 Savitar Research Group

Wireless Broadband in India

A study of broadband revenue rates

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Executive summary

In the light of recent Broadband spectrum acquisition at high cost, operators are trying to evaluate the path forward to offer services to consumers. The 'path forward' is littered with risky decisions that include a technology choice (see Whitepaper#1). Consumer adoption is another great risk factor. Past technology adoptions in India have proven that the tariffs and the device costs, summed as one time cost and recurring cost, have to hit a sweet spot for high adoption. Also, the broadband service costs may alienate a majority who may choose not to take up the service because of fulfillment of their needs by existing low cost alternatives.

Therefore, this study focuses on rationalization of the sweet spot around which a broadband business can be built in Indian urban/sub-urban areas. The study takes into account many factors including marketing, technology & financial requirements, competition, other deployments etc.

Some key findings of the study are:

- We predict that the broadband monthly ARPU's will in the range of $15-20 according to this study on Metro Delhi.
- Nomadic outdoor, un-tethered home indoor and nomadic corporate VPN access of high speed internet data will dominate the initial service offering in Urban/Sub-urban areas.
- Best use of spectrum for optimal financial return is to offer high speed data services to keep adoption high.

Introduction

Earlier this year India has auctioned spectrum for deployment of broadband services. One perspective of the price paid by the winners is the Cost/MHz/Pop. By this metric the price paid by the prospective operators seems reasonable (see table). But with a slight modifier, the per capita according to Purchasing Power Parity rate of $2940, that is ranked 128th in the world, the picture gets muddled. Looking from the aspiration of the end-user, there has to be a clear and compelling difference for them to adopt in a set of choices. This includes the choice of not opting for such a service at all. For the broadband operator, the field of play is filled with dynamic inter-dependent pieces but great potential for business albeit with abundant risk. So what is the right recipe that creates a need for the end-users to adopt these set of services and the right strategy for operators to fulfill their business goals? Some dimensions are already un-violably defined- 20MHz spectrum. Other dimensions pose dynamic risk to long term business plan- technology of choice for deployment (See White paper#1). This paper explores the strategic dimension of revenue generation with underlying sub-dimensions such as Blended ARPU rate, adoption rate and optimal usage of spectrum asset.

The questions to be answered in this study are:

1. What is the gravity ARPU for reasonable BB business plan that meets target adoption rates and its erosion in time? How low can the gravity ARPU go before becoming unviable in financial return?
2. What are the segmented ARPU classes where you can offer differentiated services to optimize business return in view of prevailing competition? What services can be offered in each segment vis a vis competition
3. What is the best use of spectrum for optimal return on business?

Competition and trends

A panoramic view of the playfield for BB operators in India covers mature and nascent markets. Convergence of BB and cellular services is exciting and is bound to be fruitful for BB operator as the services to end-users gravitate to more of data delivery. Competing in more mature markets would require patience and clear strategic goal on overall revenue, a component of which should be the presence in mature markets. This is true unless the market opportunity is new like in un-tethered services.

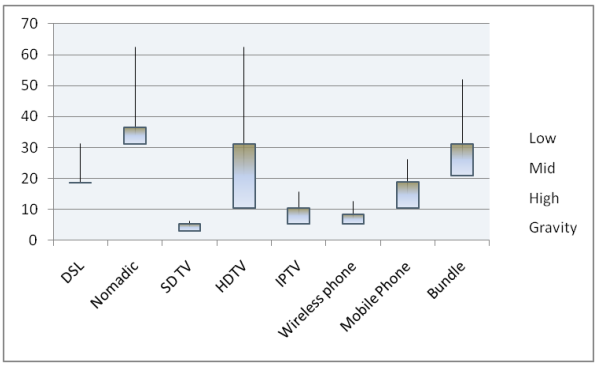


Figure 1: Current services & gravity ARPUs($)

Triple play bundles are available in US and European markets where the service revenue is much higher. The basic voice and video segment for last mile in Indian context will not be compelling for the facts that there is mature competition and service revenue rates are extremely low (see Figure 1 and Table1).

Table 1: Competing service offerings in India

Service	Technology	Sample Services	End point usage	End-User Device	Interoperable	Equivalent data Rate	2010 Monthly ARPU ($)
Internet Data	ADSL	Internet	Fixed	Modem	No	128-2Mbps	8- 20
	VDSL	Internet	Fixed	Modem	No	128-2Mbps	8- 20
	FTTH	Internet	Fixed	Modem	No	768-20Mbps	8- 20
	HSPA+	Internet	Mobile	USB dongle, Smart phone, Laptop	Yes	1-7 Mbps	30- 50*
Adhoc/ Proprietary	WiMAX 'd', WiFi, WiBro	Internet	Fixed	Modem	No	512-2Mbps	8- 20
Cellular Data	WLL	Internet	Nomadic	USB Dongle	No	64-256kbps	10- 20
	GSM/CDMA GPRS/EDGE	Internet	Nomadic	USB Dongle, Smart Phone	Yes/No	64-256kbps	20- 40
Video	Cable	175 Ch.SDTV	Fixed	End Point, Set top Box	No	10Mbps	5- 8
	Satellite	175 Ch.SDTV + HDTV	Fixed	Set top box	No	17.5Mbps	5- 15
Cellular Voice	CDMA/GSM		Mobile	Cellular phones	Yes	-	5- 8
	3G		Mobile	Cellular Phones	Yes	-	5- 8
Dial Up		Internet	Fixed	Modem Phone	No	64-256kbps	5

*Estimated price

A look at other worldwide broadband deployments

A sweep of Broadband operator offerings across the world reveals a set of diverse strategies. We studied the following to understand the evolving business proposition and put it in India context and constraints thereof. The focus has been to look at stable, standardized, 4G like inter-operable networks.

Table2: 4G Broadband service offerings worldwide

Operator	Region	Devices	Service Plan	Monthly ARPU ($)
Yota	Russia	Mobile WiMAX/WiFI device, Express card, Laptops, USB dongle, Smart Phone	Unlimited mobile/nomadic Internet within coverage area, + 20 TV channels on Smart Phone	16.50- 30
UQ Communications	Japan	Notebooks, Laptops, USB Dongle	Unlimited nomadic internet	50
Clearwire	USA	WiMAX/WiFI device , Notebooks, Laptops, USB Dongle	3G/4G connectivity, Mobile internet, Last mile connectivity	30- 100
KT	Korea	USB dongle, smart phone, Netbooks, PMP	Mobile internet with rich services	20

http://www.yota.ru/en/devices/main/

http://www.uqwimax.jp/

http://www.clear.com/shop/services

http://www.ktwibro.com/eng/userdevices/mobile_phone.html

Other considerations for service differentiation

The end-user experience can be a differentiation factor if the operator can provide superior quality of service to whatever services that exist today. Whether it is WiMAX or TD-LTE, end to end quality of service is built in to the technology. Then if planning is done in terms of end user device and temporal location coverage of the user, unmatched by other technologies, end-user experience can be enhanced without much sacrifice on financial goals. An example set of display devices and required data rates are shown in the figure below.

42" 16x9 HDTV- 7.5Mbps per Channel

32" 4X3 SDTV- 10Mbps per 100+ Channels

Laptop & Notebook- 1Mbps

Smart Phone- 400Kbps

Service plan play book for 4G broadband operators

As mentioned before, a full range of services can be brought into significance depending on the business strategy. The table below is a good list to start with.

Table3: Possible Service plan play

Service	Usage	Device	Bundle	QOS Requirement	Data rate
Last Mile Video	Light	26" SDTV 4X3	30 Channels (Broadcast)	High	4Mbps
	Medium	42" SDTV 16X9	50 Channels + 12 Show Case Channels (Broadcast + Multicast)	High	10Mbps
	High	HDTV 1080i	50 Channels + 12 Show Case Channels + 1 HDTV channel (Broadcast + Multicast)	High	17.5Mbps
Last Mile Voice	12.2 kbps AMR	Wireless Phone	1 channel	High	
			2 channels	High	
			6 channels	High	
Last Mile Gaming	Medium	42" SDTV		Medium	2Mbps
	High	HDTV		High	5Mbps
Last Mile Connectivity	Low	Wireless indoor Modem		Low	1 Mbps
	Medium			Low	2Mbps
	High			Low	5Mbps
Last Mile Triple Play	Low	Wireless indoor triple play box		High	2Mbps
	Medium			High	10Mbps
	High			High	17.5Mbps
Nomadic- Internet Data	Medium	Smart phone		Low	2 Mbps
	High	Laptop		Low	5 Mbps
Mobile- Internet Data	Low	Smart phone		Low	1 Mbps
	Medium	Smart phone		Low	2 Mbps
	High	Laptop		Low	5 Mbps
MVNO Wholesale data- Nomadic	Medium	Smart phone		Low	2 Mbps
	High	Laptop		Low	5 Mbps
MVNO Wholesale data - Mobile	Low	Smart phone		Low	1 Mbps
	Medium	Smart phone		Low	2 Mbps
	High	Laptop		Low	5 Mbps

In the current situation device availability and maturity is limited to certain type of end user devices (Ex: WiMAX devices), specifically- USB dongles, Laptops, Notebooks, smart phones and modems. More types of devices at affordable price points will become available as the demand and eco-system grows. Therefore, the choice of services will be limited by certified devices availability.

What then are the strategies for an operator to get to positive cash flow early? Listed below are opportunities for the operator to optimally utilize the expensive resources- the spectrum and the deployed network. As the adoption rate reaches a critical mass, better applications become available on converged devices rich service plans can be devised.

We feel the key to eventual broadband penetration and success is tied closely to adoption rate which is influenced by service plan offerings, rates and QOS. Each operator will have to devise a strategy that creates a maximum return in the longer term while covering the short term financial goals such as break-even time in cash flows. Some basic strategies could be:

- Data delivery network (3G Overlay, Last Mile & Mobile- data)
- Rich Content delivery (Last mile & Mobile)
- Service delivery (Last Mile & Mobile- Any part of Triple play)

Eventual decision on strategy could be an evolving mix of above based on operator and parent organization's strengths (for example content resource). Others may sign SLA's for MVNOs, last mile access services etc besides the basic high speed internet access. Again, interesting disruptive strategies are possible within the context of costs of the deployed network build, technology choices and strengths of the parent organization.
In a saturated market segments such as video content delivery, operators need to evaluate their returns based on parameters other than profits. With multiple choices to the last mile, mature delivery methods (cable & satellite) and low costs (INR 150 for 30 basic SDTV channels- source TRAI), BB operators may need to value returns based on penetration into market segment and perhaps prevention of churn. A service offering around this basic price may be at point of indifference to the customer. Any penetration could be useful to keep attracting customers to the technology and increase chances of up take on parallel bundled services.
Some strategies may involve content and its delivery. Apart from pricing strategies for such service offerings, careful consideration must be given to regional choices, cost of content and delivery method to create a clear differentiation.

Can you do unlimited broadband service offer? One has to proceed with caution on this kind of an offer. If you take example of practical aspects of user behavior in Clearwire network, 5% of the heavy users aka hogs consume 90% of the bandwidth. Another example is the 3G network deployments as in AT&T in USA. iPhone users with high speed data and video usage caused unsupportable demand on the network. In volume market where low ARPU for a major part drives the adoption, a small change in usage behavior on a particular popular application (Ex: video download) can create a massive dynamic demand on the system.

How do you dimension the guaranteed BW services? Operators need to carefully consider that they are using their fundamental and expensive resource to maximize the return. Richer and guaranteed services are means of attracting customers. But this has to be balanced in proportion to the relative COGS (cost of goods and services) of other revenue generating services.

How to price with respect to 3G services? 3G services have not been in service in India yet except for BSNL. BSNL is priced for penetration and is not the likely indicator of future private operator pricing. A survey of price/performance between 3G and WiMAX in select deployments is captured in the table below.

	Average DL Mbps	Peak DL Mbps	Monthly Service Price
Yota (Russia)	5	5	$30- unlimited
3G (Russia)	1.2	1	$40- 5GB cap
UQ Comm. (Japan)	8.7	14-16	$50- Unlimited
3G (Tokyo, Japan)	3.46	4.55	$60- Unlimited
Clear (USA)	3.8	10-12	$30- basic unlimited
3G (USA)	0.95-1.35	7.2	$60- 5GB cap
Packet One (Malaysia)	1-3	9	$15- 5GB $30- 20GB
3G (Kaula Lumpur, Malaysia)	0.4-0.6	1.5	$28
Source: Ram Alluri, Intel, Presentation at ITU Regional Workshop on IMT			

Many strategies for service deployment have been explored by Ekaa including the triple and quad play services with due consideration for regulations and restriction such as on VOIP. However, we chose to exhibit the BB data strategy with a conviction that this will provide most % contribution to EBITDA with top 30% users.

Recommended Initial Services

- Internet Data- nomadic outdoor, home indoor
- Data overlay 3G/ Wholesale Data transport
- Corporate- enterprise nomadic VPN access

Evaluation Methodology

Ekaa platform offers a rich scope of exploring various strategies along this dimension. A simple flow chart depicted here shows the method of analysis at a high level. WiMAX is assumed as the initial choice of deployment (See White Paper#1). Larger scope parameters such as deployed Base-stations are explored on Delhi Metro canvas. Whereas, medium to smaller scope parameters such as zone interference and sector level statistics are studied at a finer granularity of constituencies. However, the strategies and business plan have been evaluated on and will apply to Delhi Metro. Specifically for this study, a general mix of services and applications have been considered mostly on data services. Segmentation is as per conventional understanding and business intelligence of existing services in India and worldwide by broadband operators.

WiMax 'e' enhanced Release 1.5:

- Target mix of service plans <- Business Intelligence on competition
- Overlay on Delhi GIS (6m resolution)
- Technology analysis
    - Radio Network Planning for limited mobility/nomadic
        - Reuse 1-3-2 wimax 'e' nomadic/indoor
        - Deployment as per GIS pop density distribution
    - Dynamic Capacity estimates and throughput estimates
    - Applications assigned to Service plans (Some Guaranteed)
        - Voice
            - VOIP codec (AMR Speech CODEC 12.2 kbps)
        - Video
            - Fixed Home Last Mile (Provisioned per end-user device display size)
                - SDTV per ch
                - HDTV per ch (H.264 MPEG4)
            - Mobile TV (Provisioned per end-user device display size)
                - SDTV per ch
                - HDTV per ch (H.264 MPEG4)
        - Internet Data : Music & Video Down loads, Email, video telephony etc.

        - Note on impact due to scheduler choices
          Scheduler has a major impact on end-user experience. The proprietary schemes adopted by TEMs may be dependent on the strategy and type of services planned by the Operator/Service Provider. Ekaa has a easily configurable UI to benchmark any scheme. For this study, we assume a proportional fair scheme with QOS considerations at multiple levels.
    - Capacity allocation and service usage discussion in context of business plan:
      Capacity creation and demand allocation is tightly coupled to services planning. Careful consideration must be given to backhaul strategy to deal with the demand inflation especially on QOS content such as guaranteed bandwidth mobile internet data and video services. Backhaul provisioning costs are assumed per peak data rate requirements. Capacity of the deployed network meets the requirement of the traffic forecast by marketing and CAPEX/OPEX costs are automatically sync'ed up in finance on Ekaa DB.

- Financial analysis
    - Assumptions
        - Service bundle mix: A reasonable mix as described before has been assumed with plan per segment in each category.

        - Content costs are not considered for now.

- End-user devices are expected to be available at affordable rates that do not require operator subsidy. For example, USB dongles and indoor CPEs are expected to be in the price range of $20-35. This is not considered as a factor in adoption rates in this study.

- Point of indifference is reached in a service price when further drop in pricing of a service plan is not performing well relative to other service plans. This could be because of service plan COGS or adoption rate indifference.

- Sensitivity study
  - Determination of gravity (or blended) ARPU: First the subscriber count is assigned to each service plan per market forecasts in each segment. Service plan revenue and COGS are calculated and averaged over the total number of Subscribers. ARPU sensitivity to NPV is studied.
  - Adoption rate: ARPU along with price of End-User devices cause massive shifts in adoption rates in India. Empirical data has been used to get a relationship established between ARPU and adoption rate to study the sensitivity to NPV.

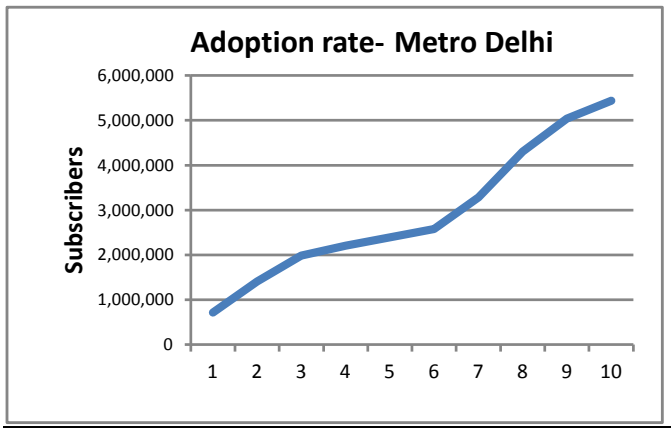
Results and discussion

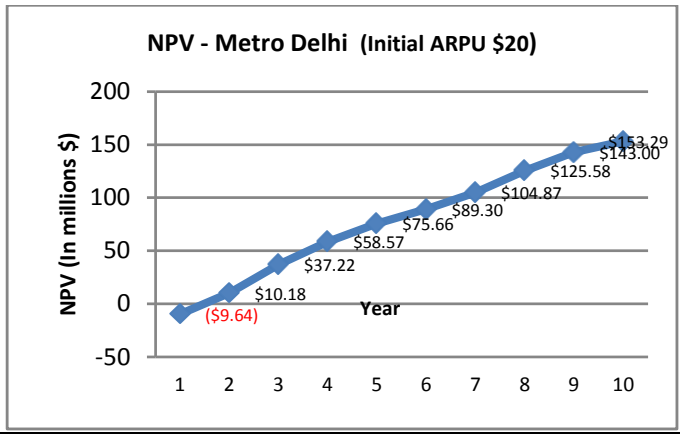
Using Ekaa, a practical and deployable system was modeled that meets the traffic demand forecasted by the Marketing plan. Overall capacity and individual site capacities have been extracted based on detailed technology study. This active capacity was allocated to individual service plan schemes per Market plan.

Market forecast data, therefore flowed directly into technology analysis and financial analysis. Technology extracted data is also directly accessible to the financial analysis which includes: capacities, deployment configuration for financial cost compilation etc.,.

In financial domain, Ekaa offers many analysis features. Baseline NPV projection was accomplished for the Market forecast, fully deployed system and other cost considerations (See Appendix A). Resource and service dimension of the system capacity, the main asset, are obtained to get a good picture of spectrum utilization as shown in figures below.

To answer the ARPU questions finally, we studied the sensitivity of the two main parameters- ARPU and Adoption rate. There is an obvious inter-relationship between the two that demands serious consideration. For example, early cellular adoption in India was slow in its growth till the tariff rates and end-user devices hit the sweet spot and then the adoption exploded. In this analysis such relationship has been considered based on empirical data.





Sensitivity studies have been done on gravity ARPU and adoption rate on NPV value for the seventh year of operation. As discussed in Appendix A on financial assumptions (see White paper#1), the initial monthly ARPU erodes 5% year over year even as data rate doubles every 2.5 years. Therefore, any initial gravity monthly ARPU below $15 is not feasible from investment perspective if you consider the high finance costs of the spectrum acquisition.

Similar observation can be made on adoption rate. It is vital to blend in a strategy of attractive service plans and revenue opportunities that cater to not only to sooner than later financial goals such as time to positive cash flow, and also to keep the long term view of Subscriber adoption rate to technology.

If one were to disregard the spectrum finance costs and its burden on business proposition, the gravity ARPU can reach far below $15 and still be positive on the seventh year NPV. There is a beneficial impact on adoption rate also as the ARPU becomes more competitive with respect to existing offerings. Calculations of gravity ARPU in these cases are scenario based and depend on many contextual considerations.

- We predict that the initial broadband monthly ARPU's will in the range of $15-20 according to this study on Metro Delhi with a decline of at least 5% YOY
- Nomadic outdoor, un-tethered home indoor and nomadic corporate VPN access of high speed internet data will dominate the initial service offering in Urban/Sub-urban areas.
- Best use of spectrum for optimal financial return is to offer high speed data services to keep adoption high.

Sensitivity Study: ARPU and Adoption rate – Metro Delhi