur@gmail.com, gghallur@yahoo.com

# About Research at SITM

## Telecom Business Research Cell

Symbiosis Institute of Telecom Management formed the Telecom Business Research Cell (TBRC) in 2006 to promote and participate in applied research in Business & Technology.

The research done under the aegis of TBRC is based upon the contribution from eminent professionals, industry experts and faculty & students of SITM

### **The major research initiatives undertaken under TBRC are:**

- Monitoring of Research Projects of the students,
- “Prevision” SITM's Annual Telecom Forecast
- Faculty Research Projects
- Publication of the TBR Research Journal.
- Exploring the possibilities of collaborating with the industry for research and consultancy activities.

## SITM Research Committee

Symbiosis Institute of Telecom Management has recently constituted the Symbiosis Institute of Telecom Management Research Committee (SITMRC). The erstwhile TBRC has now come under its purview.

The members of SITM Research Committee:

- Mr. Virender Kapoor, Director, SITM
- Mr. B.V. Marathe, Dy. Director, SITM
- Mr. Giri Hallur, Asst. Professor (Telecom), SITM
- Dr. P.J. Joglekar Telecom Consultant (Former Professor, IIT Delhi)



### **Symbiosis INSTITUTE of TELECOM MANAGEMENT(SITM)**

1068, Atur Centre, Gokhale Cross Road, Model Colony, Pune - 411 016

Tel : +91 20 25674150 / 25671911

E-mail : gghallur@gmail.com, Website : [www.sitm.ac.in](http://www.sitm.ac.in)