

# TELECOM BUSINESS REVIEW

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## **From the Desk of the Chief Editor**

It gives me great pleasure in presenting to you the fifth issue of Telecom Business Review (TBR). The TBR has been a platform for scholars, teachers, professionals & students to contribute & showcase their knowledge, experience, study results & findings in the relevant areas of Technology & Business Management. In the 2011 issue we published articles on diverse topics like IT Disaster Recovery Planning, Mobile Unified Communications, An overview of the Financial and Economic Impact of 3G Auction in India.

I am sure that this year's issue of the TBR too will help to trigger quality studies in field of telecom business management and enlighten and educate the telecom fraternity.

At the release of the fifth issue I thank all the contributors for their thought provoking articles. I also express my heartfelt gratitude to the members of the editorial board and all our esteemed reviewers. I also seek the support of the telecom fraternity in our efforts of making the TBR global by contributing research papers that highlight global issues in telecom business.

**Sunil Patil**

Director, SITM

# A Study Of Automobiles As Future Nodes Of Mobile Networks

**Gaurav Arora**

## Abstract

In coming years automobile industry will not boast of sunroof, music systems or leather seats as must-have options in a new car but it will be the high speed and bandwidth enabled seamless connectivity that will revolutionize the whole experience of driving. The LTE connected car concept will allow consumers to access network anytime anywhere.

The paper talks about the LTE (Long Term Evolution) technology, its applications and advantages in Indian context. It then focuses on the use of LTE for making cars the modern communication means. It talks about the kind of applications and capacity to be deployed in future which will change the customers perception of a car. The kind of integration and facilities will open a new dimension for customer satisfaction. A car will be solution to many daily problems other than just transportation. Various main features to be expected are discussed like infotainment, on-demand entertainment, navigation diagnostic. Automobiles are going to be the latest mobile networks and innovative partnerships across different industries will make this concept a reality which will open a world of limitless options for consumers

Finally the impact of such convergence on both telecom and automobile industry is discussed. LTE Vs WiMAX situation for India is also studied and the latest developments highlighted.

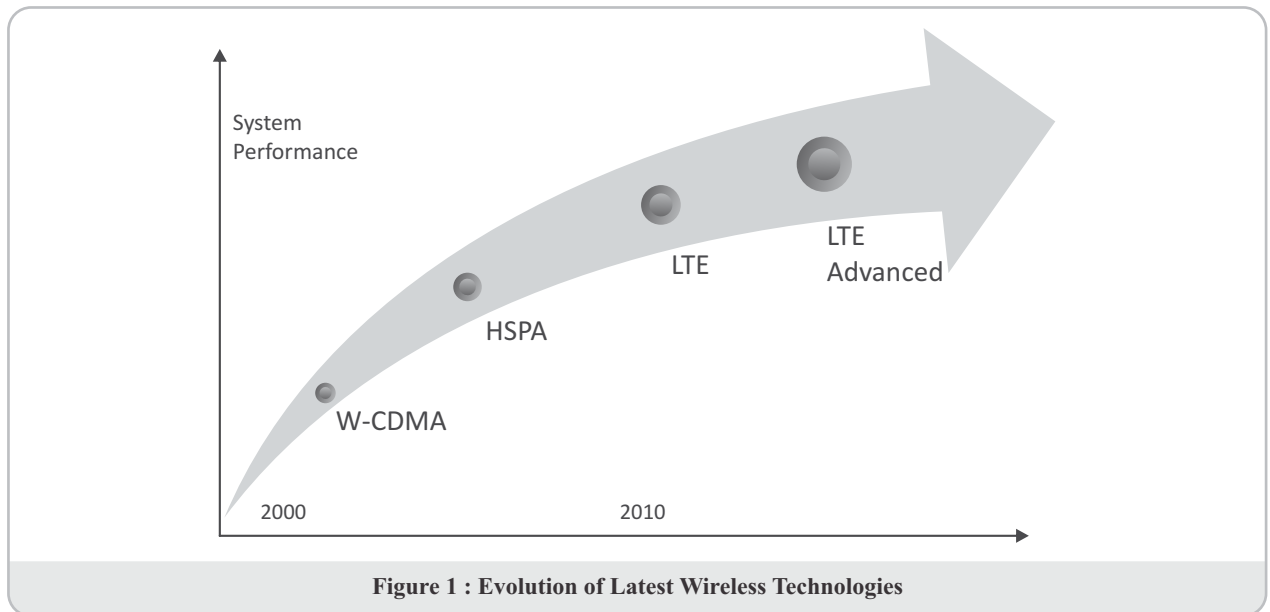
With demand for convergence, content for data hungry devices in US, Europe and a booming telecom industry in all major Asian economies the entire world is ready for making concepts like LTE connected car a reality.

## Long Term Evolution: Vision beyond 3G

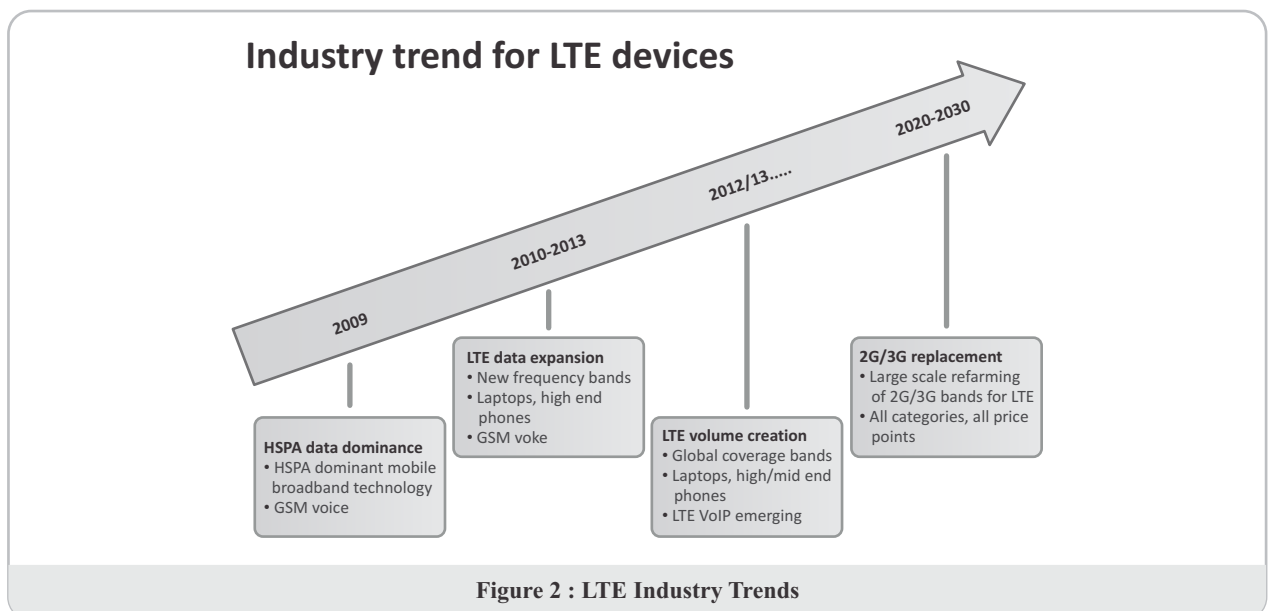
LTE (Long Term Evolution) is latest trade-mark name of the project of a high performance air interface for cellular mobile telephony. It's been introduced by the 3rd Generation Partnership Project (3GPP). The current generation of mobile networks is collectively known as "third generation" networks (3G) while LTE is marketed as 4G. LTE is the way beyond 3G and is a step towards the so called 4th Generation (4G) of radio access technologies which are specifically designed to increase the speed and capacity of the mobile networks. Ideally, LTE is actually a 3.9G technology as it does not entirely comply with the International Mobile Telecommunications (IMT) Advanced 4G requirements. LTE can be seen as enhancement to the Universal Mobile Telecommunications System (UMTS) which was first detailed in 3rd Generation Partnership Project (3GPP) Release 8. Much of this 3GPP Release8 focuses on adopting this new 4G mobile communications wireless technology and includes the all-IP (Internet Protocol) flat networking architecture. Apart from being a mobile telephone development, LTE is also being endorsed by various public safety agencies of US as the favored technology for the new 700 MHz public-safety radio band. The LTE specification provides uplink of at least 50 Mbps and downlink rates of at least 100 Mbps with Radio Access Network round-trip time below 10ms. LTE also supports for scalable carrier bandwidths in range of 20 MHz down to 1.4 MHz with support for both frequency division duplexing and time division duplexing. LTE provides various advantages like high throughput, plug and play, low latency, Frequency and Time Division in the same platform, a simple architecture with low costs and an improved end-user experience.

LTE being fully backward compatible will also enable seamless passing to cell towers which work on older network technologies such as GSM (Global System for Mobile Communications), CDMA One, W-CDMA (UMTS), and CDMA (Code division multiple access) 2000.

The next step for LTE evolution is currently being standardized in 3GPP Release 10 and is going to be known as LTE Advanced [Fig 1]. On the 18th of August 2009, the European Commission announced to invest a total of €18 million into research and deployment of LTE and 4G candidate systems LTE Advanced [1]



With a new generation of content hungry consumer devices in the market, LTE will provide the capacity support for connectivity in addition to mobile migration of Internet Applications such as Video Streaming, Mobile TV, Voice Over IP and Music Download etc [Fig 2].



## Connected Car Concept

You sit in your car and as you put on your seat belt, the first thing it tells you is that the servicing for your car is due this week, not just that it mails your service dealer regarding an appointment of yours and confirms back to you the day and time you need to go for car servicing. Next instance it gives you a list of available food joints based on the route taken by you with today's Special menu for each.

Now your kids don't need to ask how much time more to wait for their favorite food joint, you can tell exact time and meanwhile your kids can enjoy multiplayer gaming experience with their friends sitting at home.

This new car will be based on new services and business models using these latest 4G technologies. It is enabled by always-on network connectivity, ultra-high bandwidth technology, cloud computing and value-added network resources such as content management. Furthermore it provides users with location services, identity, billing, security and innovative in-vehicle hardware and software systems. This kind of service pack provides always-on access to the internet, along with entertainment and real-time navigation systems.

**Various features on offer:**

- Access to TV and video content, social and communication information, as well as streamed radio.
- Live dynamic information regarding traffic and various places for shopping, food joints and other interests.
- Recovery systems for stolen vehicles.
- Accident and emergency assistance.
- Screens in front and rear of the vehicle with Wi-Fi access points for portable devices.
- Video and audio services, such as on-demand movies and access to TV and internet video.
- Location-based services with Live map data and Google Maps.
- Communication and messaging service access.
- Remote vehicle diagnostics, maintenance tracking and notifications systems.
- Voice interaction facility in various languages.

**The LTE Connected Car concept offers independently operated touch-screens that allow access to a menu of infotainment, entertainment, security and driving-related services including:**

- Streaming of Videos on demand - video content such as movies and TV programs can be streamed to the vehicle while new content can also be rented or purchased in-car for immediate playback or pausing.
- Gaming - with high speed Internet availability, multi-player games can be played against other passengers who are within the car or in other cars or anywhere in the world.
- Audio Library - a massive audio catalog will be available for instant play from the cloud.
- Home Control - with home automation and security systems in place the car can connect to home and manage lighting, climate control systems and home security cameras with live streaming of video feeds.
- Seamless connectivity through Wi-Fi hotspot - car's high-speed connection enables in-car Wi-Fi network which allows various mobile devices to access other applications.

- Support for Advanced Navigation - integrated location-based services and real-time traffic, road condition and weather alerts. With real-time GPS updates you are never going to be off your destination.
- Vehicle and Road monitoring - car's security, maintenance scheduling and theft protection is all integrated. The vehicle's status, location and road conditions that can be shared with other drivers and real time sharing of data enables the safest and most efficient route for you to take.
- What better than a dashboard that will reconfigure itself for each driver and plays a music specific to your choice and taste as soon you enter the car. While your car infotainment system tells you where your friends are and which place to fix for your quick get together while your way back home.

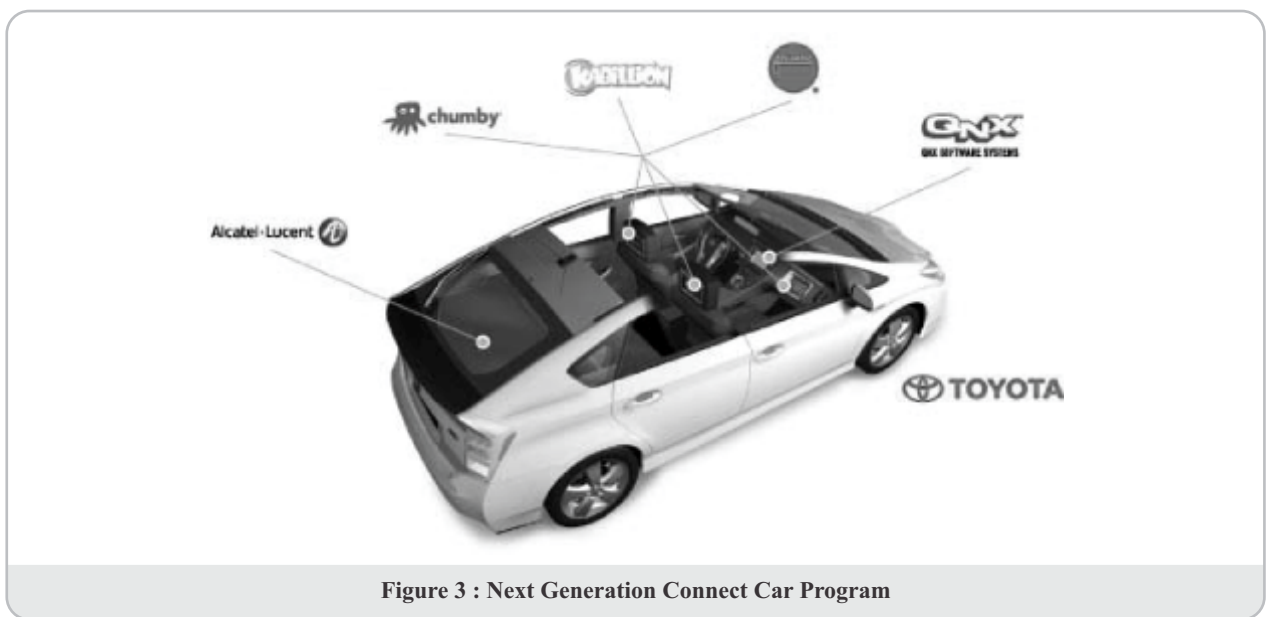


Figure 3 : Next Generation Connect Car Program

The differentiator for any application developers will be the ability to understand the automotive companies 'pain points,' and develop reliable software that are production ready. The need is to have a continual relationship buildup between customer and car manufacturer and not as traditionally where once the consumer drives a car off the lot, there's no more relationship. Connected Car applications allow a longer-term loyalty and the ability to update customer software through cloud connectivity.

## Economic Potential and Challenges with Indian Perspective

The connected car concept has tremendous potential to bring along major players from various industries together and create a platform for huge revenue generation and at the same time providing endless choices to the end customer. With LTE Connected Car, the automobile industry is poised to be the latest mobile network. With convergence being the name of the game, next generation wireless technologies like LTE combined with automotive industry is going to play a major role in driving home customers and revenues. Each of the individual concepts of location based services, cloud computing and wireless connectivity for safety and security have massive potential and offerings for the customers. Imagine each of these collaborating to provide end services which drive the revenue of each of them in the chain. Moreover all of this is done while enabling inter-operability and use of widely used platforms such as flash for content delivery. All these can find abundant target markets in a developing economy like India where data is just taking over the Voice share in telephony.



For instance if we take the Indian Music Industry its current size is over Rs. 670 crores, however growth has been thwarted by a rapid decline of sales of the physical music formats. With the LTE services and connected car applications providing digital distribution platforms such as streaming, downloads and music subscriptions will proliferate and growth will be driven by the digital music segment.

**“Digital music sales are expected to grow at a CAGR of 24 percent between 2009 and 2013 to reach Rs. 3 billion in 2013 [3]”.**

In current social networking scenario, digital media advertising i.e. internet and mobile is expected to emerge as the medium of choice for advertisers. Mobile broadband will give advertisers an outstanding platform which allows them to deliver not just text-based content but also full video transfer or live streaming on the move. Now LTE connected Car makes this possible and hence offering advertisers a complete new set of target customers for their advertisements.

**“Online advertising India is expected to grow with CAGR of 32 percent between 2009 and 2013 to touch Rs 20 billion in 2013 [3]”.**

Gaming industry adds another dimension to this connected car. With Indian Gaming Industry being in its early stages still is expected to have huge potential with large market to cater and changing lifestyles.

**“Every month India sees about 6-7 million game downloads on the mobile phone. Mobile gaming is projected to grow from a size of Rs. 2.5 billion in 2008 to an estimated Rs. 12 billion by 2013; translating into a cumulative growth of 36 percent between 2009 and 2013 [3]”**

With such trends for mobile gaming LTE connected car is going to offer a whole new rich gaming experience to customers.

The auto industry will need to make consumer aware about such exciting options and to not just fulfill the basic need of travelling but by delighting the customer with whole new experience.

The challenge forward is going to be the acceptability of these new wireless technologies. With 4G technologies already going on trials in the developed countries, the talk for the same has started in India. WiMAX is a wireless broadband technology which can be deployed quickly and should be well-suited for India-where there is a shortage of copper cable resources. In addition, some operators in India fail in their bid for a 3G license, while others—even with 3G licenses-cannot adequately develop wireless broadband services due to the limited 2×5MHz spectrum of their licenses.

Initially it seemed mobile WiMAX was on the fast track to be the 4G wireless technology of choice for evolving mobile broadband networks. Two biggest carriers in North America, AT&T and Verizon, said LTE provides a more natural upgrade for their GSM/UMTS/HSPA/CDMA-based networks and subscribers - and GSM is the dominant mobile standard worldwide, with more than 3 billion global customers as of 2010.

Similar reactions are coming from Indian markets as well with Mr. Vivek Mohan, MD, Alcatel-Lucent India declaring the shift in focus of Alcatel's research and development unit in Chennai to developing solutions for broadband services based on Long-Term Evolution (LTE). The recently concluded auction for broadband wireless access spectrum has also thrown up a situation wherein there could be a greater number of operators betting on LTE technology, rather than WiMax [4]

Though eco-system for TD LTE is still two years away, winners are widely expected to use India as test market that could provide it adequate scale and, thus, lower device costs for further deployment in global markets.



## Current Players

With the development and rapid deployment of the next generation of broadband services based on Long Term Evolution (LTE) and other ultra high bandwidth technologies this connected car concept is going to attract multi-industry participants. ng Connect's Program founded in 2009, is being supported by leading network, consumer electronics, application and content providers including 4DK, Alcatel-Lucent, Atlantic Records, BUZZMEDIA, chumby, Connect2Media, Creative Technology Ltd., dimedis, FISHLABS, GameStreamer, Inc., Gemalto, HP, Intamac Systems Ltd., Kabillion, Kyocera Communications Inc., LearningMate, MediaTile, QNX Software Systems, R360, RebelVox LLC., Samsung, SIGNEXX, Total Immersion, Toyota Motor Sales (TMS) USA, Inc., TuneWiki, V-Gate and Words & Numbers [2]

## Conclusion

The paper discussed the opportunity of utilizing latest 4G technologies like Long Term Evolution (LTE) for cars in connection with the rapid development of wireless technology. Many large cities of the world are ready to accept such connected car concept and require the system with ability to send and receive signals at high data rates of 10 Mbps while driving at 100 plus speeds. For this, different technology giants and industry leaders need to come together and one such initiative being worked on is ng Connect program. An operating system for embedded computer in the car will allow tracking the status of all the main sensors applied in cars. Passengers and drivers will have unique opportunity to listen to internet radio, watch movies, check e-mails and book online airline tickets, to connect their mobile devices to the internet by use of Wi-Fi in the car. LTE connected car concept is going to create revolution in both developed and developing markets around the world given proper implementation of wireless technologies and integration with industries like automobile. This connected car concept is just the beginning of wide applicability of LTE enabling convergence and seamless connectivity.

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## Profile of the author



Mr. Gaurav Arora is an Electronics and Communication Engineer from Delhi and has worked on Intelligent Network services and Mobile VAS for 4 years at Alcatel Lucent before joining Vinod Gupta School of Management, IIT Kharagpur to pursue his MBA. He is doing his MBA in Marketing/IT and has keen interest in further exploring the dynamic Telecom industry in India and worldwide. He is a network gaming freak and likes to play Sudoku and read during his free time.

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# Data Age in Indian Telecom

**Birma Ram**

## Abstract

To cater to and profit from the ever increasing usage of Internet in all functions of business and society telecom industry in India has ploughed in large sums for 3G spectrum. The industry believes that mobile internet is the next big thing that will drive revenues for telecom in times ahead. The GPRS usage has been the fastest growing revenue activity for all players and now with increased investments, they are trying hard to obtain more revenue from data services.

However, given the fact that we have 12-13 telecom operators it will not be easy to garner big market share in data service section as Indian consumers, being used to minimum tariff in the world, would give enough volumes to each player to even breakeven in near future. Though smart phones with increased data application have been adopted by Indian consumers but volumes will be a problem due to many psychological hurdles in consumers' mind.

In study done by the author for 2 months in Kerala circle, with demographic features like highest education rate and per capita income in India, he tried to find out opportunities and threats for telecom players by understanding consumer perspective for data services, pattern of usage, factors that encourage users to shift internet usage from PC to mobiles, needs of the subscribers, the offerings of telecom players and un-met needs if any. In-person interviews with 185 consumers of all telecom operators have resulted in useful insights that can help telecom players to reshape their dimension of data services.

## Introduction of Data age in Indian Telecom

Birth of mobile internet took place in Japan when NTT DoCoMo launched i-mode in 1999 after which mobile internet experienced exponential growth in Asian countries like India, South Korea, etc. Also, the rates of both voice and data services has come down drastically and the penetration of internet has increased in India from 2.8 million in 1999 to 88 million in 2010. The composition of internet using population in India is very interesting as observed in 2010; 19-40 years age group constitutes nearly 85% among Internet users, 85% of total internet users were male and Top ten cities having most number of Internet users are Mumbai, Delhi, Bangalore, Kolkata, Chennai, Pune, Hyderabad, Surat and Nagpur which combined contribute 37% to total internet using population of India. Fact that internet penetration stood at 6.9% and other interesting figures like this led the Indian telecom players spend about \$15.1 billion in 3G auction, conducted in April 2010, to tap the future growth. But the data age began much before 3G with the economical 2G/2.5G/EDGE technology or more famously known as GPRS internet on mobile phones. Since 3G has not gained so much penetration, the focus of this study, conducted in April 2011, was more on GPRS mobile internet usage among Indian consumers. (Source: Reports on <http://www.coai.com/revenue.php>, <http://www.coai.com/statistics.php>)

## Synopsis

As the price war in voice service hampered the revenue growth to be in tandem with the rising subscriber base, they started to mull over the future growth driver which was coming from data services with revenue growth of above 50% yoy. But due to development hurdles like low literacy rate, low disposable income, language differences and low internet penetration as a whole created big problems to realise the full potential of mobile internet. So it becomes important to understand the consumers' mobile internet life cycle, usage patterns, style, demands and means to optimise the potential lying with mobility of internet service. This study would help to understand the mobile customers and data users, specifically, better while the outcomes give incisive information about product development and promotional strategy. The content preference of different segment customers and challenges they face can lead to improved services

which will result in both higher revenues and brand loyalty to service providers. This made this project very important from the telecom sector's perspective as it would bring first hand insights about consumer internet life cycle and this was the first extensive research carried out by the company in data services among consumers. Consumer behavior understanding would bring more revenue through improved need satisfaction by offering services most needed by consumers at profitable rates. This research comprised of competitor analysis from customers' perspective, in-depth survey conducted with different network data users to understand what they want and how different players are serving those needs better/poor. On the basis of data collected from 185 interviews with customers of different segments, the recommendations were made to bring the data service experience dynamic and interesting. Focus of strategies was to enhance data usage while moving the customers up the evolution ladder of internet usage, not to mention the revenue increase involved.

## Research background

This research was conducted in Cochin, Kerala which has highest human development Index and literacy rate which encase the upcoming patterns of development and help the research to capture future attributes of Indian population as literacy and economic growth rates can be expected to grow and match that of Kerala at that time. Research was conducted with a random sample population of 185 GPRS enabled mobile phone users who were interviewed for the survey. Though penetration of 3G was not much at the time of research it doesn't stop companies to apply learning of this research to 3G data service revenue enhancement as the difference between 3G and 2G is 'speed' which creates small changes in the whole game. The nature of survey was kept qualitative and gestural & unspoken responses were also captured along with survey questions. Since the research was conducted in particular region, many observations that do not apply to rest of Indian population have not been included.

Note: The initial report was comprehensive and each segment (20 narrow segments) was individually analysed to grab maximum insight but due to limitations of space and purpose, encapsulated version has been provided here while circle and client specific findings and recommendations has not been included.

## Project Title

Understanding consumer's mobile internet Life cycle and working out strategies to enhance internet usage.

## Research objectives

**Research was conducted to achieve following objectives:**

- **Competitive Analysis** - To observe New User Experience by experiencing the data services of different networks right from the activation part. Complete outcome of this part has not been included in this paper as it was client specific but general findings applicable to the sector are intimated in findings.
- **Usage Pattern & Choice Making Process** - In-depth interviews were conducted with 185 consumers in different categories & segments and their psychological characteristics & interests on internet helped me to understand their behavior towards data services.
- **Challenges & Problems to Consumers** - The research helps to understand the reasons of no usage or limited usage of mobile internet by consumers of different segments.
- **Findings** - On the basis of survey conducted, findings relevant to data services for different consumer segments was required to be produced.

- **Recommendations** - Recommendations were given after understanding the factors for driving revenue and increasing data usage by consumers. This part has not been included in this paper as it was also client specific though general recommendations have been given.

## Research Methodology:

### 1. Competitive Analysis -

- Firstly, SIM cards for four networks i.e. Vodafone, Airtel, Idea and Tata Docomo were purchased and data services were activated by following the information provided on welcome kit.
- **After activation, data services were experienced on the basis of following parameters:**
  - i. Welcome kit information and help: Information on the welcome kit is the first point of interaction for consumers and it was the first criteria to compare different networks for data services.
  - ii. Customer care support: Customer care support consists of two parts- IVR & Executive support. The networks were compared on both parts as a new consumer needs both kind of support for using data services initially.
  - iii. Computer connectivity ease: many of the consumers need to connect phone to computer for using internet. So I tested the ease of connectivity for different networks to find out if something needs to be improved in this concern.
  - iv. Offers & Packages for Data services: Also the consumers consider the offers given by different network providers while selecting the data services. This is an important criteria that helped to focus from cost and choice perspectives.

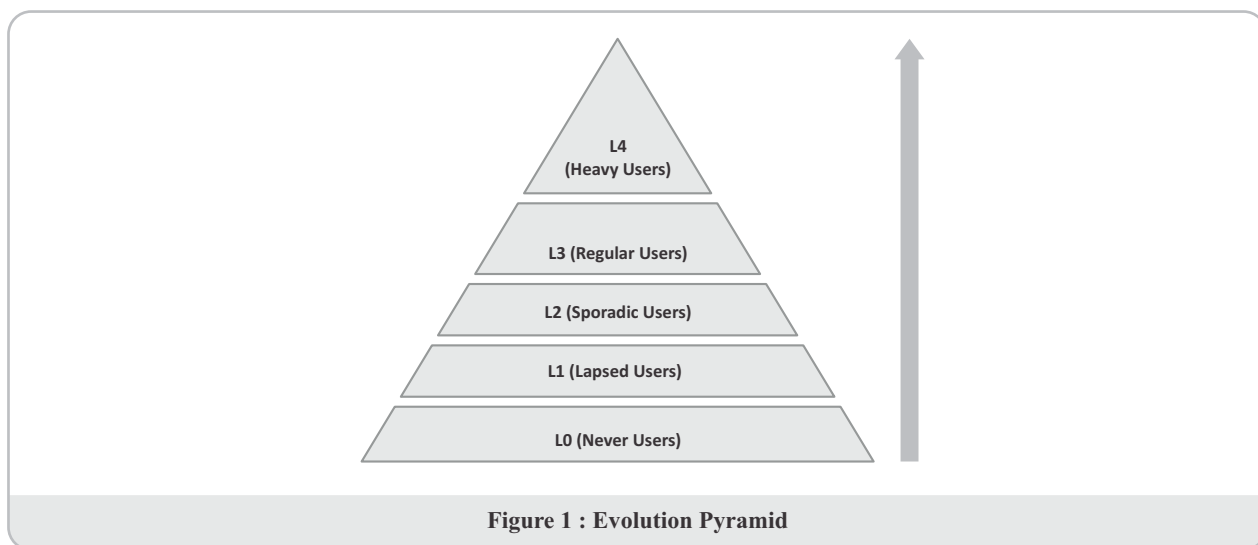
### 2. Segmentation of consumers -

The consumer base of mobile internet service is segmented on the basis of their demographical and degree of evolution characteristics.

- **Degree of Evolution**

The GPRS enabled handset consumers can be divided in 5 levels on the basis of frequency and duration of mobile internet usage namely-

- i. L0 (Never used): These consumers have not used GPRS even once even though they have GPRS enabled mobile handsets.
- ii. L1 (Lapsed Users): These consumers have downloaded GPRS & WAP settings and experienced internet through mobile but stopped using.
- iii. L2 (Sporadic Users): These consumers use mobile internet up to 3 times a week.
- iv. L3 (Regular Users): These consumers are using mobile internet regularly i.e. up to 7 times a week or daily.
- v. L4 (Heavy Users): These consumers are heavy users, using internet many times a day. These are fully evolved consumers.



### • Demographic segmentation

On the basis of demographics of the consumer base, they have been segmented in following categories:

- i. Youth students: These are the students of colleges and schools. They have different environment, time availability, friend circle, community, technical inclination and interests. So they have been considered as one demographic category.
- ii. Working Youth: these are the young consumers working in early stage after college and under 30 years of age. These consumers have different learning and working environment, different preferences, needs, interests, resources, etc.
- iii. Working Executives (above 30 years age): These consumers are in different age group and have different priorities. So they have been considered as a segment.
- iv. Businessmen: These consumers have different requirements and needs from rest of the segments. So they have been considered as a separate category.

### Segmentation Grid:

		Degree of Evolution				
Segments	Level Demo.	L0-Enabled handset but never used	L1-Lapsed after experience	L2-Sporadic Users (up to 3 times week)	L3-Regular users (up to ones a day)	L4-Heavy Users (Many times a day)
	Youth Students	1	7	6	12	15
	Working Youth (below 30 years age)	12	7	13	13	12
	Working professional (above 30 years)	10	9	16	9	8
	Business Professional	9	6	8	7	5

Opportunity →

↓ Challenges

**Figure 2 : Segmentation Grid**

The horizontal span shows the five levels of evolution whereas on vertical scale is different consumer demographic profiling. The numbers written in the column shows number of consumers interviewed in each category. Though effort was made to find consumers in all segments but due to segment size in market few responses could be captured in youth student + L0 category. The following are the challenges and opportunities that are shown in the grid:

• **Opportunity:**

The biggest opportunity in data services is present in youth student & working youth categories because of the following micro & macro factors which has been reflected in the survey findings too -

- i. More technically inclination along with more time for browsing & learning hence can be moved up the ladder faster.
- ii. If captured early, these consumers tend to move along with new technology and brand loyalty is easy to grow as they are more engaging and early adopters.
- iii. Nearly 50% of India's population is under 30 years of age and these customers have longer consumption timeline which increase their Net Present Value significantly over other categories.
- iv. High disposable income, evolving need recognition for social networking, connectivity to different services through internet, knowledge access, increasing penetration of mobile gadgets with internet needs, etc. makes them more likely to use data services in coming time.

• **Challenges:**

The challenges lying with L0 (No Users) & L1 (Lapsed users) which need instant attention by service providers so that they do not leave these potential customers untapped -

- i. L0 & L1 consumers are found to be less technically aware about the uses, benefits and direction of operating on GPRS enabled mobile devices which diverts the intention of internet usage from mobile to computer even if they find mobile internet more suitable for their purposes.
- ii. These customers mainly consist of 30+ age group who find mobile internet new and feel resistant to change. This is a major challenge as service providers are losing customers with good prospect and spending potential.
- iii. Lack of awareness of charges, hesitancy to start exploring and unclear benefits of mobile internet over internet on computer force non-usage on GPRS enabled handsets.

### **3. Survey Methodology:**

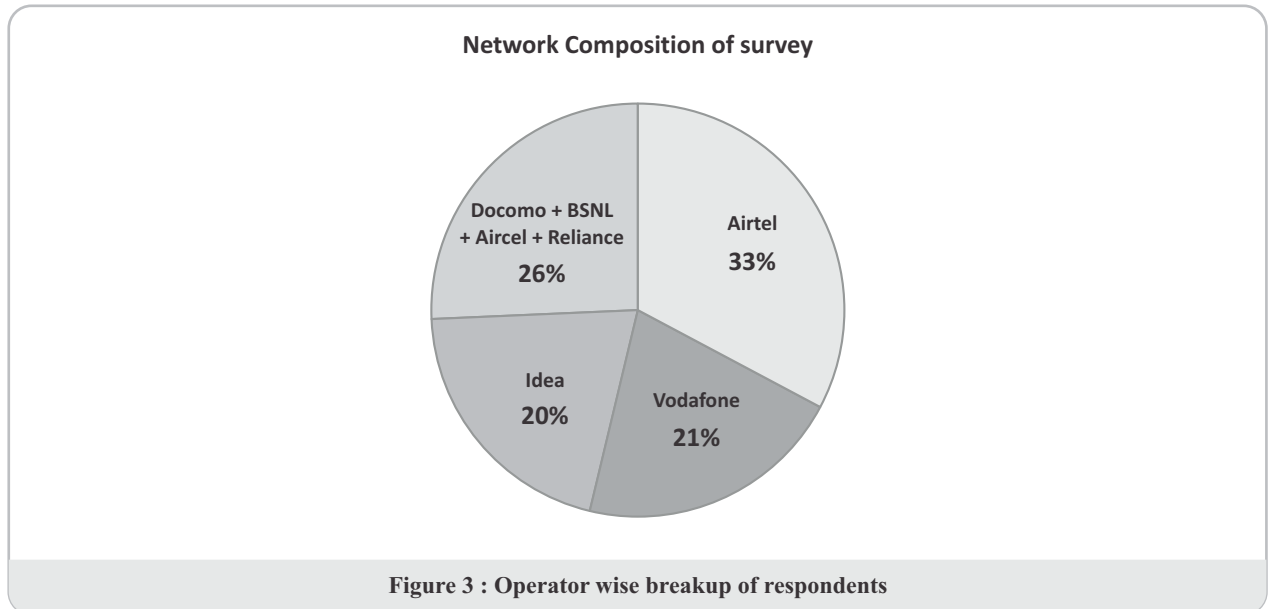
For understanding the consumer behaviour towards mobile internet and internet on computer, their choice making process, interests, expectations and satisfaction level from mobile internet, a questionnaire was designed to conduct qualitative research with different consumer segments after several test surveys.

The survey was conducted with 185 consumers in Kochi, Kerala. The consumers were met in-person at places like malls, public places, working places, mobile stores, food courts, home, etc.

Each day 10-15 consumers were surveyed. Each consumer was asked insightful questions mentioned in questionnaire.



Also important information that could not be included in questions like special reactions, unspoken inclination in consumer's behaviour, way of answering (whether answered without help or needed option push method), etc. was also captured, interpreted and added to questionnaire answers.



## Findings & Recommendations:

### 1. L0 & L1 users -

Since L0 and L1 users' current state is 'non-users' even though L1 users have tried mobile internet but stopped using and L0 users have not even tried. All the segments cannot be covered separately here so results have been aggregated for L0 & L1, L2, L3 and L4 segments.

#### Challenges and problems:

Challenges which stopped the users from continually use mobile internet are

- Low Awareness of 'GPRS=mobile internet' & lack of awareness about benefits of GPRS: Most of the L0 users did not understand what GPRS meant and how it is beneficial to them even though they all were internet users (even though using basic mailing and search applications through internet on computer). All the companies are targeting these consumers by publicising and pushing GPRS activation request even though they don't understand clearly that GPRS stand for mobile internet.
- High Charges: These users did not opt for data packs and rates otherwise are costly. Since most of these users were found using internet through computers in office or home and perceived paying monthly rental as unnecessary expenditure as they accessed internet mainly for emails, search and song downloads (seldom).
- L1 users could not understand the balance deduction based upon download amount (data is downloaded even though one opens a page and downloads nothing manually) and perceived it as unjust balance deductions as they were high (no data pack). Also, in some companies' cases these balance deduction communications for data usage were offline which reached half an hour late to consumers and they could not relate it with usage they did. This created lack of trust and transparency in data services.

- Complexity & Learning problem: Since the GPRS settings are pushed and some handsets require manual changes in settings of frequency, mode, etc. and make the whole process a little cumbersome for less technologically inclined customers in this segment which is dominated by business people, and working class population (both have office/home internet and do not feel much need for GPRS if it comes at 'time & complexity' cost)

## Content

These two segments showed inclination towards following internet utilities (in order of preference)

- Email: Email (gmail mostly) is basic internet function which these customers use on internet through computer.
- Facebook/Orkut: Social media is also getting good response from these segment customers.
- Google: This is invariably used by all customers for their work related or other purposes.
- News: Less used though but getting popularity in young working class.
- Cricket: This is famous in young working class especially when cricket season is on!

## Surrogates

Since it is not possible by just visualizing the data usage what kind of user she/he is, it was required to find some surrogates based on usage pattern of different segment. Combination of surrogates can help to determine what kind of customer one is and what content to be pushed, what help he may need and how they will behave towards offer, data packs and different services.

### • Students & Working youth:

- i. Low ARPU: Generally this category has lowest ARPU among non-users, approximately between Rs 30 – 150.
- ii. Message pack: Message pack usage has been found high among young consumers.
- iii. Prepaid: Most of the customers are prepaid

### • Working Professional & Businessmen:

- i. High ARPU(>200): This category showed high voice revenue and low messaging and caller tune revenue. The overall ARPU is high and generally above Rs. 200.
- ii. MCI: Miss Call Alert service is most wanted to this category and most of the users have been using it.
- iii. Postpaid: The user base is little more inclined towards postpaid services.

## Recommendations

On the basis of study, recommendations were made to improve revenue through increased data usage in these categories (client specific and region based recommendations have not been included)

- Site based payment: Some companies have started this but still not all. L0 & L1 users use specific and limited websites and if they are charged according to peculiar usage they may become more inclined towards using mobile internet and subsequently can be moved up the life cycle ladder.
- Promote 'mobile Internet' not 'GPRS': Companies should spread awareness about mobile internet concept, benefits and ease of use instead of pushing technical terms like GPRS to these less technologically inclined category.
- Instant & complete information: charges deducted, usage, duration of usage and tariff should be communicated instantly through online system (some companies still don't have it).
- Promotion strategy: Pamphlets in recharge shops + IVR dedicated to GPRS and spreading awareness about the same + Response Message methodology to give services like pay per site, song download, etc. Weekend Promotion strategy as these customers give less attention towards promotion done during office hours and week days and consistent promotion throughout week will over feed and attract detestation from customers.
- Ease in setting installation and help: Help should be provided to enable GPRS, if not automatically, for less tech savvy customers by manual/IVR help dedicated for GPRS.

## **2. L2 users:**

These customers use mobile internet but only up to 3 times a week. Since the usage is low, I tried to find out causes and solutions to improve usage. This category is clearly dominated by working class majorly.

### **Challenges and problems -**

Following are the challenges faced by consumers which lead to limited usage of mobile internet:

- Computer Habitual: Consumers explicitly named ease and advantage of internet on computer which they could not find on mobile though they used internet on it while travelling. This hurdle is unanimously mentioned by customers and becomes big problem for consumers to move up the degree of evolution.
- Low information about Packs: These customers know about data packs but seldom have they known the ease and process of recharging data packs. Also, they peculiarly use small data packs during weekends if they do not have internet on computer, get more time to browse on phone and travel.
- Speed & Cost: These customers use limited mobile internet because of low speed and high cost as awareness about small data packs and ease of recharging has not been clearly conveyed. Also they do not use mobile internet speed boosters like the evolved users.
- Hesitant to Explore: Also these customers are less inclined to explore beyond few regular applications like Gmail, Google, Facebook or other inbuilt icons in their phones.

## **Content**

This segment showed inclination towards following internet utilities (in order of preference)

- Usage: Emails, FB/Orkut, Google, Cricket and News are most used services in preference order.
- Music download: Music download from free music sites is also popular in this category. Though mostly they do it through computer.

- Wallpapers: This is seldom used feature.
- Small low cost Games: Sometimes they download games too, mostly for their kids.

### **Surrogates**

Following are set of characteristics that may help in segmentation and to identify the consumers of this segment while observing patterns in available data.

#### **• Students & Working Youth:**

- i. Low ARPU: These consumers have low ARPU generally and mostly from voice and messaging services.
- ii. Small packs/ No packs: Data packs are used seldom and if used, they are small packs (occasionally when they travel or on weekends) for 3-4 days.
- iii. Weekend use: Mostly these customer use internet at weekends (via computer connectivity).
- iv. Heavy Texting: High texting is also important characteristic of this group.

#### **• Working Executives & Businessmen:**

- i. High ARPU(>500) & Postpaid: These customers have high ARPU with mostly postpaid connection.
- ii. Heavy on Voice: Most revenue comes from voice calls and Missed Call Alert service.
- iii. No Packs: Packs are not used by these customers but their usage is also small.

### **Recommendations**

Following are some important suggestions to move these customers towards high internet usage and revenue increase.

- Low Price Monthly Packs: Since these customers use small or no packs but usage is also less, they can be provided with monthly packs at very low rates like Rs. 30 and slowly when they start using more of GPRS and become habitual to the ease of mobile internet, charges can be increased to present level. This way one can move them up the evolution ladder and increase revenue.
- Benefits of Packs + charges information: Benefits of packs should be communicated well along with ease of recharging and charges should be stipulated clearly.
- Opera Mini & Speed Accelerators + Benefits: Mobile internet speed boosters can be suggested via messages mentioning clearly the advantages and links of downloading them without charge. This will solve the speed problem faced by many.
- Suggest Services + Direct Helpline: Since these customers are little hesitant to explore, service providers can suggest relevant and little advanced services or websites like moneycontrol, news related websites, jokes or information giving websites, free music websites etc. to drive more data usage. Though care should be taken that the suggestions do not eat into company's ringtone, song and other WAP service business!

### 3. L3 & L4 users:

These customer use mobile internet regularly (up to 7 times a week) and many times a day, respectively. Since it has been found that usage patterns are similar except the frequency of usage, observations of both the segments have been given below.

#### Challenges and problems:

Following are the challenges faced by consumers which, if solved, can further improve data usage and enhance experience along with revenues:

- **Speed:** Mainly these customers complain about slow speed and are more likely to shift towards 3G if rates are low and reasonable to them.
- **Choice in Content:** Since the content like songs, videos, news, etc. are been used by these customers, they want more varieties, suggestions about websites that may be interesting to them and improved content choice in songs and ringtones in most popular language including English.
- **Multi-tasking:** This is a desirable function for these customers but only high end mobile phones provide this.
- **Choice in Packs:** Many companies do not provide website based data packs which entice these segments. Also these customers use mobile internet via computer, so require unlimited or bigger data packs in some cases.
- **Less Time to Explore:** Less time to explore things on mobile is hindering their usage.

#### Content

Apart from services like Gmail, cricket websites, Facebook/Orkut, News, etc. following are special content information about these well evolved customer segments.

- **Music:** \*Students & Working Youth-New Hindi + English + Regional language songs are most preferred by the young generation.  
\*Working Executives & Businessmen- Hit Regional language songs + Hindi songs are most preferred by working executives and business class.
- **Videos:** Movie trailers + New Movie Song + Funny + Cricket Live-streaming are favorite choice of videos, but used less due to slow speed.
- **Games:** Racing + Action + Puzzles are most popular games which entice these customers.

#### Surrogates:

The following are surrogates to help in identification of these customers:

- **Students & Working Youth:** High downloading of music + Caller tune + Messaging + computer connectivity + mostly Prepaid
- **Working Executives & Businessmen:** High ARPU(>600) + Low Downloading+ MCI + Share Market alerts + Postpaid

## Recommendations

Following are some recommendations to further increase data usage and experience of high and fully evolved data users:

- Opera Mini + Nimbuzz + speed accelerators should be pushed to these customers and advantage of these speed enhancing software and multi-tasking facilities involved should be well communicated.
- WAP: Content Enrichment + easy structure for browsing different categories need to implement. Content presently serves to obsolete or little choice of customers and need to upgrade very fast and continuously.
- Unlimited Packs + Night packs should be suggested as usage through computer connectivity is high during nights and 2GB packs are not sufficient (some provide bigger data packs too).
- Promotion: Instant Reply Message(IRM) + List of New Products, suggestions should be interactive through IRM and latest content according to the interest of customers of these segments should be suggested through messages or a separate suggestion inbox (that can be downloaded and saved on screen and gets updated every day which can be seen by customer whenever he/she wants to see it)

## Advantages of Recommended Framework

### •Ease of implementing:

The above mentioned process of segmentation can be performed easily by service provider as follow-

- i. Sorting of customer data as per surrogates and Traffic data, Contact centers data (customer complaints, contact center interactions logs and stats, etc.) and Billing data.
- ii. Finding common customer under groups and pushing recommended content.
- iii. Empowering learning and other recommendations like low price packs, region based content, etc. for different segments.
- iv. Tracking movement and changes in usage pattern and further segmenting customer base accordingly, maintain timeline tracking of customer movement on learning curve.
- v. Giving personalised help to customers who feel resistant to machine generated help (ARPU based cost-return analysis should qualify customers for personalised service).

### •Customisation of Framework:

Since customers belonging to different geographical and cultural contexts may have differences in usage pattern, content choice, language preference, technical bending, etc., the framework may require little reworking to suit the new context but more or less the factors affecting the strategic decision and customer behaviour are likely to remain same for Indian states. This gives a clear cut strategic implementation framework for any telecom company to increase data penetration in different circles.

## Challenges for Service Providers

Above, different segments have been discussed with focus on challenges faced by consumers in adopting the new era of data services but there are certain contests that the service providers have to



come across to help customers move up for data usage. Macro and micro level hurdles that may hinder the telecom companies to fully developing the data service market:

• **Technology Hindrance:**

Since the technological cycle is revolving fast, companies are required to invest huge sums of money to develop network advantage over the competitors which may reduce their return on asset if technological churns are kept pace with. ARPU is one of the lowest for Indian telecom and the price war started to gain market share now seems hard to reverse. Consumers seems less inclined to pay more for 3G rates but feel unsatisfied with slow speed GPRS. So a middle path through pricing strategy may play crucial role to gain competitive advantage if a proper network effect is developed by service provider (like Blackberry messenger service) which locks customers into data services and incentivise new customers to join in. This may prove win-win situation for customers demanding high speed connection and service providers seeking volumes in sales.

• **Changing Consumer Psychology:**

Two major challenges are there in front of telecom industry in data services context which encapsulates strategic concerns-

- i. Help PC internet users to move on mobile internet: More than 100 million Indian customers are on internet but only 40 million through mobile internet. Challenge lies to move rest 60 million customers on mobile internet.
- ii. Help GPRS enabled handset users to use mobile internet: About 140 million customers have active GPRS enabled handsets in India out of which nearly 35% are active on GPRS. So challenge is to move these active users up the evolution ladder while getting rest of 65% customers to use GPRS.

• **Spectrum Limit:**

Present spectrum available to Indian telecom players is not sufficient to provide services like video conference which may overburden the network if accessed simultaneously by little percentage of total subscribers. This brings two major challenges-

- i. Unfeasible low rates: If rates for video calling (very important data service) are reduced, jams will reduce service satisfaction and non-reduction in rates lead to low penetration, reducing ROI & ROA.
- ii. Application Development: Since the applications like video conference require bring huge traffic into spectrum, companies are less likely to develop similar applications as this will reduce overall spectrum efficiency.

• **Competency Maintenance:**

Recommendations on content & promotional strategy mentioned for different segments can be applied and easily copied within hours if found successful. So the critical differentiating factor is how well the companies segment their customer base and the way they superimpose surrogates to find suitable content for particular segment.

These external issues are hard to tackle as regulations are tight and do not allow acquiring more spectrum. This poses a big hurdle in developing high speed data service market, particularly in Indian context.

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# Identification of Factors Influencing Consumer's Buying Behaviour for Mobile Handsets

**Preeti Virdi**

## **Abstract**

Consumer buying behaviour aims at understanding customer's preferences and desires. Competition has led to many brands selling similar products at competitive prices. Various factors result in consumer's decision to buy a product. The Mobile handset Industry is a turbulent market with smaller product lives and increased price wars. There is a growing concern for determining the factors leading to the choice of handsets by customers. This paper throws light on the factors that motivate consumers to own mobile handsets. The paper mainly explores the attributes that people look in for generally while buying a handset. Data was collected from a sample of 216 handset owners aged from varied age group, income group and perceptions for buying decisions. The factors are based on the certain variables used in the survey. These variables were aimed at identifying the factors that influenced the choice of handsets at the point of purchase. The variables include Stereo sonic sound, Value for Money, Durability, Brand Accessibility, etc. that influence the choice of a brand from the list, but these attributes might not be the most important determinants for deciding the brands. The study is useful for developing a market strategy that is pro customer needs.

**Key Words: Telecom, Handsets, Features, Consumer Behaviour**

## **Introduction**

Telecommunication has become an integral part of all human interfaces and a lot of development in business and other spheres can be attributed to the sector. India is the fastest growing consumer durables market of the world with the highest population of consumers for electronic goods especially mobile phones.

Consumer research has devoted less attention to the factors underlying the mobile handset buying decision process. There are numerous factors that need to be taken into account when exploring mobile phone buying decision process by consumers.

The mobile handset market is a typical technology push driven market and is witnessing a burgeoning increase. The market has witnessed a shift from predominant CDMA to GSM technology enabled handsets. The products are created keeping latent needs of the consumers in mind. Innovative technology like GPRS, 3G, and Mobile TV etc. are making mobile handsets redundant more quickly and reducing the product life cycle. With the increase in technology, the buying patterns have changed from retailer end to online purchases.

Moreover, the opening up of domestic markets for local handset manufacturers has led to a price war in handset industry and led incumbents to reduce their handset prices and reduced features.

The primary objective of this paper is to determine the factors influencing consumer's buying behaviour for mobile handsets.

## **Literature Review**

### **Consumer Behaviour**

Consumer buying behaviour is guided by the entire decision process of the consumer and consumer's search for benefits or solutions rather than products (Rowley, 1997) make the entire buying process an emotional exercise.

Lower price is a factor affecting the buying decision of the consumer but its ubiquity is doubtful (Anna Watson, 2002)

Customer satisfaction and Loyalty plays one amongst a lot many factors for determining the consumer's buying behaviour. Consumers tend to make purchase decisions based on cost effectiveness, low variable and service cost, long life and high performance of a product over other models. Also consumer buy the product on the basis of the style, features and innovative technology introduced in the market. Mobile Handsets have become the part of lifestyle in India. As the life- stage changes, so does the handsets and the influencers of its purchase. The influence of peer group is biggest for the new technology seeking youth. For middle aged buyer, self-image, family pride and children are the key influences. Another factor is included in that is the positive or negative attitude of the consumer toward the product. The brand which will provide good service assurance and has good market reputation wins the battle of gaining customer attention (Banerjee Saikat 2010)

Brand image plays an important role in the buying decision of a handset by the consumer. Branding refers to the strategic creation , development, implementation of the brand Branding plays very important role in building the image of the product and promoting the product. It helps in removing the negativity and rumours about the company. Branding promotes the unique and unmatched qualities of the product. Branding helps in attracting the customer to the product. Branding the product helps in determining the reliability and durability of the product along with customers trust. (Patel Pratik C 2010)

Patra Supriyo and Datta Saroj K. (2010) determined that celebrity endorsement is another important aspect in product promotion. When company pursue a celebrity they always look for such who is successful in his or her profession, widely recognized in the society and have huge fan following and enjoy media attention. They have demographic and psychographic connect with the target audience. The study has also concluded that celebrity serves as spokesperson for the product. The research concludes that in India, consumers inadvertently follow the products that the Bollywood superstars promote.

## Mobile Handset

Previous literature on buying decision of mobile handset is not abundantly available. A few academic articles have shed some light on the topic.

Leung and Wei (2000) conducted a study in Hong Kong and found that intrinsic or social (social status, affection or sociability, and relaxation) and instrumental or task-oriented (mobility and immediate access) were the main drivers for owning the mobile handset. Contrary to the previous work done by Noble, they revealed that instrumental or utilitarian uses of the handset were more frequent than the social uses. They further explained that the instrumental motives were much stronger than social or intrinsic uses when we compared it to the uses of the land line telephone. Other studies have found that personality and social environment influence the needs and choices of a particular medium. Papacharissa and Rubin (2000) identified that perceptions, socialization, psychological characteristics, and attitudes influence behaviors and motives, and thereby influence the choices of media (handset).

Grant and O'Donohoe (2007) proposed five factors for owning a mobile handset—convenient entertainment, social stimulation, experiential learning, escapism, and purchase information and advice.

Kanagasabai Kajendra (2010) conducted a research on customer perception of delivered value with respect to mobile phones in Sri Lanka. Various factors were deduced owing to customer perception of value deliverance. The author bifurcated the factors as: Image Value, Monetary Cost, Energy and Time costs, and Psychic Cost. Having analysed the problem, the author conclusion drawn by the author was that the factors affecting buyer's decision were innovative services, multimedia, design, brand and basic properties, outside influence, price, and reliability.

Though, a lot many factors have been deduced from the work of able researchers. A gap in study remains for the determination of factors in the buying decisions of Indian buyers. The study relates to the factors affecting buying decision of handsets by Indian consumer.

## Objectives of the study

- To study the various factors which affect the buying decision of the customer in case of purchasing mobile handsets.
- To find the impact of cost as a factor on the buying decision of the consumers

## Assumptions

- For the study we have assumed Micromax, Fly, G Five, Lava, Lemon, Spice mobiles etc. as local make handsets. These might not be completely indigenous manufacturers but, this assumption is taken keeping in mind the perception of general public.
- All the elements of the population are handset users and are equally aware about the latest trends in the handset industry.

## Research Design and Methodology

The research objective was to determine the factors acting as a driving force for the purchase behaviour of handsets in the three North Indian cities. Owing to the in-depth details required about the factors to determine the data, exploratory research design was undertaken.

A sample size of the study included 216 respondents from across the three cities. Convenience sampling (Non-probability sampling method) was used to select respondents from different walks of life randomly. The sampling population included the general public; respondents were handset owners and included people from different financial backgrounds. The sample included an equivalent mix of student population, Government employees, businessmen or shopkeepers, home makers, daily wage earners.

The main research instrument used was a well-structured questionnaire which was administrated among the respondents. The questionnaire was simple and Likert's scaling method was used to determine the agreeableness of the respondent to the statements mentioned in the questionnaire. Maximum agreement was valued at 5 and minimum agreement was valued at 1.

A total of 23 statements specifying different attributes of buying were rated by the respondents. The statements used in the questionnaire and the different attributes taken in accordance with the statements were:

- I will purchase a handset that is cheaper (Cost effectiveness)
- I prefer handsets which are feature rich (Enhanced Features)
- I prefer handset which has greater after sales service (Reliability)
- I prefer handsets with Social Networking imbibed within them (Innovative Technology)
- More the sound quality, better is the mobile phone (Stereo sonic sound)
- I feel a good mobile phone must have a good camera (Built –in Camera)
- There is a competition between me and my friends for a better mobile phone (Peer Rivalry)
- I am brand conscious while purchasing a handset (Brand)
- Television and Radio advertisements affect my decision to buy a handset (Advertisements)
- I consult my family and friends before buying a handset (Peer Consultation)

- I prefer purchasing my mobile phone from company outlet (Accessibility)
- I buy mobile phone online (Net Savvy)
- I will prefer the handset brand whose accessories are easily available (Accessories)
- I shall recommend my current handset to others (Brand recommender)
- I am loyal to the brand of handset I own (Brand Loyalty)
- Branded handsets are better as they provide value for money (Value for Money)
- Celebrity Endorsements affect my decision to buy a handset (Celebrity Endorsements)
- Branded handsets have better after sales service (After Sales Service)
- Branded handsets have better durability (Durability)
- The overall quality of my current handset is very good (Quality and Usability)
- I like to buy a new handset every year (New product conscious)
- I change mobile handsets once in 3 years (Replaceability)
- I change my handset only if it is broken down (Repairability)

## **Data Collection**

Detailed field survey was launched simultaneously in different areas of the Tricity; information was collected through face-to-face interviews with respondents using structured questionnaires. The first part consisted of demographic details of the respondents. The second part included statements (designed according to Likert Scale) questions regarding types of mobile handset and service providers the respondents were using. The qualitative responses given by respondents along with their grievances and suggestions were taken for future reference. Also, various secondary sources including Books, newspaper, magazines, websites, blogs etc. were referred for setting up the basis of the research.

## **Data Analysis**

### **Data Analysis Method**

The data received from the field work was analysed qualitatively and quantitatively. Application packages like Office XP (Microsoft Word, Microsoft Excel) and SPSS were used

### **Sample characteristics**

The data in the study was collected from handset owners across the Tricity. The characteristics of sample were:

1. Out of 216 respondents 80% owned Branded handsets. The Branded handsets include incumbents handset players while 20% respondents owned local make and unbranded handsets.
2. 25 (12%) respondents belonged to the age bracket of greater than 46 years. 76 (35%) respondents were in the age bracket less than 25 years while 113 (53%) respondents belonged to youth.

The maximum buyers of handsets were college going students and young professionals.

3. 25% respondents were female. While 75% respondents were male.
4. 17% respondents belonged to the monthly income bracket of less below Rs 10,000. 24% respondents belonged to the monthly income bracket of Rs 10,000 to 20,000. 28% respondents belonged to the monthly income bracket of Rs 20,000 to 30,000. 24% respondents had monthly income greater than Rs. 30,000. While 7% respondents did not disclose their income.



## SPSS Analysis

### Reliability Test

Reliability Test was carried out by applying Cronbach's Alpha Method using SPSS 12.0. The reliability of the questionnaire was found to 0.776 and the number of items taken were 23. For a reliable questionnaire Cronbach's coefficient must be greater than 0.7, hence the questionnaire was reliable.

### Factor Analysis

An exploratory factor analysis was done using SPSS 12.0. Varimax rotation was used to identify the underlying factor structure for owning a mobile handset.

The KMO measure of sampling adequacy and Bartlett's test of sphericity showed highly significant correlations between variables supporting the use of factor analysis. The KMO factor's value was 0.853 hence significant.

The test reduced the attributes into five factors. These five factors had eigen value greater than 1. These five factors were main factors determined that lead to customer buying preference for mobile handsets. The estimated nine factors explain 54.67% of the total variance.

Total Variance Explained							
Component	Initial Eigenvalues			Extraction Sums of Squared Loadings			
	Total	% of Variance	Cumulative %	Total	% of Variance	Cumulative %	
1	6.071	26.397	26.397	6.071	26.397	26.397	2
2	2.381	10.352	36.749	2.381	10.352	36.749	3
3	1.706	7.419	44.169	1.706	7.419	44.169	4
4	1.324	5.755	49.924	1.324	5.755	49.924	4
5	1.092	4.747	54.670	1.092	4.747	54.670	5
6	.957	4.161	58.831				
7	.884	3.845	62.676				
8	.848	3.687	66.363				
9	.824	3.584	69.947				
10	.798	3.469	73.416				
11	.706	3.067	76.483				
12	.642	2.790	79.273				
13	.579	2.516	81.789				
14	.554	2.407	84.196				
15	.551	2.394	86.590				
16	.475	2.064	88.653				
17	.455	1.979	90.632				
18	.441	1.917	92.549				
19	.416	1.809	94.358				
20	.367	1.597	95.955				
21	.349	1.516	97.471				

Table 1 : Statistics of Variance of attributes

On analysing the rotated component matrix, all 23 attributes were divided amongst the five factors. The attribute having highest value for the factor was associated with the factor.

Rotated Component Matrix					
FACTORS					
VARIABLE	Basic Product and Brand appeals	Online and offline social influence	Innovative Features	Cost effectiveness	Advertisement and WOM appeals
Enhanced Features	.553				
Stereo sonic sound	.491				
Built –in Camera	.614				
Brand	.674				
Accessibility	.434				
Accessories	.505				
Brand recommender	.690				
Brand Loyalty	.676				
Value for Money	.721				
After Sales Service	.563				
Durability	.748				
Quality and Usability	.632				
Peer Rivalry		.772			
Net Savvy		.505			
Celebrity Endorsements		.659			
New product conscious		.225			
Reliability			.443		
Innovative Technology			.613		
Replacability			.718		
Replacability				.704	
Cost effectiveness				.691	
Advertisements					.731
Peer Consultation					.696
Extraction Method: Principal Component Analysis.					
Rotation Method: Varimax with Kaiser Normalization.					
a. Rotation converged in 10 iterations.					

Table 2: Rotated Component Matrix

## Findings

The findings can be represented as:

Factor No.	Factor Name	Attribute Name
1	Basic Product and Brand appeals	Enhanced Features
		Stereo sonic sound
		Built –in Camera
		Brand
		Accessibility
		Accessories
		Brand recommender
		Brand Loyalty
		Value for Money
		After Sales Service
		Durability
		Quality and Usability
2	Online and offline social influence	Peer Rivalry
		Net Savvy
		Celebrity Endorsements
		New product conscious
3	Innovative Features	Reliability
		Innovative Technology
		Replacability
4	Cost effectiveness	Repairability
		Cost effectiveness
5	Advertisement and WOM appeals	Advertisements
		Peer Consultation

**Table 3: Factors affecting the purchasing decision**

## Conclusion

In the Tricity, the motivation for the buying of the handsets depends upon multiple factors. The factors affecting the decision include Basic Product and Brand appeals. Nokia has been found to be the most preferred handset brand by the respondents. Only 20% of the respondents owned local make and unbranded handsets. The empirical results have provided considerable support for the presence of factors including online and offline social influence yielded by the medium and by peers, Advertisements promotional activities carried forward by the brand and Word of mouth appeals of their friends and family. Consumers of branded as well as unbranded handsets focussed not only on the quality of the handset but also on the new features added by the company in the handsets. Consumers preferred durability and quality of the handset over its brand name thus proving that the consumers of today are brand conscious but not on the cost of a utilitarian and quality offering. Though it was expected that consumers would be price sensitive and purchase a low cost product,

it was observed that price sensitivity affects the consumers only slightly. This observation opens the gates for a feature rich Smartphones to compete in the market on the basis of their offerings.

The identification of these factors enhances the understanding about the consumer psyche while purchasing mobile handsets. The research makes an observation that in order to sustain their existence in the competitive handset manufacturing industry companies must keep on innovating for new features. The delight feature of yesteryears is now being touted by the consumers as the basic product and consumers expect and demand increase in the features but keeping the handset sleek. Companies need to look into providing a low cost communication device able enough to synchronise work, home, entertainment and personality of the individual. The trends are shifting from a single SIM handset to dual sim handset. With the coming up of 3G in India, smartphones have become a rage among youth as well as middle aged consumers. Companies can focus on smartphones not only at a lower cost but also customizable to meet individual needs. There is still a lot of opportunity in the handset industry and the arena gets bigger with focusing on consumer's ease of use and on adding innovative features.

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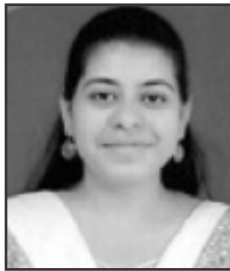
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# Policy and Charging Control – A Necessity

Jawahar Sabapathy & Vipin Verma

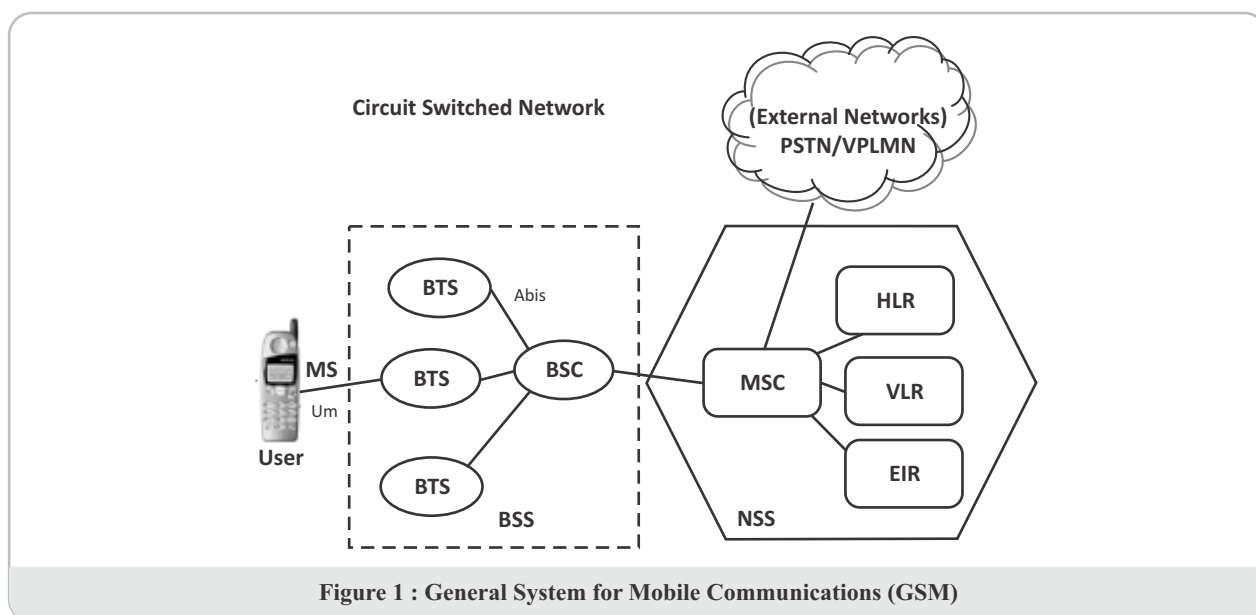
## Abstract

Over the past few years mobile telephony has seen a huge paradigm shift. Early 90's saw a tremendous growth in voice traffic shifting the balance from Fixed to Mobile. Preliminary use of Mobile for data was enabled by Circuit Switched Data (CSD), i.e. using Mobile voice circuit as a Modem. There was a parallel phenomenon happening in terms of internet revolution. To enable accessing the internet from mobile, GPRS and EDGE / CDMA 1xRTT/EVDO were introduced. Data traffic growth has been multi fold over internet and on the mobile networks. The introduction of smart phones has caused exponential growth in traffic on mobile networks. New business requirements originated in terms of accessing data on the move, and mobile phones became the obvious choice. Inline to the business requirement, 3GPP and standard bodies started to work on standards for wireless, mobile broadband resulting in LTE Advanced and WiMax. LTE and WiMax are pure IP networks with Packet Switched bearers. With these networks, Voice itself is a service over data networks (PS). The network supports multiple services that have varied requirements when it comes to Latency, Error rate, Data losses. This growth in data combined with the need to support multiple services with different QoS requirements, has led to the requirement of Policy & Charging components. This paper will summarize wireless technology evolution and provide more insight on the Policy & Charging Control (PCC in short) components.

## Wireless Communication - Evolution

### An evolutionary shift from Data over CS to Voice over PS

Global System for Mobile Communications (GSM) was conceptualized and deployments started in 1990s. It provided seamless mobility across various geographies and used Frequency Division Modulation (FDM) and Time Division Modulation (TDM). GSM provides Circuit switching i.e. a dedicated channel is established for each session (known as bearer), voice being the Primary service. Below diagram presents the basic components of a GSM network.





During initial days of GSM, there was very little requirement to transmit data while mobile, as there were not many applications around requiring data transmission. Existing demands were met with CSD, over GSM, with rates up to 9.6 Kbps.

GPRS - Around mid -1990s, with the popularity of internet rising, demand for data access, while on the move, started catching up. This led to the origin of General Packet Radio System (GPRS). GPRS introduced two new major components to the GSM core, named Serving GPRS support node (SGSN) and Gateway GPRS Support Node (GGSN) adding a packet core. SGSN takes care of mobility management related tasks like routing, handover and IP address assignment. GGSN acts as a gateway and router & it connects to ISPs or other corporate networks. Voice services continued to use CS Core, while data services started flowing through PS core enabled by SGSN and GGSN. In addition, in GPRS technology, the channel is used more efficiently owing to the packet-switching nature of the core. GPRS provides greater transfer speeds up to 171 Kbps (theoretically). Below diagram provides the structure of a GPRS network. General applications using WAP (Wireless Access Protocol) became popular over GPRS. GPRS USB modems became a way to access mobile internet.

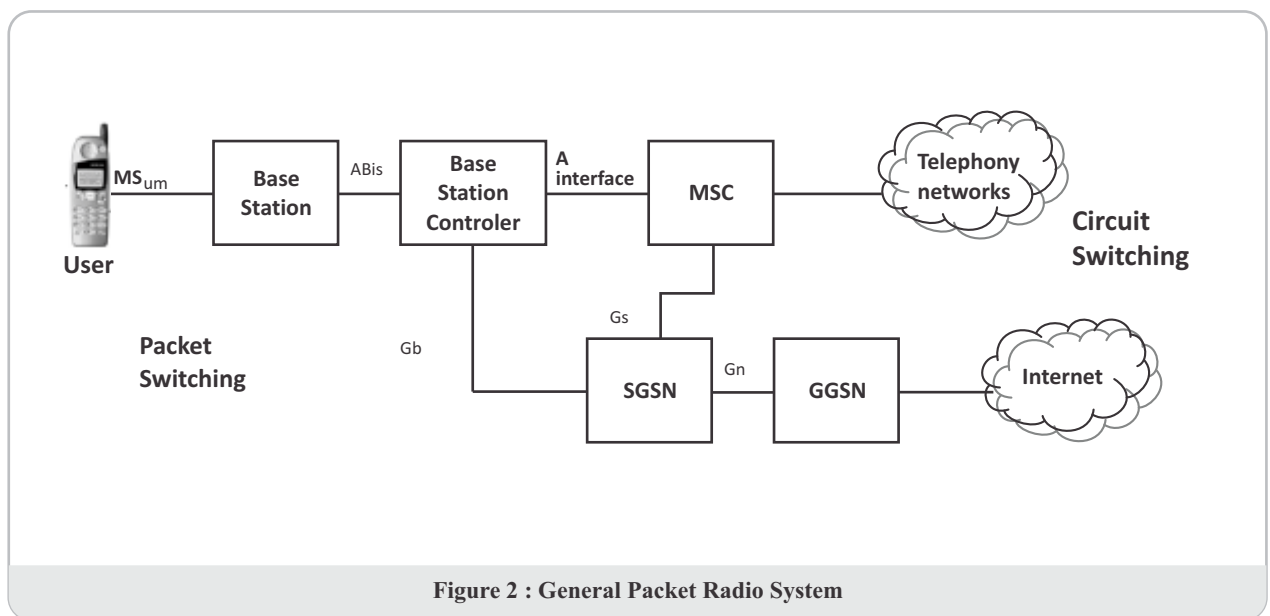


Figure 2 : General Packet Radio System

## Universal Mobile Telecommunications Systems (UMTS)

Early 2000 saw internet usage increasing multi-fold. New applications such as video conferencing, machine to machine data transfer started coming on horizon. In UMTS, there was a shift from the FDD and TDD and a more efficient Wideband CDMA was introduced. 3G networks use a 5MHz wide radio channels. Using this bandwidth and WCDMA, 3G networks are able to carry data at the speeds of around 2 Mbps in its original format. However with the later enhancements included in later releases of the standard the data transmission speeds are increased to 14.4 Mbps.

3G maintained two core approaches, i.e. a CS Core for conversational class of services while using PS Core for data oriented services. 3G supported services requiring higher bandwidth, better data experience. VoIP services started becoming popular.

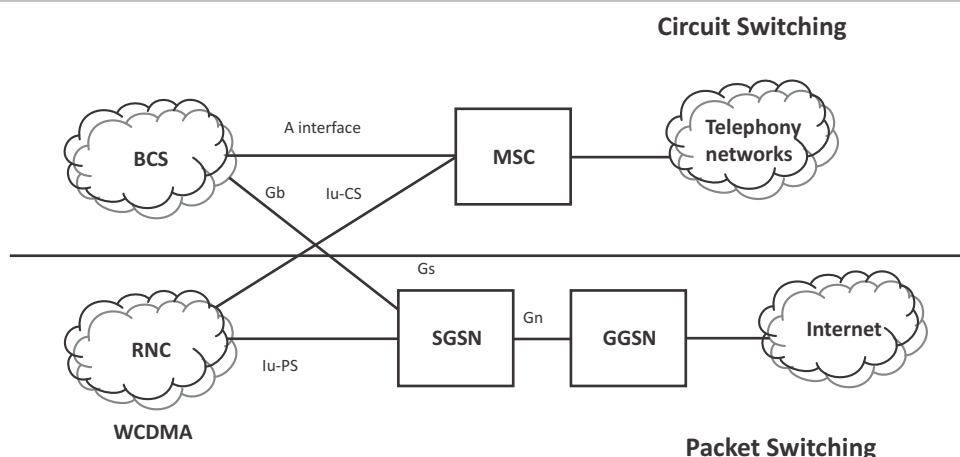


Figure 3 : Universal Mobile Telecommunications Systems

Demand for more data usage by subscribers had not stopped here and work for the next generation networks was underway. 3GPP started working on LTE while HSPA systems were being added to 3G for furthering the data rates. The Next generation of Mobile communications from 3gpp is named Evolved Packet system (EPS).

Evolved Packet System – EPS framework is illustrated in the diagram below. It is important to note that it is completely built around packet switching with CS core removed. Primary design goals for the EPS include DL speeds up to 100 MBPS with low latency. The core of EPS, known as Evolved Packet Core, is designed to support multiple Access networks including the advanced Long Term Evolution (LTE-A), GSM Edge, UMTS, CDMA and non-3GPP access networks such as WiMax etc.

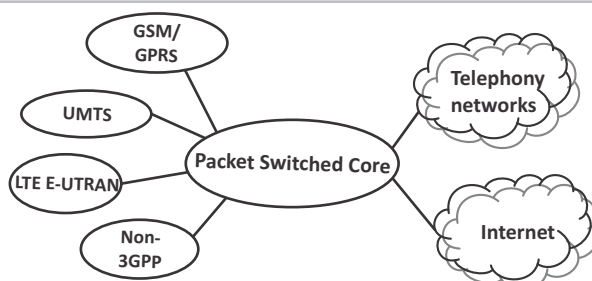


Figure 4 : Packet Switched Evolved packet Core supporting multiple Access's

Below is the diagram showing various components involved in EPS showing LTE-A access and EPC.

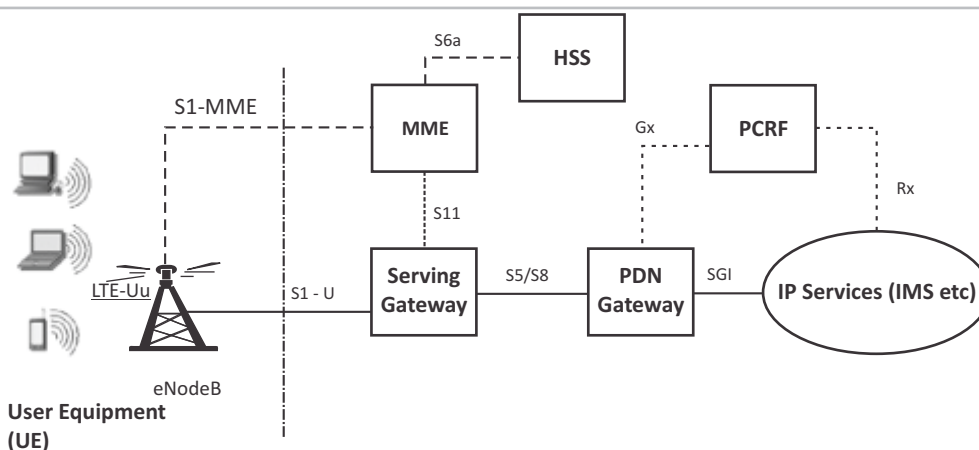


Figure 5 : 4G network layout – SAE (System Architecture Evolution)

The core network consists of Serving Gateway, serving as a local mobility anchor for the data bearers when the User Equipment (UE) moves between eNodeBs and inter-working with other 3GPP technologies such as GPRS and UMTS. PDN Gateway is responsible for IP address allocation to the UE, gateway to data networks such as Internet, Operator's service networks such as IMS, Corporate Intranets. Mobility Management Entity (MME) provides anchor to signaling functions related to bearer management (creation/termination), connection management and security between network and UE. HLR/HSS contains users' subscription data including restriction on service usage and QoS profiles. PCRF plays the central role in Policy and Charging; (PCC) PCC Rules are configured in PCRF. The key capability of service and subscriber differentiation is achieved by PCRF in tandem with various nodes and PCEF in particular. Subsequent sections will delve deeper into the realms of PCC and associated components

## Policy & Charging – A Business Case

This process of Wireless evolution, described above, clearly shows one thing, i.e. data, data and more data is going to flow across networks. Initially "Eat All you Can" type of unlimited plans for data services was sufficient and required in the initial days of 2.5 and 3G.

With the arrival of smart phones and new services that are video based, supporting such unlimited plans would have required huge capex, opex to deploy, support and scale the networks.

### Here is one of the excerpts from a news portal -

A large American Telco had to resort to throttling some of its heaviest mobile data users in an effort to maintain its network QoS for the rest of its subscribers.

The company said that 95% of their data customers will not see any change in service.

The highest data users, the top 5% with 3G devices on unlimited data plans, may experience **managed data speeds** when connected to a congested 3G cell site after reaching certain data-usage levels in a bill cycle.

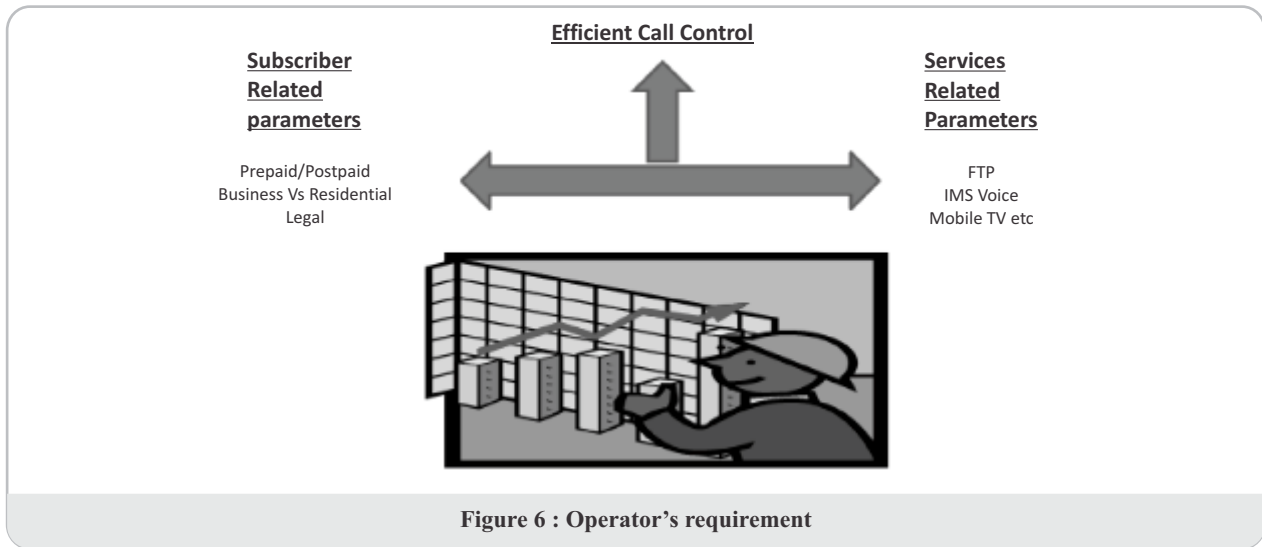
The company added that such users will only experience reduced data speeds when necessary to optimize data network traffic in that area. If congestion drops or the user is handed over to a different cell site, then the throttling of the service would cease.

With CS core removed, the PS core has to support different services having varied QoS requirements (like BW, latency, jitter etc.). Accordingly for operators the most important concerns are -

- a) Having more flexible and dynamic control on their networks for e.g. having service differentiation as emergency calls, data browsing are all travelling through the same network.
- b) Increasing average revenues per customer and for per MB of data download/upload.

This ever growing demand of having a finer control on the network offerings has led to the birth of Policy and charging control (PCC). PCC enables them to apply use cases for Bandwidth management, QoS Shifting, Tiered Plans, Geography specific pricing / congestion controls to manage the demand-supply gap. This is an important step in ensuring customers pay for what they want and vice-versa i.e. receives the service that they have paid for. This increases customer satisfaction and protects revenue. Second, this allows for critical services such as Emergency to be carried even in congestion times and helps operators meet the regulatory compliance needs. Subsequent sections provide more technical details about how this all is achieved with the help of PCC.

Below diagrams depicts the operator's requirements at the subscriber levels and at the network level.

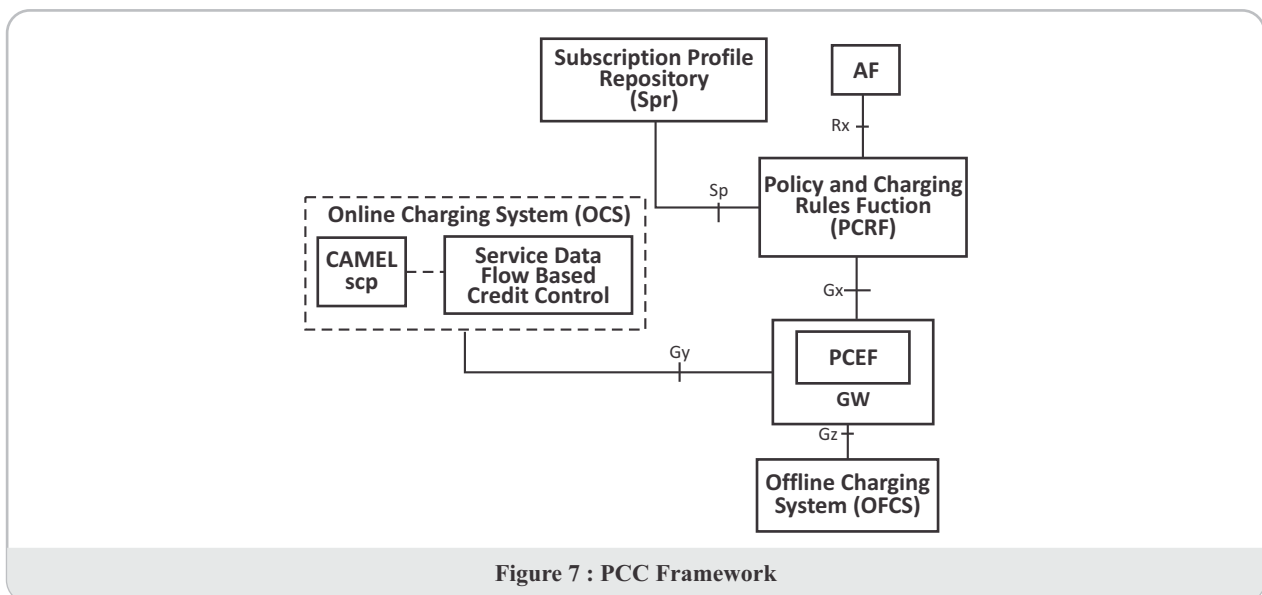


## Policy and Charging Control Framework -

A policy is defined as a set of prioritized rules which control network behavior at each customer level, dynamic enough, so that it can be modified with in a session.

Before proceeding on the Policy let's have a brief look at the precursors to PCC. 3GPP release 5 proposed Service Based Local Policy. It was a basic offering to ensure a QoS for a particular service. 3GPP release 6 defined Flow based charging. This allows breaking down of PDP context into individual IP-flows based on IP address and port numbers. The procedure was defined for online and offline charging. More details about these can be found in [3].

3GPP release 7 defines the PCC architecture, this includes the process of applying QoS and dynamic charging rules based decision. Below is a component diagram depicting PCC framework -



Here is a brief description of PCC Components –

- Policy Control
  - i. Gating control - capability to block or allow IP packets
  - ii. QoS Control
- Charging Control
  - i. Offline or Online charging
- OCS - Online charging system
  - i. Charging and Balance / Credit Management system
- SPR - Subscriber Profile Registry
  - i. Subscription information, User specific policies
- AF – Application Function
  - i. Terminating Application signaling and traffic
  - ii. IMS – P-CSCF. Non IMS E.g. Video Streaming Server
- PCEF – Policy and Charging Enforcement Function
  - i. Enforces policy decisions received from PCRF
- E.g. Gating, MBR policing
  - i. Measures user plane traffic and reports to OFCS and OCS
- PCRF – Policy and Charging Rules Function
  - i. Policy Control Node. Receive info from AF, PCEF and SPR
  - ii. Operator policies
  - iii. Create service session level policy decisions provided to PCEF

## Evolved Packet System and Quality of Service (QoS)

The understanding of QoS is important to understand and appreciate the role played by PCC. EPS is required to support the full gamut of services required by customers, e.g. multimedia services such as video, voice and data, email, browsing, social networking, Enterprise Apps and consumer apps.

These services require different quality of service from network in terms of packet delays, loss. This has led to standardization of QoS implementation to enable multi vendor inter-working and to allow wide variety of services to be offered on EPS to different customer segments.

### 3GPP defines QoS with a set of parameters listed below:

1. Packet Delay Budget– or latency (in ms)
2. Packet error loss
3. Packet handling priority

These triplets are referred to as QoS Class Identifier (QCI). QCI is a pointer to standardized set of values and is interpreted and applied to in respective nodes as per the required characteristics. The standard QCI classifies the bearers into Guaranteed Bit Rate (GBR) and non- GBR to enable multiple services.

For non GBR traffic, it's possible to specify aggregate Max Bit Rates (AMBR) to allow for network planning. Two important variants are UE-AMBR (specific to user equipment), APN-AMBR (specific to a given UE and APN).

In addition to QCI, Allocation and Retention Priority (ARP) plays a key role in admission/ retention of traffic during congestion times.

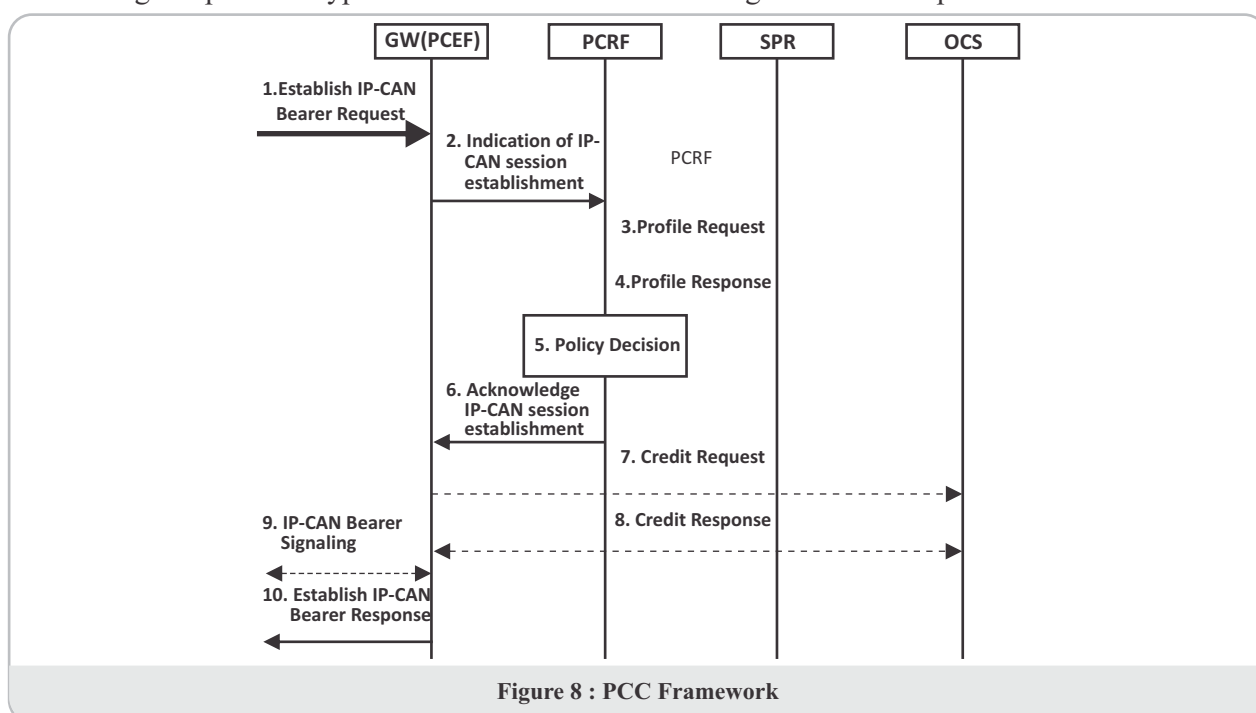
3GPP simplified and standardized the QCI parameters defined for 4G networks. The table below is implemented by EPS elements to provide a standardized way to treat traffic from multiple services and subscribers. The QCI parameters are as mentioned in the table below -

QCI	Resource Type	Priority	Packet Delay Budget	Packet Error Loss Rate	Example Services
1 2	GBR	2	100ms	$10^{-2}$	Conversational Voice
		4	150ms	$10^{-3}$	Conversational video (live streaming)
3		3	50ms	$10^{-3}$	Real-time gaming
4		5	300ms	$10^{-6}$	Non -conversational video (buffered streaming)
5 6	Non-GBR	1	100ms	$10^{-6}$	IMS signalling
		6	300ms	$10^{-6}$	Video buffered streaming) TCP-based (e.g. www, e-mail, chat,ftp,p2p file sharing, progressive video, etc.)
7		7	100ms	$10^{-3}$	Voice, video (live streaming) interactive gaming
8		8	300ms	$10^{-6}$	Video (buffered streaming) TCP-based (e.g. www, email, chat, ftp, p2p filesharing, progressive video, etc.)
9		9	300ms	$10^{-6}$	Video (buffered streaming) TCP-based (e.g. www, email, chat, ftp, p2p filesharing, progressive video, etc.)

Table 1: QCI parameters for 4G network

## Session Control and PCC

Below diagram provides typical call flow with inner workings of these components -





In PCC framework policies are configured in PCRF. There are two kinds of policies, static and dynamic. Static policies are configured by the operator and dynamic policies are defined by the Application Function and OCS. Operator created policies are retrieved by PCEF at the time of session creation and on specific trigger points decided by Operator.

There is a key difference between 2.5/3G networks and EPS – in earlier networks, UEs request for new bearer with the QoS and networks provided the same. In LTE, network initiates and creates the bearers and QoS is decided by PCRF.

Application Function (AF) provides any service specific QoS information to PCRF using Rx interface (based on diameter). Examples of AF include video streaming server or an IMS VoIP application server. Subscriber Profile Registry (SPR) provides subscriber based charging and service delivery specific parameters for e.g. eligible QoS to PCRF over Sp interface. Based on this information PCRF takes a decision on whether the session should continue (Gating Control) or if it continues what should be the attributes for the session (session control). Accordingly PCRF provides the policy decision to PCEF via Gx interface. PCEF plays the role of enforcing the policy.

As stated before, the QCI mapping table provides two types of bearers, Guaranteed Bit rate (GBR) and Non-GBR. As the name implies, non-GBR bearers do not guarantee data rates and is on a best effort basis. Conversational services such as VoIP over IMS, e.g. Skype call are considered as GBR services. In case it is not possible to provide GBR for the session, PCEF may either drop any other session (of lower priority) or may not allow this session to continue. Using a combination of QCI, GBR and ARP, the EPS is able to support wide variety of services and customer segments and manage the normal and congestion periods accordingly. This way PCC plays a pivotal role in providing finer control to network operators on their service offerings.

## **PCC - Future enhancements -**

The PCC continues to evolve by taking into account, the emerging business, service needs. 3GPP release 11 has introduced Service awareness and privacy policies. To achieve this, a service detection mechanism has been introduced in PCC architecture. A new component named Traffic detection function (TDF) does the job of detecting a service. Use of service detection mechanism may require user consent hence user privacy policies are introduced. Subscriber Profile Registry is extended to store User privacy policies. At the time of session setup PCRF checks the user's privacy settings to verify if the usage of traffic detection function is allowed. If it is allowed the PCRF in its response to PCEF would instruct the TDF on what services to detect. After detecting a service TDF informs PCRF about the detected service. The PCRF can take appropriate PCC decisions based on the detected service. As the TDF involves dealing with the customer privacy settings, it will be interesting to see how various countries/geographies adopt this feature. For e.g. to achieve net neutrality, Netherlands has mandated that operators can't block or provide preferential treatment to traffic going to public Ips.

## **Rollout Scenarios -**

Operators worldwide are in various stages of deploying the LTE-EPC network with PCC. The challenges are mainly in integrating the charging, subscriber profile and policy. Policies will be dictated by applications, specified by subscription and there could be dynamic policies based on congestion. In India, PCC is being used by telecom operators to provide tiered BW usage for e.g. providing 2Mbps BW up to a 10 GB of data download/upload and lower QoS after that. Most of these deployments are being done for 3G and 2.5G (CDMA). 4G/LTE will require/necessitate fully fledged PCC as an All-IP network with multi service transport and enhanced network capacity. Other challenges to be managed include –

- a) Scalability - in terms of latency introduced by various new components for PCC
- b) Customer Support - As it may become difficult for the Customer Care teams to explain the sophistication involved in policy to end users in terms of why they could not access a particular service or why they did not receive a pre defined BW etc.
- c) Subscriber Data consolidation – Subscriber data for different purposes is being stored in different systems – for e.g. HLR/HSS for Authentication purposes, Billing for charging and billing, CRM for customer care, SPR for policies and BI/DW for 360 deg views. There are attempts to rationalize this i.e. either some form of consolidation / federation of large subscriber profile / authentication info – so that PCC can be effectively deployed with full 360 deg view of the same.

While initial use cases of Policy and PCC are centered on fair BW use, Congestion control, supporting multiple services on Packet Switched Core, and catered to network deployment and Planning, there is a crucial element of monetization of network resources and supporting different customer segments is gaining importance – for example 'Turbo Boost' will temporarily increase a customer's QoS – say for IPL Final. Other policies could be related to regulatory compliance – for e.g. do not offer service X in areas Y. It's possible to offer attractive products for e.g. a combined product for people who own iPhone and iPad. Such requirements have been seen in US and European markets. In addition, M2M is expected to add more devices with varied traffic model. For e.g. chatty, highly mobile vs. non moving etc and this will create more policy and charging related requirements along with SLA commitments for such services in critical areas such as security, medicine and commerce. Here Subscriber profile Repository, CRM, Real time charging, Analytics elements will play a crucial role. SPR/CRM together will provide important insights into usage patterns of different segment of customers – providing important parameters to product design for various customer segments such as Consumers, Enterprises, M2M products as each will demand a different QoS, Service portfolio and offer revenue opportunities.

## Conclusion

In the end we can summarize that the dynamism offered by PCC helps us achieve all the mentioned objectives below

1. Fair usage management techniques to better handle network congestion
2. Improve quality of our key services such as VoIP/videos etc
3. Enable us to understand subscriber behavior and create appropriate subscriber profiles
4. Enable us to apply Time of Day control to certain applications or individual customers
5. Enable us to block or throttle certain third party internet apps such as P2P
6. Allows dynamic changes to subscriber offering, for example Turbo Booster packages. This will result in The subscriber receiving high QoS for a pre defined duration
7. Enable a group of entities to share resources (say business entity sharing a defined volume)
8. Ability to balance traffic across multiple access networks. This can be achieved by setting static policy by network operator.
9. Meet local regulatory requirements. E.g. emergency calls, calls originating from Police depts. should be of higher priority.

10. Manage age restrictions or parental control for each IP flow.

As the evolving networks of future are based on IP / Packet Cores, PCC will play a key role in ensuring operator meets the business needs of increased customer satisfaction, financial targets, and regulatory compliance and offer multiple multimedia services to customers over a simplified network

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# Why Does Water Defy Gravity In Waterfall Model?

**Suresh Randadath**

## Abstract

In a classical Waterfall model of software solution delivery the water (used as a metaphor for “project process”) is expected to flow smoothly from the initial phase of the project life cycle down to the subsequent phases till the final phase is executed. But reality is that water seldom flows down so smoothly and often a previous step is re-executed (a reverse flow), mainly due to lack of stability in the requirements, when the subsequent phase is already in execution. There are other factors as well that cause this. Consequently this negatively impacts the quality of the solution delivered. While this is a common phenomenon in any software project, this is especially true for Telecom BSS projects and this paper looks at some of the reasons behind this and suggests some solutions to address it.

The paper looks at three dimensions of Telecom ecosystem that significantly influences how smoothly the process flows in a Waterfall model. These are Telecom market dynamics, CSP induced factors and BSP induced factors. The paper concludes with a set of solutions that CSPs and BSPs can implement to address this, along with a case study.

This paper is written based on the observations made from various projects where the author was involved in.

## 1. Introduction

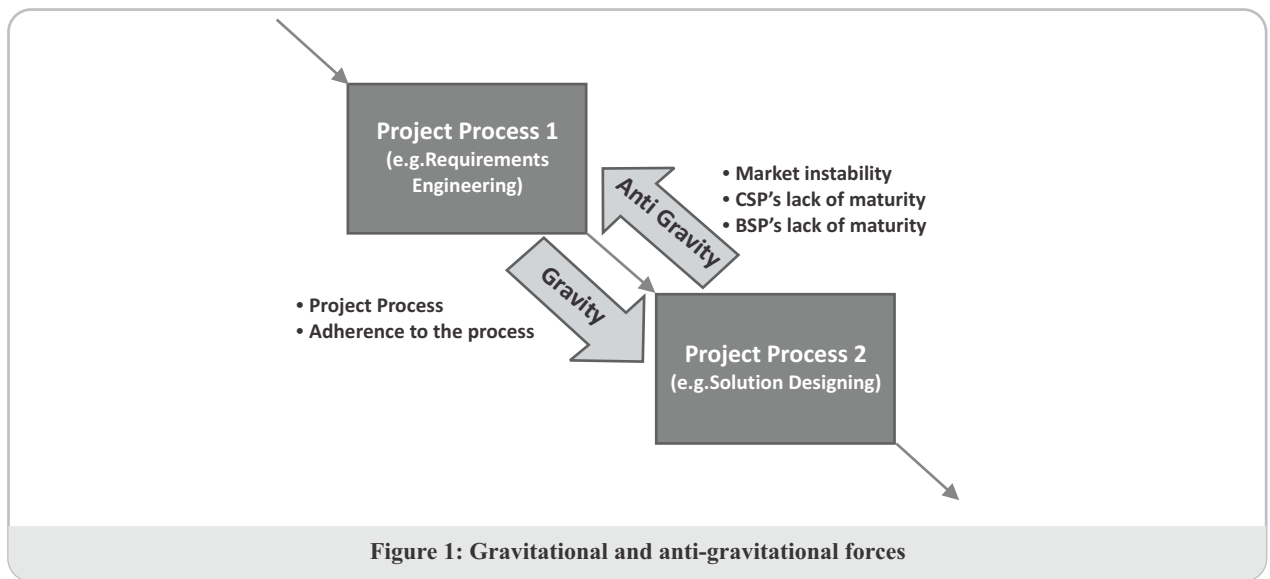
In a classical Waterfall model of software solution delivery water (a metaphor for the 'project process') is expected to flow smoothly from the initial phase of the project life cycle towards the end. The gravity (a metaphor for the 'process adherence by the stakeholders') exerts a force that makes this downward flow happen smoothly at the right time. But reality is that water seldom flows down so smoothly and timely. This is especially true for Telecom BSS projects and this paper looks at the various forces that exert an upward pressure countering the gravity causing the water to stagnate and even flow upwards. The paper concludes with some recommendations and a case study to avoid this based on the experience the author has had of working in BSS projects.

While it is true that other models of software delivery addresses some of the issues faced in Waterfall model and many projects adapt those models these days, author's experience shows that many software vendors still use the Waterfall model and struggle with issues induced by this model in their project delivery. Often these vendors have their own proprietary processes tuned to Waterfall model, that is well engrained into their software delivery process. Authors experience shows that there is a large resistance in changing this model due to the inertia developed over many years of practicing this model and the obvious difficulties in changing a well established process.

While the issues with Waterfall model discussed in this paper is applicable for software projects executed in many different domains, this paper focuses on Telecom BSS domain as it has certain unique challenges as explained in Section 2. Besides, the targeted readers for this paper are from that domain. Readers are requested to draw appropriate inferences to relate this to other domains as applicable.

## 2. Gravity defying factors

The figure 1 below illustrates the gravitational pull that keeps the water flowing in a Waterfall model and the anti gravitational push that tries to resist this flow.



The factors that cause the water to defy gravity are categorized into three:

1. Telecom market induced factors
2. CSP induced factors
3. BSP induced factors

## 2.1. Telecom Market Induced Factors

Telecom market space today is witnessing three main challenges:

1. Falling ARPU: Stiff competition and constant drop in tariffs are leading to ever falling ARPUs. This further leads to sustained pressure on marketing to constantly produce innovative services and rate tariff plans at short notice in an attempt to improve ARPU, retain existing subscribers while attracting more subscribers.
2. Volatile technology: Technological changes resulting in new devices (like smart phones, tablets and the apps that run on them) and new methods of service delivery (more and more business and personal transactions moving to communication devices).
3. Volatile telecom ecosystem: With usage patterns rapidly shifting from voice based to data based, the service delivery is no longer confined to traditional telecom operators. Rapid change in service delivery and user behavior forces CSPs to be constantly innovative and nimble footed to meet the challenges of a dynamic telecom ecosystem.

## 2.2. CSP Induced Factors

### 2.2.1. Lack of maturity of the operator CSP

Lack of clear business strategy of the operator leads to instability in the business requirements. This causes business requirements being changed before it is implemented. Such volatility results in requirements and the solutions not getting finalized in their respective phases in the project life cycle.

CSP with no central decision making authority ends up in having too many decision makers who often contradict each other, thereby delaying the decision or revisiting already made decisions surrounding the scope of the requirement. All these exert more strain on the delivery team to revisit the drawing board to modify the already conceived solution.

The failure to involve the marketing team in the requirement gathering phase is yet another reason for the requirements not getting stabilized. It was observed in the past that the IT team, who is managing the operations using the existing solution, drives the requirements workshop resulting in only the current requirements and current operational issues being included in the scope of work. In such situations, often requirements that are meant to address the long term corporate strategy get overlooked, causing potential changes to requirements midway through the delivery.

Water either stagnates or flows back up to preceding phase, defying gravity.

Note: Lack of maturity is an exceptional attribute found in certain CSPs and the paper is not generalizing all CSPs as lacking in maturity.

### **2.2.2. Tendency to shorten the delivery cycle**

Due to the market induced pressure, CSPs do not have the time to wait for the solution to be delivered over several months. As a result the BSPs often end up committing to unrealistically shorter timeframe for solution delivery. This, coupled with delay in getting approval for closure (sign off of the collaterals like SRS, Design documents, etc) of a particular phase in the project forces the delivery team to fast track the project processes. This induces heavy rework as activities in multiple phases are happening in parallel, in complete contrast to the classical water fall model.

Water flows back up to preceding phase, defying gravity.

## **2.3 BSP Induced Factors:**

It may be argued that Waterfall model cannot be singularly blamed for the BSP induced factors discussed in this section. However, due to the long delivery cycle that is typically associated with Waterfall model, these factors induce a higher risk to project delivery, compared to other shorter delivery models that are prevalent today.

### **2.3.1 Failure to identify the critical success factors (CSFs) of the customer**

What makes a CSP successful in their business? Often either this question never asked or gets drowned in the din of the numerous requirements discussions that happen during the requirements gathering workshops. Failure to identify the critical success factors often have telling impacts on the success of the solution that is delivered. There is no use in ensuring all the not-so-important requirements are working well when even one of the few critical functionality of the CSP has failed. Such failures can bring the CSP's business to a grinding halt. It is true that for a BSS solution, rating and billing are the most crucial functionalities. But for different geographies, the set of other factors that makes a CSP successful varies. For example in the African continent a credit control functionality of the solution is of paramount importance to the success of a CSP's business compared to a CSP in the Americas where adhering to the SLA to their clients is of more importance.

What do all these mean? The solution fails to pass the user acceptance test, as it is not addressing the CSFs. Water stagnates, defying gravity.



### **2.3.2 Inadequate requirement engineering**

Customers often know what they want. The word “often” is deliberately placed here to highlight that there are situations where the customers are either not really sure about the right business requirement (e.g. startup CSPs) or they struggle to express the requirements unambiguously to the requirement engineering team due to language barrier. In this process of give and take some requirements get missed out and some others get misinterpreted. As a result of this when the requirements are translated into designs and submitted to the CSP for approval, it undergoes many iterations of reviews and modifications. This is where the skills of the requirement engineering team, and the methods and tools employed by this team in eliciting requirements play a crucial role.

Water stagnates initially due to difficulty in finalising the requirements, or later flows back up due to wrong requirements, defying gravity.

### **2.3.3 Long delivery cycle**

As mentioned at the beginning of this paper, the dynamic nature of the telecom market, constantly keeps a CSPs on their toes to come out with innovative product offerings to retain/attract clients and improve ARPU. As a result it is not ideal to have a long delivery cycle for BSS solution delivery. The requirements identified at the beginning of the requirements gathering phase of the project, rapidly becomes obsolete during the course of the long delivery cycle and new requirements keep cropping up keeping the drawing board abuzz with activities throughout the life cycle. All these induce high degree of rework.

Water flows back up defying gravity.

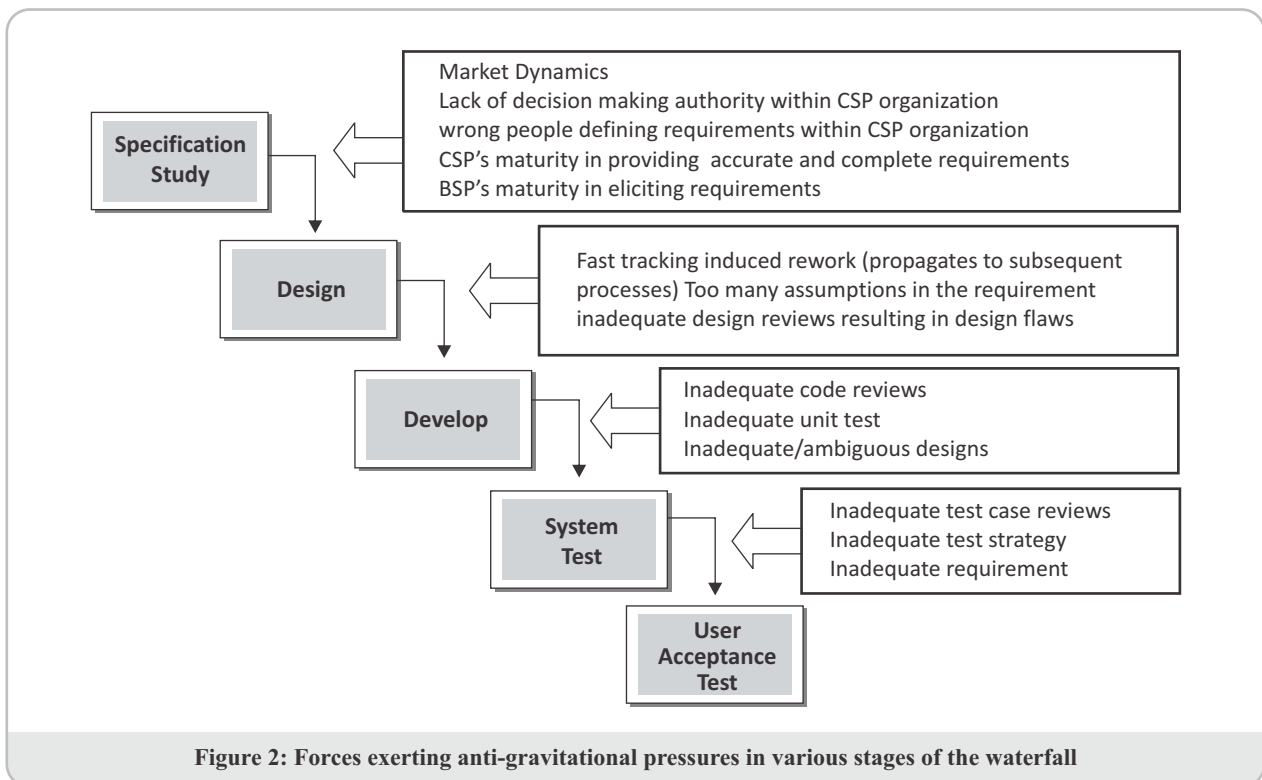
### **2.3.4 Product rigidity/constraints**

If a prepackaged software product is being implemented as the BSS solution, the lack of flexibility of the software product can act as a hurdle for the delivery team to make changes to the traditional Waterfall model or adapt to a completely different delivery model. For example, if an Agile approach is to be used, then the software product should be modular enough to implement the solution incrementally.

Not all aspects of the requirements are volatile in nature. So if the software product is capable of implementing the solution only for the less volatile aspects of the scope, then the risk of rework on the volatile components reduces significantly.

### **2.3.5 Project Delivery QualityLack of maturity of BSP**

Poor quality of the project delivery also impacts the smooth flow of water. Besides the obvious reasons surrounding the technical skills of the team and the fast tracking mentioned earlier, there are other factors that impact the quality of the deliverable in various stages of the project life cycle, as illustrated in Figure 2 below, thereby preventing the smooth downward flow of water. The factors given here may not necessarily be an exhaustive list, but author's experience shows that these factors are most common in projects, largely due to BSP's process immaturity or unrealistic timeline within which the projects are delivered.



Note: Lack of maturity is an exceptional attribute found in certain BSPs and the paper is not generalizing all BSPs as lacking in maturity.

## 3. Recommendations

### 3.1 For the CSP

#### 3.1.1 Decision Making

Establish a central decision making authority who will take all decisions surrounding the business and technology requirements to implement the solution, supported with a team of business and IT personnel to provide appropriate input into the decision making process.

#### 3.1.2. Business Insight

Deep insight into the business trends and corporate strategy in terms of the business roadmap is vital rather than addressing only the current and short term operational issues and needs. CSP should be clear about what makes them successful and what makes each different departments / divisions / sections / teams succeed in their individual functions. This will help in prioritizing the requirements so that in the event of scope expanding and going beyond the acceptable timeline for delivery, the delivery can be prioritised keeping the CSFs in mind. IT and Business teams need to work in tandem to scope the requirements accordingly and communicate this to the BSP team.

#### 3.1.3 Requirement Stability

If the business requirements are not stable or not clearly known, employing Waterfall model for delivery is highly risky. In such situation, CSP should ensure that BSP is aware of their constraints in defining stable requirements, so that a different delivery model is mutually agreed and employed.

## 3.2 For the BSP

### 3.2.1 Skills

In this globalised economy, requirement engineering team should be equipped to interact unambiguously with CSPs operating in different geographies, with a clear understanding of their cultures. This aspect is highlighted as the experience of the author shows that not much emphasis is given by BSPs to equip the requirement engineering team to face this challenge. While strong knowledge of the domain, in which the CSP is operating, is paramount for effective requirement engineering, the ability to effectively interact and communicate with the CSP is crucial to ensure requirements are captured unambiguously and completely.

### 3.2.2 Tools and Methodologies

Using a template containing industry standard requirements (e.g. eTOM framework) to drive the requirement engineering workshop helps in ensuring that standard requirements are not missed out for capturing. It also helps in guiding startup CSPs who are not sure about what they really want.

When written/spoken language does not work, go for pictures. Modeling tools, like UML, help tremendously in establishing a healthy communication between CSPs and the requirement engineering teams.

### 3.2.3 Delivery Model

BSPs need to be nimble footed as the traditional approaches to delivery may no longer be effective for a dynamic market segment like Telecom. Blind adherence to Waterfall model or rigidity of the product/solution/process in adapting other models like Agile, Scrum, Spiral, etc may prove to be fatal as discussed earlier. Depending on the situation an appropriate model needs to be adapted\*.

The software products and the tools required to implement them need to be flexible enough to shorten the delivery cycle. Products and solutions should be modular enough to differentiate between static and dynamic functionality of the BSS so that delivery can be made more innovatively. This typically requires a Service Delivery Platform which is basically an infrastructure upon which different types of services can be launched. The Service Delivery Platform should be designed keeping the long term business strategy/growth in mind.

\*What is best suited for a given situation is not discussed in this paper, but a case study is provided later in this paper to explain a particular situation.

## Summary

Implementing Telecom BSS solutions is a challenging activity due to the various forces that constantly influence the CSP's business, operations and BSPs delivery capabilities. Hence using traditional Waterfall model for Telecom BSS solution delivery may not be appropriate in all situations due to the above forces acting as a counter to the gravity to prevent the water flowing smoothly. Both the CSP and the BSP have to understand the intensity of these forces and take measures to counter these forces so as to make Waterfall models successful. If these forces cannot be countered then the above stakeholders should be flexible enough to change the model to suit the given circumstance, through changes in the process, product or team structure.

The purpose of the paper was to caution the reader on the pitfalls of using this model and share some practical experiences author has had of working in many projects that follow this model. While it is true that there are more popular models evolved in the last few decades that are aimed at addressing the

shortcomings of this model, the model has its own advantages which may be leveraged if the anti-gravitational forces can be managed effectively.

*May gravity succeed in this tussle of the forces!*

## **Appendix A**

### **An agile approach to delivery – A case study**

This case study illustrates a UK based BSP who was using Waterfall as the only model for delivery all along, moved to a pseudo-agile model to meet a very demanding timeline for BSS project delivery.

#### **1.1.Project Overview**

A CSP in the North African region have recently acquired two companies with established business on fixed wire line and broadband services. The CSP needed to integrate data and fixed wireline services of the acquired business (hereinafter called legacy system) to the existing BSS solution. The CSP had approached the above BSP to do the necessary customization, Implementation and Data Migration of the services from the legacy system so as to integrate these two systems.

##### **1.1.1.Customer Expectation**

The CSP wanted to do the above integration in a very short span of time because:

1. There were multiple applications in the legacy systems which added to operational overhead.
2. Legacy system was not flexible to support new features.
3. Many operations were manual and error-prone in the legacy system.
4. The legacy system solution is out-dated and did not have adequate technical support.

##### **1.1.2.The Delivery Strategy**

Due to the short delivery timeline, every possible avenue for cutting down the duration was explored. BSPs product (BSS solution) and processes were designed for a Waterfall model of delivery. However that model of solution delivery was not practical for this project due to extremely short timeline. Hence a “pseudo-agile” delivery model (hereinafter referred to as “agile” for simplicity) was conceived as follows:

1. Design, Development and Testing activities are to be done in parallel
2. Perform concurrent activities wherever possible
3. Staggered (iterative) delivery drops to System Testing
4. No detailed design documents will be prepared
5. Code review will be limited to business critical functionality alone
6. Design sign-off will not be done before development starts
7. Design sign-off will be staggered, and the sign-off is expected to be obtained as development completes.

## 1.2. The Agile Model

Three main changes were brought about by the BSP to their delivery model, to move away from the traditional Waterfall model, as follows:

1. Placed a Technical Architect at the CSP premises to provide walk through of the solution being developed to CSP regularly, so that any deviations can be fixed immediately. This was crucial as there was no opportunity to get a design sign-off before development starts, unlike a traditional Waterfall model.
2. The BSP delivery team was broken into many small teams, with each team having 1 designer and 1 or more developers who will work on a particular design. This again was a crucial aspect of this model, because in the absence of a detailed design, technical communication can break down. But keeping the designer and developer as a closely knit team ensured they communicate closely and effectively. So effectively there were no separate design and development phases in the project.
3. The Work Breakdown Structure for the delivery was made as fine as possible, so that each activity is as atomic as possible for small iterative design and development that is required for such a delivery model. This was a big challenge as the software product used by the BSP for the delivery was not designed for such a model.

Offshore team had regular daily conference-call with CSP to clarify day-to-day requirement/design/development and testing issues. The clarifications or decisions which required involvement from CSP, outside the conference-call, were recorded and tracked till closure. Regular communication and discussions with CSP management resolved dependencies, issues and mitigated risks well on time.

A daily informal stand-up meeting was held every morning with all key team members to assess progress, risks and issues. Free flowing communication among CSP and BSP teams was encouraged throughout the project, which helped just-in-time for all, especially for developers who built the solution as the design evolved. The development lead and test lead were put into the tasks of rigorous monitoring practices. There was daily expectation identified for each individual and communicated and tracked. Initially testers were not comfortable preparing test objectives or test cases based on work-in-progress requirements and designs, but they got used to it as the project progressed.

Due to the high risk of non-conformance anticipated because of this new model of delivery, BSP wanted to provide iterative releases to User Acceptance Test (UAT) much early, while the System Test was still in progress. BSP communicated the releases well in advance and insisted that the CSP takes it early and tests. With these early releases, BSP engaged CSP's UAT team well in advance to plan and perform test readiness very early in the project. To BSP's surprise, CSP really liked the concept of 'Early Release' because of the fact that they could get a feel of what the solution will be at an earlier stage and can give feedback.

The final release to UAT went on time as per original commitment to the CSP. The CSP also took comparatively very less time (1 month) than previous phases to complete their final testing and take the solution to production run.

## 1.3 Best practices followed

Some of the best practices followed in the project are given below:

**Quality :** Going Agile was not just about quick and dirty code which works. But about quick yet careful coding which is robust.

**Face-to-Face Communication :** Encouraged face-to-face communication rather than emails to avoid ambiguity.

**Short Term Incremental Planning :** A rolling wave planning was performed looking into the next week and next release activities. This brought visibility of issues, risks, pre-requisites, assumptions for the future and helped us to be prepared.

**Stand-up Meeting :** Despite the initial resistance of the team, the daily stand-up meeting turned out to be very useful to discuss and iron out the day's issues.

**Prioritization - Dependency management :** In an agile development, addressing dependency issues between various parts of the solution is a challenge. Team performed very well to avoid dependency issues through careful selection of functionality for development.

**Iterative Release :** Helped the internal testers and customers to 'feel' the solution early and give feedback which then were addressed and included in the next quick release.

**Pair Programming :** Pairing designers and developers saved time with excellent collaboration between themselves and others.

## Glossary

**ARPU :** Average Revenue Per User.

**BSP :** BSS Solution Provider.

**BSS :** Business Support Systems.

**CSP :** Communication Service Provider.

**Fast Tracking :** Starting a particular phase when the preceding phase is not completed. This is often done to save time when a preceding phase is taking too long to get completed.

## Profile of the author



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# Business Intelligence: A Telecom Perspective

**Manjari Srivastava & Rahul Singh**

## **Abstract**

Nowadays as organizations all over are faced with a deluge of data, the challenge of managing and making it actionable is also looming large. For raw data to be constructive it has to be analysed, classified and important patterns are to be identified from it. Getting that information in a timely manner, to the right people in the right places throughout an organization is an important means to enterprise success. This is where Business Intelligence comes into play.

BI becomes even more critical in the extremely challenging and dynamic telecom industry where a company's success is measured by customer satisfaction and growth of its profit margins. BI enables firms to plumb the datasets through the process of selecting, exploring and modelling large amounts of data to uncover previously unknown data patterns. An efficient Business Intelligence can facilitate the discovery of an organisation's latent potential of data which can assist in making strategic decisions.

The evolution of mobile business intelligence will empower the decision makers with tools which can assist in formulating future proof strategies, augmenting organizational growth.

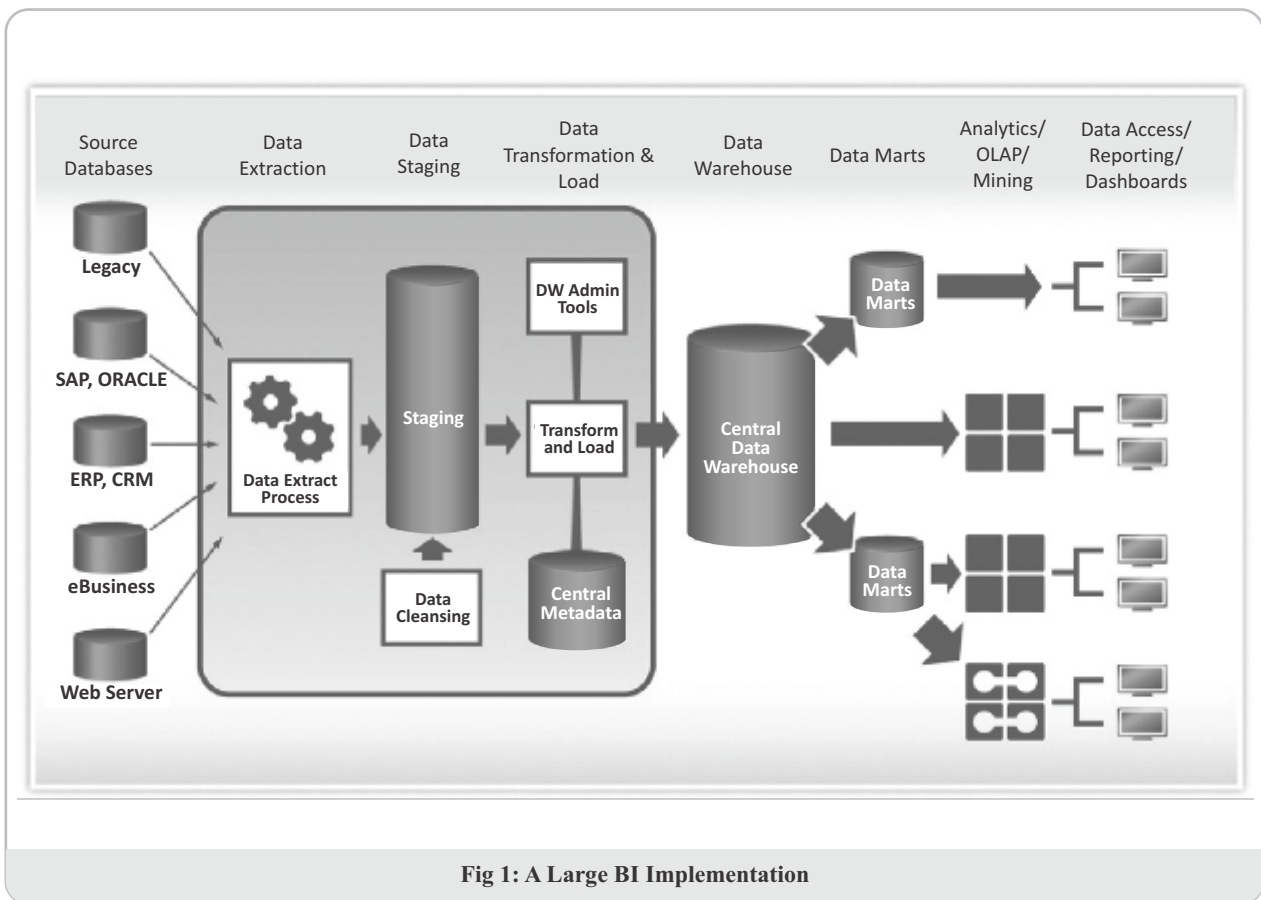
The Next Generation of Business Intelligence has taken a leap forward to eliminate the biggest hindrance in BI implementation, i.e., Cost. New business intelligence tools together with Software-as-a-Service (SaaS), Predictive Analysis and Real Time Monitoring will significantly lower the cost associated with BI. This next generation of BI technology is still evolving and comes with plenty of risks such as security issues and the inability of organizations to integrate BI fully in their business processes, which result in underutilization of BI's true potential.

The momentary challenges associated with BI will eventually be overcome as the wave of opportunities associated with it is completely harnessed. With appropriate rigor and a motivation to manage for business sustainability, there is no reason that organizations cannot capture the value of business intelligence; and this paper is an effort towards analysing the same.

## **Business Intelligence: An Imperative for Strategic Decision Making**

Business Intelligence is a set of methodologies, processes, architecture and technologies to present complex and competitive information in order to draw meaningful insights for effective strategic and tactical decision-making.

BI solutions are complex and typically include a number of components running on different systems. These systems contain valuable information which IT organizations identify, collect, reformat and cleanse. Then IT loads the data into a staging database, a data warehouse and possibly multiple data marts for analysis. This process, known as ETL (Extract Transform and Load), helps ensure the data is validated and integrated, enabling efficient analysis and a single-version-of-the-truth. (1)

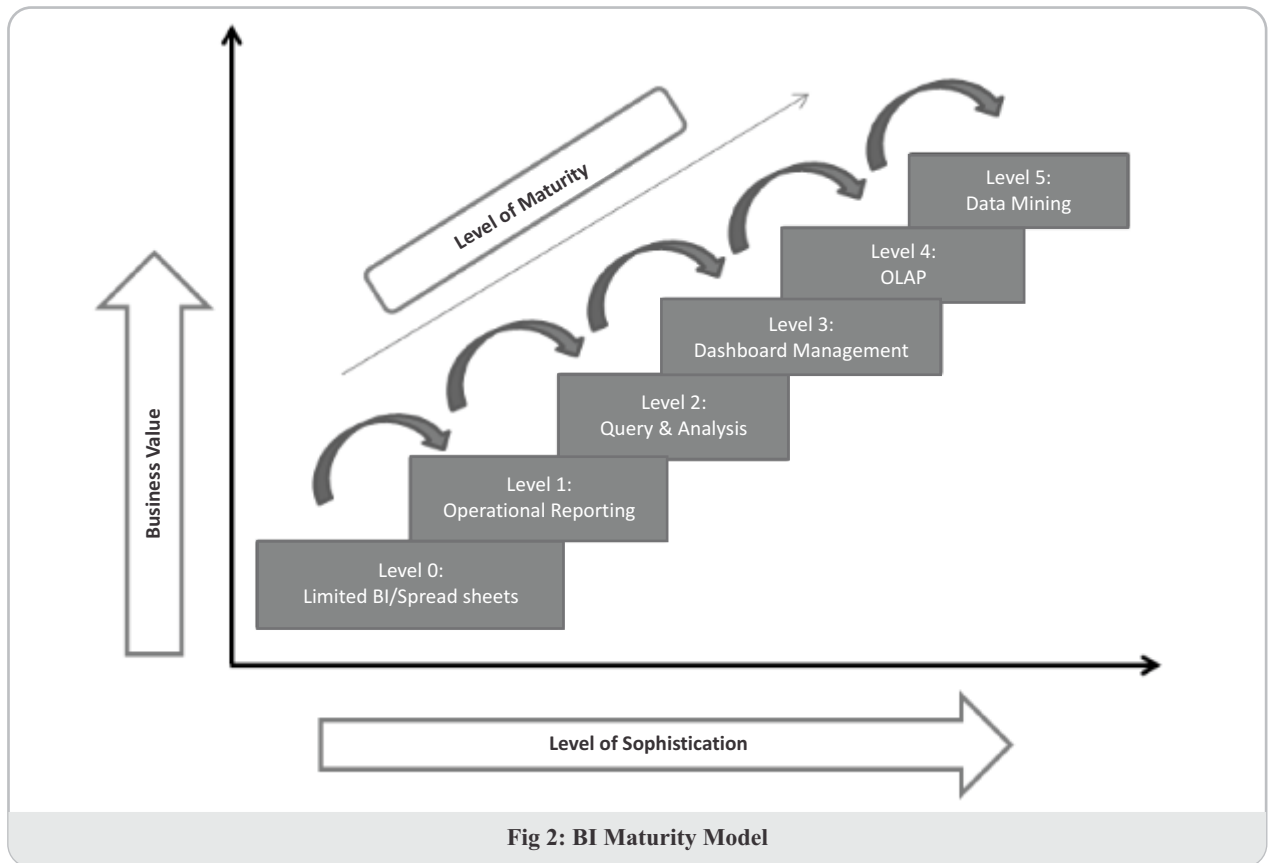


The objective of BI is to improve timeliness and quality of the input to strategic decision making process. This facilitates an enhanced understanding of project scope and prevents any future “scope creep”. It creates a framework for sound financial management and value creation. BI also facilitates a company to monitor its actual results against the expected impact and provides feedback mechanisms to refine and revise business strategies and technical activities. BI helps companies trim down costs and improve operating margins.

## BI Maturity Model

The evolution of the BI systems can be defined by a six-level maturity model. These six levels are measured by the value imparted to the business against the complexity of the BI tool suite.

“The lowest level of business intelligence maturity (level 0) is characterized by fractured reporting using varied data sources and guidelines for defining Key Performance Indicators (KPI) for an organization, thereby creating an incoherent and somewhat imprecise view of an enterprise. The level 5 of BI maturity model is characterized by strategic, tactical, and operational decision-making in circumstances where various factors and variables are involved. Organizations operating on level 5 tools are capable of effectively model their business model and precisely scheme their future results.” (2)



Maturity Level	Characteristic	Features
Level 0	Limited BI/ Spread sheets	<ul style="list-style-type: none"> <li>• Widely used personal desktop application</li> <li>• Reporting conducted in rows and columns</li> <li>• High degree of individual use</li> <li>• High degree of inaccuracy and variability</li> <li>• Limited security</li> <li>• Limited collaboration</li> </ul>
Level 1	Operational Reports	<ul style="list-style-type: none"> <li>• Presents data in a logical format</li> <li>• Data is distributed in s highly-formatted manner</li> <li>• Reports can be published on a regular schedule</li> <li>• Distribution of organized listings of data</li> <li>• Enables users to understand transactional and/or detailed level data</li> <li>• Typically developed by information technology (IT) personnel and/or knowledgeable power users</li> </ul>

Maturity Level	Characteristic	Features
Level 2	Query & Analysis Solutions and Environments	<ul style="list-style-type: none"> <li>• Utilized primarily by business users</li> <li>• Drag-n-drop interfaces to create queries and simple reports</li> <li>• Rapidly and intuitively generate queries with minimal help from IT professionals</li> <li>• Highly-interactive methods to query data</li> <li>• Users ask business questions to develop queries</li> <li>• To produce queries, users only need to understand their own business terms</li> <li>• Users can independently dive into the details of their data</li> </ul>
Level 3	Dashboard Management	<ul style="list-style-type: none"> <li>• Presents a number of organizational metrics in a single consolidated view</li> <li>• Utilizes graphics, charts, grids, gauges, and maps</li> <li>• Monitors organizational metrics and key performance indicators (KPI)</li> <li>• Enables real-time visibility into data</li> <li>• Primarily utilized by senior management and key decision-makers</li> <li>• Rapidly displays a snapshot of organizational performance</li> </ul>
Level 4	Online Analytical Processing	<ul style="list-style-type: none"> <li>• Queries from OLAP cubes rather than database tables</li> <li>• Enables advanced insight into past performance</li> <li>• Provides accurate and precise “What-If” analysis</li> <li>• Queries perform extremely rapidly</li> <li>• Primarily used by business areas concerned with financial and resource planning</li> </ul>

Maturity Level	Characteristic	Features
Level 5	Data Mining and Predictive Analysis	<ul style="list-style-type: none"> <li>• Leverages statistics, advanced techniques, algorithms, and sophisticated data search capabilities</li> <li>• Extrapolate past performance to forecast future events</li> <li>• Provides answers to questions that may never have been asked</li> <li>• Calculates levels of correlation between data elements</li> <li>• Implementers are experts of statistical analysis and/or processing of large queries</li> </ul>

Reference: BI-Insider.com

Table 1: BI Maturity Levels

## Business Intelligence: A Telecom Perspective

Telecommunication market environment is facing hyper competition and the customer-centricity is the key focus of all activities. Service offerings are driven by customer requirements. In this extremely challenging business environment, players in telecom industry are under intense pressure to reduce or eliminate the threats to their profit margins.

**Revenue leakage, costing the industry approximately \$40 billion every year (KPMG annual global RA survey 2010)**

**Inaccurate or missed inter-carrier billing**

**Fraud, over \$100 billion annual industry problem worldwide**

**Churn, a multi-billion dollar problem exacerbated by the mobile number portability requirement**

**Inefficient network usage and least cost routing plans**

**Need for differentiation**

Business decision making earlier was a process based on gut feeling. However, with the drastically evolved business and industry environments, the need of the hour is to do a substantial analysis of the available data and be able to predict future trends. With a plethora of problems haunting the players in telecommunications arena, BI seems to be the only way out for them to be able to sustain competitive edge through proactive and predictive strategic decision making.

Decision Support Systems have evolved tremendously over the past two decades, and telecom companies worldwide have switched from their traditional decision making approach to a more technological and analytical approach offered by BI solutions.

Indian Telecom Industry today is in the midst of clouds of uncertainties where operating margins are declining and maintaining competitive edge is becoming harder day by day. Intelligent decision making becomes imperative for all those caught in this competitive battlefield.

To be able to succeed in these circumstances, telecom companies need to focus on few key pillars on which their sustained growth will be based.

## 1. Predictive and Proactive decision making

With launch of 3G services in India and constantly declining ARPU levels, operators are looking at VAS as the next big thing to drive revenues. They need to track the usage patterns based on user groups and locations. Customer targeting becomes tremendously crucial to be able to maximise acquisition with minimal subscriber acquisition cost. BI with its predictive and analytical tools can condense the colossal task of customer profiling to a matter of few minutes.

With 3.3 million customers, Bulgarian Mobiltel is the biggest telecommunications network in Bulgaria. It wanted a system that would unify the data and allow business analysts to prepare their own reports. It needed to implement a data warehouse and business intelligence (BI) project to more efficiently analyze traffic and revenue data. The company also needed to produce reports that could be used to make key marketing, sales, and business strategy decisions.

Prior to the implementation of the BI project, the company's IT division had to generate each report requested by users in marketing, finance, sales, and other divisions by pulling data from various systems. As the information was coming from different systems, there were often conflicts in the data, as different systems accounted for same data in slightly different ways. It wanted a system that would unify the data and would allow business analysts to prepare their own reports. The data is crucial to the company and is mainly used to support marketing and business initiatives such as loyalty and retention programs.

They decided to use BI and they received three systems in one: Data Transformation Services [DTS], warehouse management, and OLAP (Online Analytical Processing) server. OLAP technology enables data warehouses to be used effectively for online analysis, providing rapid responses to iterative complex analytical queries. OLAP's multidimensional data model and data aggregation techniques organize and summarize large amounts of data so it can be evaluated quickly using online analysis and graphical tools. The answer to a query into historical data often leads to subsequent queries as the analyst searches for answers or explores possibilities. OLAP systems provide the speed and flexibility to support the analyst in real time.

The benefits were not just limited to increased competitive advantage and low TCO. With an enterprise-wide access to data, there are now no delays in the processing of the reports as the analysts have instant access. Easy access and analysis of live data are critical business tools and the analysts now feel more in control of their own data. It saves them the step of explaining to IT what they need and waiting for IT to generate the report and it reduces the time-to-market. The new system also enables and supports major marketing and business initiatives such as customer segmentation and profiling, tariff analysis, customer retention, and campaign management. (3)

## 2. Cost Saving

According to leading credit rating agencies CRISIL and Fitch, although 3G services will help cellular operators augment revenues, the high upfront fee they have paid for spectrum will negatively impact their financial profiles in the short to medium term. In this scenario, operators are looking at ways to reduce their opex. BI tools have been proved to decrease costs notably across various industry domains. Organizations are looking at license and maintenance cost saving by consolidating different BI platforms to one preferred platform.

In 1996, France Telecom created the Active Research Information Agency (ARIA) to organize the flow of strategic information within its companies.



This decision reflected a central strategic commitment: the belief that accurate, timely business intelligence gives France Telecom a considerable advantage in its marketplace. ARIA gives France Telecom employees access to information about the market and their areas of responsibility, allowing instant insight into events and enabling them to respond faster and better than competitors. The problem was finding a technology base that supported this strategic vision.

France Telecom opted for a BI tool that could “build an expandable, open-ended framework that responds to growing internal demands and synthesizes business intelligence data”. The BI System manages multiple data formats and automatically replicates content to ensure optimum security. Using the tool in self-service mode, a France Telecom employee requests information through a search engine and specifies preferred themes, sources, points of interest, languages, number of articles to be returned and so forth. A standard browser displays search results as hypertext links. For difficult searches, ARIA information experts and analysts intervene and guarantee a response within 48 hours. It handles all aspects of the personalization process: management of user profiles and marketplace rules, ranking of information, interactive filtering and managing communities.

With this, the business could extract valuable information that will influence operational and strategic decision making through essential tools for improving employee productivity. France Telecom estimates that BI implementation saves the company between 15 million Euros and 30 million Euros a year. (4)

### 3. Data Management

There are more than 5 billion mobile devices already and a report from Cisco states that the total data navigating the net will exceed half a zeta byte by the year 2013. (5) The exponential growth of data and the need to provide even higher Quality of Experience (QoE) has made the telecom companies turn towards effective BI solutions.

The bulk of the data originates from Call Detail Records (CDRs) that are created for customer billing and financial transfers between telecom companies. Spice Communications Ltd. was Punjab's second leading telecom company, and with over three million current subscribers it offers a wide range of voice and non-voice cellular services to subscribers on a postpaid or prepaid basis.

Spice Telecom's initial foray into data warehousing was built on traditional OLTP database. However, it did not take long for the sheer volume of daily input data to begin swamping the original system. Query response times increased and it became painful to extract even simple operational counts. Concurrent users from multiple departments slowed the system even further while memory usage reached unacceptable levels. The inability to analyze data limited the company's decision-making process. Not only were ad-hoc "what-if" queries out of the question, the standard queries that monitoring the pulse of the company were becoming unwieldy.

Call traffic CDRs were large and increasing daily and multi-dimensional analysis had become a distant dream. In addition to the performance issues, Spice Telecom needed to address the system's significant storage constraints. The data warehouse needed a lot of information, but also needed to take up less room. Maintenance functions like backups, transfers, and redundancy were a drag on the entire architecture and increased the number of potential failure points. Temporary fixes included creating smaller, summary samples of data that –while not as good as the real data– were capable of being processed in a timely manner. However, the process of creating the smaller samples was itself a drain on both processing and storage resources. The system, with its associated workarounds, was essentially collapsing under its own weight.

Spice assembled a list of features and considerations for their next generation data warehouse – Extreme Performance, Small Load Window, Support Existing Tools, Use Existing Hardware, and Storage Space.

The team also wanted the solution to help them manage database growth and lower the overall maintenance costs and administrative efforts.

With the implementation of a BI tool, the business is now able to look at and analyze dimensions that were previously out of reach. Analysis that used to be a pain and took hours or even days to complete has been reduced to minutes and hours. The space savings is huge. Load windows have reduced from hours to minutes. Users are now able to drill down to very fine granular levels of querying without any issues. Data quality has also improved as users are now able to easily reconcile discrepancies.

Business benefits gained were “10X or better improvement in speed” and “40-50% data compression”. Spice runs advanced multi-dimensional analytics on the information to identify sources of revenue loss and uncover gaps in its service offerings. The BI implementation has lowered costs, improved data quality, increased their competitive edge, and fostered exceptional growth. (6)

## 4. Churn Management

Churn costs global telcos \$10 billion in the form of “customer defection” (7). By losing just 10% of its high value subscriber base can amount to a revenue loss of 85% for a telco (8). Hence churn management and customer retention are the top priorities for the telcos worldwide. Although the implementation of MNP in India has not been predicted to impact the players majorly, but they definitely need to retain their customers to counter the already falling revenues. In the current scenario it affects profitability of the company if a customer churns before the company can earn back the investment it incurred in acquiring the customer.

Telecommunications companies can increase profits by using a Business Intelligence tool to identify potential candidates for churn and also non-revenue earning customers, and can increase revenue and profitability with targeted campaigns and promotional offers to not only retain customers but also to change the non-revenue earning customers to profit earning customers.

VIVO was created by the merger of six different companies and other acquisitions. They came together to form the largest mobile telecommunications company in the southern hemisphere. VIVO is the market leader in Brazil with almost 30 per cent market share and 60 million customers. However, this phase of mergers and acquisitions created a data integration “perfect storm”— each of the merged organizations had its own data warehouses and different data sources, business rules, processes, tools, cultures, and platforms. Six data warehouses had their own distinct business intelligence tools. The disparate data warehouses made it difficult for VIVO to obtain KPIs and provide senior management and strategic areas of the company with the information and indicators they needed for decision making. The situation also created a complex, costly, and slow-moving information extraction and analysis process, generating unacceptably high response time for the business users.

VIVO opted for a “high performance business intelligence solution that would accommodate its high volumes of data in nearly 40 business areas”. VIVO was relying on six siloed data warehouses, each with its own business intelligence tools, different data sources, business rules, processes, tools, cultures, and platforms. These warehouses had sprung from the merger and acquisition of multiple local providers. Their integration gave Brazil's leading mobile telecommunications provider the opportunity to create a single view of 60 million mobile telecommunications customers.

By standardizing on to a single BI platform, VIVO has achieved its ambitions: the organization has created a single version of those 60 million customers, billions of call data records (CDRs), and a united view of key performance indicators (KPIs). Collectively, the company's showcase business intelligence solution has saved money annually and increased revenue substantially, through such better-targeted campaigns, more effective predictive churn analysis, and identification and resolution of bad debt.

The business intelligence solution contains billions of CDRs and billing information for detailed analysis on real traffic versus billed traffic, which means reduced billing issues. Meanwhile, an improved customer segmentation model enables VIVO's marketing teams to differentiate offers and customer service. More efficient predictive churn models allow actions to limit customer deflection and to increase customer satisfaction. The business intelligence solution integrated complex customer profile, usage, and behaviour data and is the official source for campaign management application. The BI solution was also a source of information for “crucial operational processes and transactional systems, such as commissioning, fraud detection, co-billing and front-office applications”.

It led to benefits including the creation of special lists and segments of customers likely to be lost/churned, allowing VIVO to more accurately predict customer defections, drive more effective marketing actions to retain customers, reduce churn, and increase customer replenish rates annually. (9)

## **5. Risk Management and Fraud Prevention**

Fraud is a serious concern for telecom companies globally leading to a revenue loss for the operators and the burden is being passed on to the existing customers. Using BI enabled predictive modelling and analytics fraud can be controlled. Identification of potentially fraudulent users and their atypical usage patterns (subscription fraud), detecting attempts to gain fraudulent entry to customer accounts (superimposed fraud), discovering unusual patterns that may need special attention such as busy hour, frustrated call attempts, switch and route congestion patterns, etc. are few ways to prevent fraud.

Mobile Tele Systems (MTS) is the leader in the mobile communications market in Russia and the Commonwealth of Independent States. To maintain its market position, profitability and to stand out among fierce competition from well established and small regional operators, MTS required managing massive amounts of data and transforming it into intelligence. MTS wanted a technology to collect, manage and analyze data from its disparate geographical locations, sources and formats of billing systems. The company also wanted to prevent fraudulent activities and prevent leakages to prevent losses. Due to lack of quality data, improper data collection and its management was the main problem.

Mobile Tele Systems' revenue management department decided that the best course of action would be to deploy business intelligence and analytics tools to gain a deep understanding of the data and what it means for their business. With Business Intelligence tools, MTS developed predictive models that helped in analyzing behaviour patterns that point to fraudulent activities and it also helped them to reduce reserves for bad debts which affected their profit margin. (10)

## **6. Network Management**

With nearly 13.35 million mobile subscribers adding to the network every month, efficiently managing the network becomes a tedious job for operators. This too when there is immense pressure on them to maintain high QoS levels to remain competitive in the market. BI tools have proven to be very effective for comparing a wide range of metrics across network operations, creating real-time reports for identifying problems that need immediate attention, and generating alerts for instant notification of emergency situations requiring rapid response.

Telstra is the leading telecommunications company in Australia and was the sole telecommunication provider for 2000 Sydney Olympic Games. It needed to manage a sharp increase in mobile phone calls during the games while maintaining normal service levels for Sydney—a city of four million. Telstra needed a technology that would help them to measure performance of near real time data on call traffic and also assist in adjusting its cell management system to provide faultless, congestion-free mobile telephone network during the Olympic Games.

Telstra used a BI solution which helped them to quickly identify network traffic surges and manage the huge volumes of information it needed to analyse in order to keep its system operating at peak performance. It flawlessly handled more than 500,000 calls during the Opening Ceremony and managed more than 100,000 calls per day without any significant service issues. (11)

## 7. Improved ROI

With the huge debt burden post 3G auctions last year, telecom operators are now looking at low cost solutions and obtaining a high ROI. BI implementation can assist the operators to lessen their opex considerably and thereby improve revenues. BI solutions have generally been an expensive affair for organisations, but recent developments in the field of BI have produced results with optimal cost, faster payback and improved ROI.

IBM, the leading telecommunication company has a semiconductor facility at New York that combines IBM's array of leading-edge chip-making technologies with the economies of scale. The facility makes frequent changes in operations due to IBM venturing in new technologies with different requirements and making those challenges rapidly was the key to remain on the cutting edge in the semiconductor market. IBM was using a software at the facility for a number of years and a team of programmers was responsible for managing the code and generating custom reports on an as needed basis. IBM found that the reporting programming team was having difficulty in generating reports for engineering and manufacturing teams. IBM found that the reporting programming team was having difficulty keeping up with the reporting requirements for the engineering and manufacturing teams, and it wanted to make report creation easier so individual users would have more rapid access to the information they needed. IBM also wanted to ensure that it could maintain the integrity of the data even if many more users had access to it.

IBM deployed a BI solution to increase the access and reduce the complexity in the generation of the report. It reduced the daily presentation time as well as report creation time. The tool also helped in visibility of data and its accuracy. They achieved a ROI of 386% with payback period of 3.2 months. (12)

## Next Generation Business Intelligence: The Way Ahead

A recent Gartner survey of BI professionals worldwide found that cost has become a bigger factor in buying decisions. (13) License fees represent only one-quarter of the total cost of a BI platform; implementation cost and administration costs account for three quarters. With the huge cost associated with BI implementation, trend is moving towards the Next Generation BI. The problem is that BI often has fallen short of ideal, delivering insight into the past but not into up-to-the-moment performance or future prospects.

“Next-generation BI has arrived, and three major factors are driving it: the spread of predictive analytics, more real-time performance monitoring, and much faster analysis, thanks to in-memory BI. A fourth factor, Software as a Service, promises to further alter the BI market by helping companies get these next-generation systems running more quickly.” (14)

"Predictive analytics is a white-hot growth segment that got hotter with IBM's \$1.2 billion deal to buy SPSS, a company that uses algorithms and combinations of calculations to spot trends, risks, and opportunities in ways not possible with historical reporting. Real-time monitoring detects events or patterns of events as data streams through transactional systems, networks, or communications buses. In-memory products, unlike tools that explore historical data on disk, load vast data sets into RAM so people can perform queries in seconds that would take minutes or even hours with conventional tools.” (14)

The fourth factor in the next generation of BI addresses another place where speed is needed in the deployment phase.

“With software-as-a-service options, BI doesn't always require the months-long distraction of building a data warehouse or a new data mart application, something particularly attractive for small IT shops.” (14) The latest BI solutions with SaaS show up to 70% cost saving for BI delivery.

The proliferation and growth in the adoption of mobile devices in business has created the opportunity to push business intelligence applications to the mobile user in order to provide access to information anytime, anywhere. Many firms are working or have developed mobile business intelligence tools. Mobile Business intelligence is about tapping the power of today's sophisticated Smartphone, and can give companies the ability to interact in real time with their customers and business partners, thereby improving service and boosting productivity.

For many financial organizations, IT is still a drain in terms of cost yet they have a costly and complex infrastructure that must be updated and managed. Many BI vendors have come forward with low cost, scale and simple BI solutions with capabilities include robust and dynamic visualization. The platforms for these solutions are designed to support a wide range of requirements to specifically address BI and performance management for an entire organization, specific teams, or individuals, as required.

This next generation of BI technology is still evolving and comes with plenty of risk. Prediction typically requires statistical expertise that's scarce and pricey. Real-time monitoring of stream processing technology can be a lifesaver, but only if one can respond as quickly as one detects opportunity or risk. “Fast in-memory-analysis tools are selling briskly, but they may require companies to go for higher-performance 64-bit hardware. Users newly exposed to these powerful BI tools may misinterpret the facts. These pitfalls need to be avoided.” (14)

Eventually, it is a strategic challenge and opportunity to capture the business value of BI, and we have seen that the potential for BI is substantial. “With appropriate rigor and a motivation to manage for business sustainability, there is no reason that organizations cannot capture the value of business intelligence; however that might be defined in their specific circumstances”. (15)

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# Roadmap To Synergize Telecom And Cloud

Sinjini Ray, Sheetal Laad & Shivangi Bais

## Abstract

Three things that provide consumer capabilities are often mentioned in the context of cloud computing. They are Software as a Service (SaaS), Platform as a Service (PaaS), and Infrastructure as a Service (IaaS). In addition, network service providers may provide connectivity in a cloud landscape. This paper will encompass various Telco SaaS, PaaS and IaaS products and hence defines the roadmap for the telcos to migrate to cloud with an innovative evaluator tool based on the core concepts of cloud those being TCO, ROI, QoS and Security.

## SaaS In Telecom

If the growth statistics for SaaS are anything to go by, enterprises are not underestimating the benefits. One early adopter, Salesforce.com, which started business in 1999, says its customer relationship management (CRM) software is used by 38,000 firms and 1 million subscribers. And US firm NetSuite's successful flotation last December also put the spotlight firmly on software delivery over the Internet. NetSuite provides business applications and uses SaaS for their delivery, and by September 2007 claimed 5,400 customers.

Analysts and investors are also talking up the SaaS opportunity. Gartner claims that sales of Web-based applications reached \$5.1 billion worldwide in 2007 and will grow to \$11.5 billion by 2011. Perhaps even more notable, it believes SaaS will account for over a quarter of all enterprise software sales by 2011, up from 16% last year

## SaaS Telco Products

1. Exinda Networks, for example, is using SaaS for central management and reporting of its hardware platform that boosts applications over wide area networks. Its platforms inspect traffic packets to boost application performance using techniques such as quality of service and content caching. An enterprise or service provider installs the hardware and purchases a subscription to an Exinda-run service delivery platform that manages the devices centrally.
2. Ericsson provides a SaaS solution – Ericsson Device Connection Platform (EDCP) – offering operators and M2M enterprises an initial low-cost solution for connecting devices and supporting applications, with the potential to expand and adapt to the growing needs of the market.
3. Business Analytics and intelligence on Cloud is a highly potential area where we can focus for SAAS. e.g. SAP BusinessObjects business intelligence (BI) help business users transform their decision making by providing fact-based, quality information regardless of where the data resides. SAP claims that customers will be able to quickly and effectively carry out real-time analysis of data. They will be able to get deeper insights about sales, customers and pipeline from any source, including on-demand applications for sales and human resources.
4. CRM and OSS is also highly potential for SaaS.  
Example: Salesforce: pioneer and leader in SaaS for their enterprise CRM. It can provide real time information related to various aspects such as sales. It tracks all opportunity-related data including milestones, decision makers, customer communications, and any other information unique to the company's sales process.

## PaaS In Telecom

### PaaS Solutions

#### SDP: Service delivery platform

A PaaS is like an SDP in that it is all about the rapid creation, execution, and delivery of (new) services. In fact, in many ways, a PaaS can be thought of as an SDP in the cloud. Developers come to a PaaS to experiment with creating new services, using its catalogue of reusable services and widgets to speed development and collaboration tools, to discover what others are doing, to rate their services, and to share knowledge. New services can be created in the PaaS environment, where they execute through links to the application programming interfaces (APIs) that allow other developers to mash up these services with their own so they can be seeded across the Internet, bringing traffic and new eyeballs to the PaaS. As demand for a particular service grows, the PaaS automatically scales up the resources available to the service; and once a certain volume of API calls is reached, it may start charging the developer or the users of the service, or both, for transactions. At this point, the PaaS provider turns SaaS provider, though not quite in the sense that SaaS is understood.

A PaaS is engineered from the ground up to live in the cloud, encourage collaborative and Web 2.0-style development, and have built-in, pre-integrated functions that are realized through the heavy integration of multiple products in telco SDPs. Microsoft became acutely aware that its CSF had shortcomings as a PaaS and went back to the drawing board with Azure.

#### mChoice Cloud TAP

The World's First Cloud Telco Application Platform, that offers an eco system of pre-built operator network centric applications, a vibrant developer community and creates a new breed of Telco Applications made available to the mass market through an exciting discovery mechanism. The SDP in the Cloud from hSenid Mobile allows Operators to open their services and capabilities to developers to implement and deploy applications that the operator's customers can immediately use. Developers are abstracted from the complexities of connecting to the Telco network and its underlying protocols. Instead they focus on building apps ranging from simple entertainment, information and communication applications, to complex enterprise apps.

Along with its cloud enabled telco platform hSenid Mobile offers a comprehensive product portfolio that includes a cloud enabled subscriber created VAS platform, open source app store, end-to-end customer churn management, multi-channel top up, location based services, mobile commerce, and telco reporting.

## IaaS In Telecom

A telecom network is at heart a multitenant environment that Telco's leverage to offer multiple services to multiple customers through the use of capacity management techniques that ensure optimal resource allocation and quality of service levels. Telcos also have massive OSS/BSS infrastructures that tie together network layer... and datacentre elements.... This infrastructure..., anchored by datacentres that centralize service and management functionality previously distributed across multiple [central offices]..., can serve as back-end infrastructure that end users access via the front-end service delivery method known as cloud. Infrastructure services that are one of the popular cloud services, are becoming cloud based which includes storage, content management, conferencing, processing bandwidth, and network connectivity. Cloud platforms are being scaled to accommodate the growth in the network traffic levels.

## Drivers For Change

Driving the changes in traditional telecom data center architecture is the need for network operators to concentrate on their primary services priorities—content delivery, mobile services and cloud services. Existing telco data centre models tend to be based on two totally independent architectures and support two largely independent sets of applications.

The "traditional IT" part of the telecom operator's commitment runs OSS/BSS applications. OSS/BSS systems started out as tools to track manual provisioning processes and account for the large number of network assets. As networks transitioned to smart devices with management interfaces, OSS/BSS processes were integrated with network operations centers (NOCs) to control the network. They were also integrated with customer service and order entry portals to support the creation of service orders and changes. Data centers that support these functions look a lot like enterprise data centers.

As voice services evolved from switch-hosted to computer-hosted, service features like voicemail were implemented on service delivery platforms (SDPs) that were more elements of the network than of the data center. For some service providers, SDPs have proliferated out of control, resulting in poor utilization and operations cost overruns.

## Cloud Products For Telcos

### 1. Exalogic Elastic Cloud-Oracle

Exalogic Elastic Cloud X2-2 with 64-bit x86 processors and a choice of Oracle Solaris or Oracle Linux, as well as Oracle Exalogic Elastic Cloud T3-1B with SPARC servers running Oracle Solaris. The offerings are engineered for large-scale, mission-critical deployments; Oracle Exalogic Elastic cloud provides the foundation for enterprise-class multi-tenancy or cloud applications and can support thousands of applications. All Oracle Exalogic Elastic Cloud models are hardware and software systems that leverage an InfiniBand based I/O fabric and solid-state storage with the market-leading Oracle WebLogic Server and other enterprise Java Oracle middleware products, which are assembled, tested, and tuned at the factory to dramatically reduce the time from machine delivery to being fully-operational for application deployment.

### 2. IBM SONAS

IBM also designed IBM Scale out Network Attached Storage (SONAS) to embrace cloud storage and the petabyte age. It can meet today's storage challenges with quick and cost-effective IT-enabled business enhancements designed to grow with unprecedented scale.

### 3. EMC ATMOS

For EMC, the company designed Atmos to manage information for content-rich high-scale infrastructures and cloud service provider environments. Its flexible architecture adapts easily to run in virtualized environments, or within an EMC purpose-built, low-cost, high-density hardware system. The new Atmos 2.0 is armed with brand new features for managing big data.

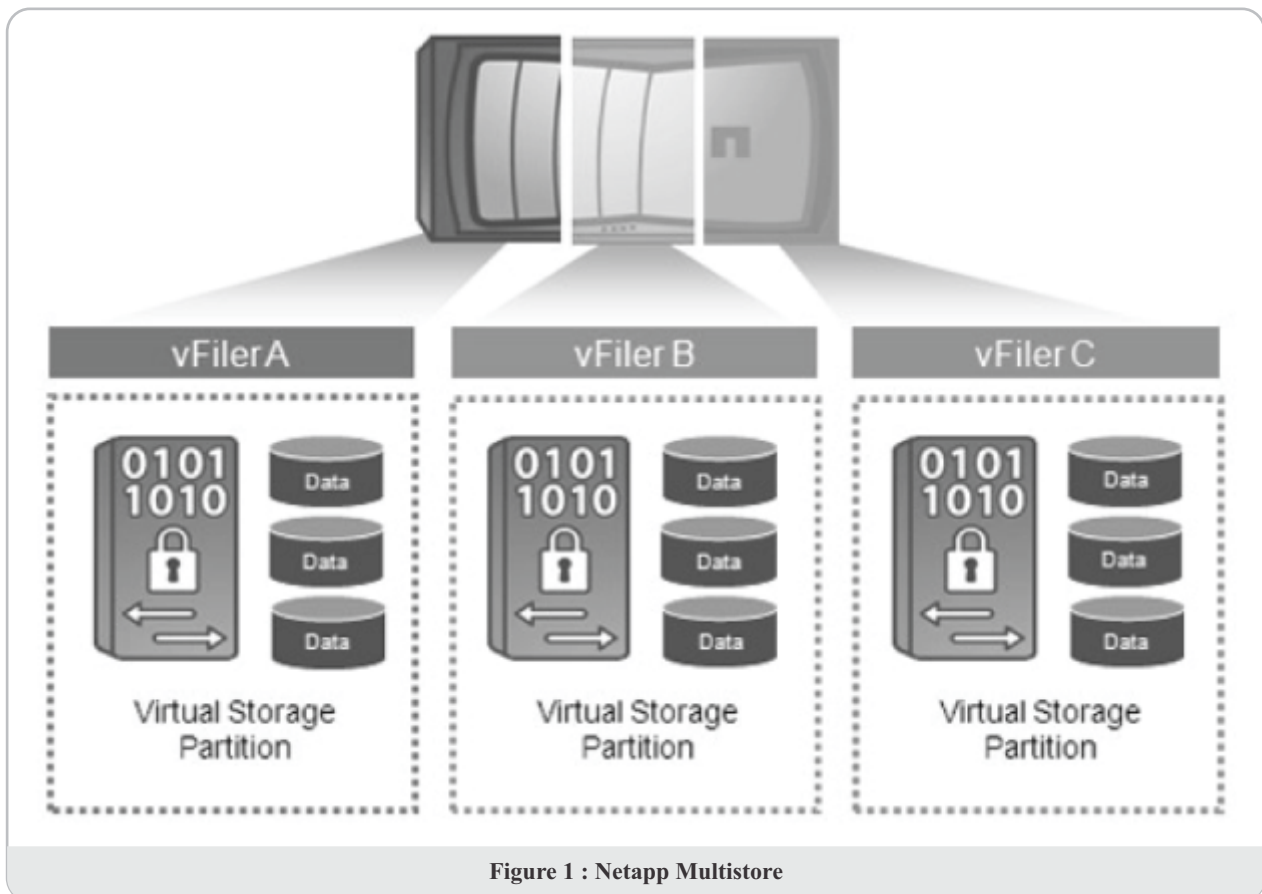
### 4. VMWare vCloud director

VMware vCloud Director facilitates the delivery of the cloud infrastructure on-demand so that end users can consume virtual resources with maximum agility. It consolidates datacenters and deploys workloads on shared infrastructure with built-in security and role-based access control. It is possible to migrate workloads between different clouds and integrate existing management systems using customer extensions, APIs, and open cross-cloud standards.

- Accelerate end user time-to-market by enabling intelligent on-demand virtual machine provisioning
- Enable rapid distribution and intelligent deployment of virtual application images
- Decrease costs by consolidating infrastructure and delivering resources to internal organizations as configurable virtual datacenters
- Ensure isolation and enforce control intelligently with policy-based user controls and VMware vShield technologies

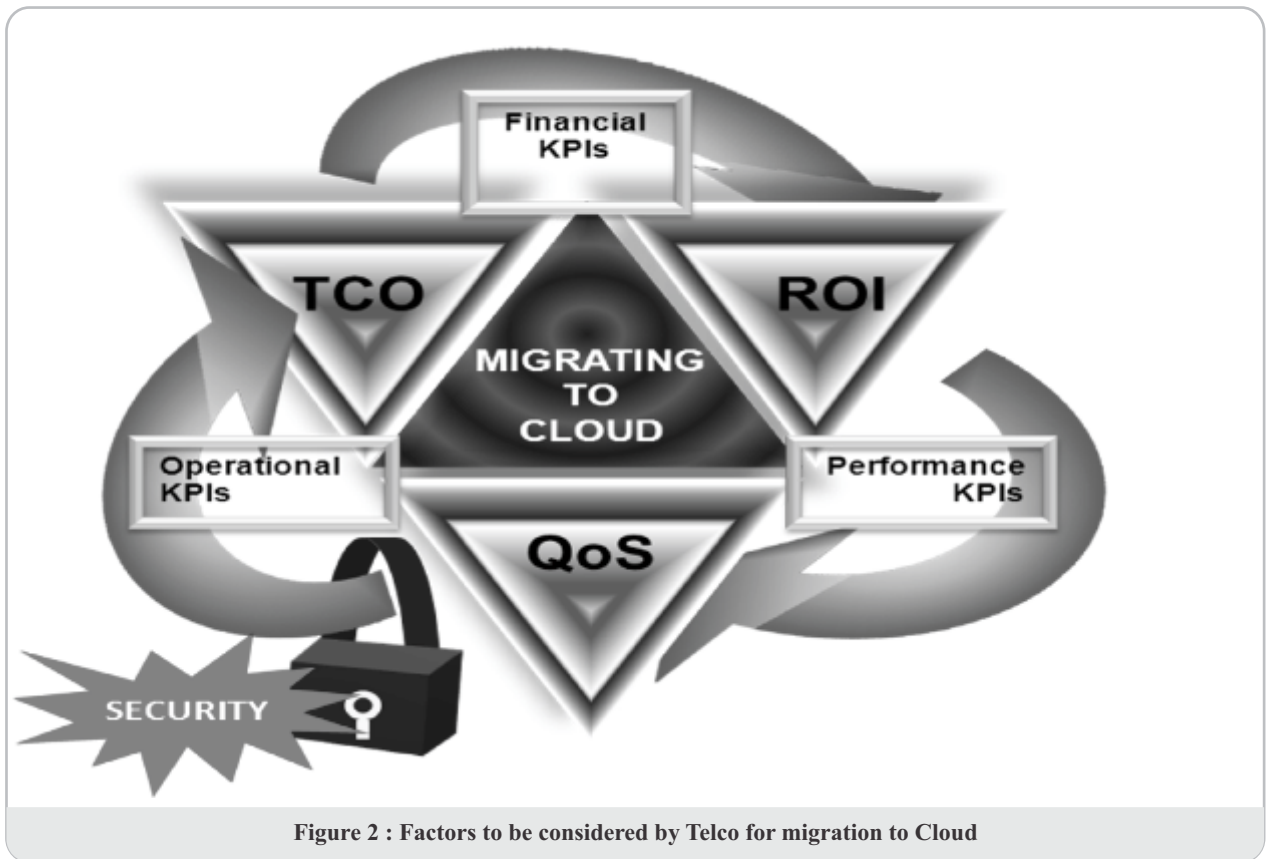
## 5. Netapp Multistore

NetApp, pioneered the idea of secure multi-tenancy with the introduction of its NetApp® MultiStore® solution in 2002—years before the first mention of cloud computing occurred in the industry press. MultiStore lets you create isolated logical partitions on a single storage system such that no information on a secured virtual partition can be accessed by unauthorized users. It also lets you easily migrate virtual partitions between storage systems and provides simple-to-manage yet powerful disaster recovery.



## Modeling Cloud For Telco

This model defines various constraints which will be the deciding factor in designing the roadmap of telco migrating to the cloud



## TCO : Total Cost of Ownership

This is the main factor for any business and the prime driver in migrating to the cloud. In this world of growing Capex and Opex and decreased revenue Total cost of ownership is the relieving point for the business to move to cloud. Total cost of operation varies for different models of cloud

- Private cloud: Here the TCO is high, for example the companies have intranet that covers Higher cost
- Public Cloud: When the Cloud is public then the TCO automatically decreases because it becomes shared and hence not owned by any individual exclusively.
- Hybrid Cloud: This has partial characteristics of private and public cloud therefore the cost of operation is between private and public cloud

## Financial KPIs

This KPIs are based on the financial parameters that will highlight the Total cost of ownership related efficiency.

### Availability versus recovery SLA:

- Indicator of availability performance compared to current service levels

### Workload – predictable costs:

- Indicator of CAPEX cost on-premise ownership versus Cloud

### Workload – variable costs:

- Indicator of OPEX cost for on-premise ownership versus Cloud; indicator of burst cost

**CAPEX versus OPEX costs:**

- Indicator of on-premise physical asset TCO versus Cloud TCO

**Asset efficiency ratio:**

- Indicator of % and cost of rationalization/consolidation of IT assets; degree of complexity reduction

## **Operational KPIs**

One of the biggest contributor to TCO is the Opex therefore it is very important attain the operational efficiency.

**Workload versus utilization %:**

- Indicator of cost-effective Cloud workload utilization

**Workload type allocations:**

- Workload size versus memory/processor distribution; indicator of % IT asset workloads using Cloud

**Ecosystem – optionality:**

- Indicator of number of commodity assets, APIs, catalog items, self service

## **ROI: Return On Investment**

This is the main motive of any business to increase the ROI, therefore the financial and performance KPIs are considered over here as the performance of the business model directly impacts the financial condition of the company

### **Financial KPIs**

**Speed of cost reduction:**

- Compression of cost reduction by Cloud adoption
- Rate of change of TCO reduction by Cloud adoption

**Optimizing cost of capacity:**

- Aligning cost with usage, CAPEX to OPEX utilization pay-as-you-go savings from Cloud adoption
- Elastic scaling cost improvements

**Optimizing ownership use:**

- Portfolio TCO , license cost reduction from Cloud adoption
- Open Source adoption
- SOA re-use adoption

**Green costs of Cloud:**

- Green sustainability

**Optimizing margin:**

- Increase in revenue/profit margin from Cloud adoption

**Revenue efficiencies:**

- Ability to generate margin increase/budget efficiency per margin
- Rate of annuity revenue



**Market disruption rate:**

- Rate of revenue growth
- Rate of new market acquisition

**Performance KPIs**

**Optimizing time to deliver/execution:**

- Increase in provisioning speed
- Reduced supply chain costs
- Speed of multi-sourcing
- Flexibility/choice

**Timeliness:**

- The degree of service responsiveness
- An indicator of the type of service choice determination

**Throughput:**

- The latency of transactions
- The volume per unit of time throughput
- An indicator of the workload efficiency

**Periodicity:**

- The frequency of demand and supply activity
- The amplitude of the demand and supply activity

**Temporal:**

- The event frequency to real-time action and outcome result

**QOS: Quality Of Service**

While migrating to the cloud, the change that will be evident to the customer is only the quality if any, Therefore the SLAs need to be evaluated properly in order to arrive at the right experience to be provided to the customer. Reducing the TCO and increasing the ROI are the prime concerns keeping the QoS fixed

**Performance KPIs**

**Experiential:**

- The quality of perceived user experience
- The quality of User Interface (UI) design and interaction – ease-of-use

**SLA response error rate:**

- Frequency of defective responses

**Intelligent automation:**

- The level of automation response (agent)

**Operational KPIs**

**Speed of time reduction:**

- Compression of time reduction by Cloud adoption
- Rate of change of TCO reduction by Cloud adoption

**Optimizing time to deliver/execution:**

- Increase in provisioning speed
- Speed of multi-sourcing

**Cloud Security Parameters**

Encircling all the above business parameter is the risk of security which is hitting the chart at the top as a part of concern for the CIOs, therefore following are the parameters which are kept as a check for the feasibility of migrating to the type of cloud.

- **Data Centralization:** In a cloud environment, the service provider takes care of storage issues and small business need not spend a lot of money on physical storage devices. Also, cloud based storage provides a way to centralize the data faster and potentially cheaper. This is particularly useful for small businesses, which cannot spend additional money on security professionals to monitor the data.
- **Incident Response:** IaaS providers can put up a dedicated forensic server that can be used on demand basis. Whenever a security violation takes place, the server can be brought online. In some investigation cases, a backup of the environment can be easily made and put onto the cloud without affecting the normal course of business.
- **Forensic Image Verification Time:** Some cloud storage implementations expose a cryptographic check sum or hash. For example, Amazon S3 generates MD5 (Message-Digest algorithm 5) hash automatically when you store an object. Therefore in theory, the need to generate time consuming Md5 checksums using external tools is eliminated.
- **Logging:** In a traditional computing paradigm by and large, logging is often an afterthought. In general, insufficient disk space is allocated that makes logging either non-existent or minimal. However, in a cloud, storage need for standard logs is automatically taken care of.
- **Data Location:** In general, cloud users are not aware of the exact location of the datacentre and also they do not have any control over the physical access mechanisms to that data. Most well-known cloud service providers have datacentres around the globe. Some service providers also take advantage of their global datacentres. However, in some cases applications and data might be stored in countries, which can judiciary concerns. For example, if the user data is stored in X country then service providers will be subjected to the security requirements and legal obligations of X country. This may also happen that a user does not have the information of these issues.
- **Investigation:** Investigating an illegitimate activity may be impossible in cloud environments. Cloud services are especially hard to investigate, because data for multiple customers may be co-located and may also be spread across multiple datacentres. Users have little knowledge about the network topology of the underlying environment. Service provider may also impose restrictions on the network security of the service users.
- **Data Segregation:** Data in the cloud is typically in a shared environment togetherwith data from other customers. Encryption cannot be assumed as the singlesolution for data segregation problems. In some situations, customers may not want to encrypt data because there may be a case when encryption accident candestroy the data.
- **Long-term Viability:** Service providers must ensure the data safety in changingbusiness situations such as mergers and acquisitions. Customers must ensuredata availability in these situations. Service provider must also make sure datasecurity in negative business conditions like prolonged outage etc.

- **Compromised Servers:** In a cloud computing environment, users do not even have a choice of using physical acquisition toolkit. In a situation, where a server is compromised; they need to shut their servers down until they get a previous backup of the data. This will further cause availability concerns.
- **Regulatory Compliance:** Traditional service providers are subjected to external audits and security certifications. If a cloud service provider does not adhere to these security audits, then it leads to an obvious decrease in customer trust.
- **Recovery:** Cloud service providers must ensure the data security in natural and man-made disasters. Generally, data is replicated across multiple sites. However, in the case of any such unwanted event, provider must do a complete and quick restoration.

## Designing The Cloud Path Evaluator

**NOTE :- (numerical values assumed here are arbitrary ; this is a tool wherein Telcos are expected to give in their input which will help to suggest them the exact type of cloud model they should go forward with)**

The prime intention behind designing the cloud path evaluator is to help the telecom operators

### Steps for getting the Input

1. Get the values corresponding to the KPIs from the company as a percentage and convert it to decimal
2. Give preference weight age to each KPI based on requirements in the scale of 1-4.4 being the highest priority.
3. Find the final weight age values = KPI values in decimal \* preference weight age
4. Obtain total values for the following
  - TCO
    - I. Total Financial KPI = average of total values of Financial KPIs
    - II. Total Operational KPI = average of total values of Operational KPIs
    - III. Total TCO indicator = Average of financial and operational KPIs
  - ROI
    - I. Total Financial KPI = average of total values of Financial KPIs
    - II. Total Performance KPI = average of total values of Performance KPIs
    - III. Total ROI indicator = Average of financial and performance KPIs
  - QoS
    - I. Total Operational KPI = average of total values of operational KPIs
    - II. Total Performance KPI = average of total values of Performance KPIs
    - III. Total ROI indicator = Average of operational and performance KPIs

NOTE: Values taken here are arbitrary; they are used just to show the calculation of the business model evaluator

Head	KPI type	KPI's	Values in decimal	Preference Weight age (1-4)	Weight age Value	Total value	
TCO	Financial	Availability <i>versus</i> recovery SLA	0.9	3	2.7	2.7	Financial KPI
		Workload - predictable costs	0.9	3	2.7		
		Workload - variable costs	0.9	3	2.7		
		CAPEX <i>versus</i> OPEX costs	0.9	3	2.7		
		Instance to asset ratio	0.9	3	2.7		
	Operational	Workload <i>versus</i> utilization %	0.9	3	2.7	2.7	Operational KPI
		Workload type allocations	0.9	3	2.7		
		Ecosystem - optionality	0.9	3	2.7		
						2.7	Total TCO indicators
ROI	Financial	Speed of cost reduction	0.8	2	1.6	2.7	Financial KPI
		Optimizing cost of capacity	0.8	2	1.6		
		Optimizing ownership use	0.8	2	1.6		
		Green costs of Cloud	0.8	2	1.6		
		Optimizing margin	0.8	2	1.6		
		Revenue efficiencies	0.8	2	1.6		
		Market disruption rate	0.8	2	1.6		
	Performance	Optimizing time to delivery / execution	0.7	1	0.7	0.7	Performance KPI
		Timeliness	0.7	1	0.7		
		Throughput	0.7	1	0.7		
		Periodicity	0.7	1	0.7		
		Temporal	0.7	1	0.7		
						1.225	Total ROI indicators
	Performance	Experience	0.95	4	3.8	3.8	Performance KPI
		SLA response error rate	0.95	4	3.8		
		Intelligent automation	0.95	4	3.8		
QoS	Operational	Optimizing time to deliver / execution	0.85	2	1.7	1.7	Operational KPI
		Speed of time reduction	0.85	2	1.7		
						2.96	Total QoS indicators

Table 1 : KPI's involved in cloud path evaluation

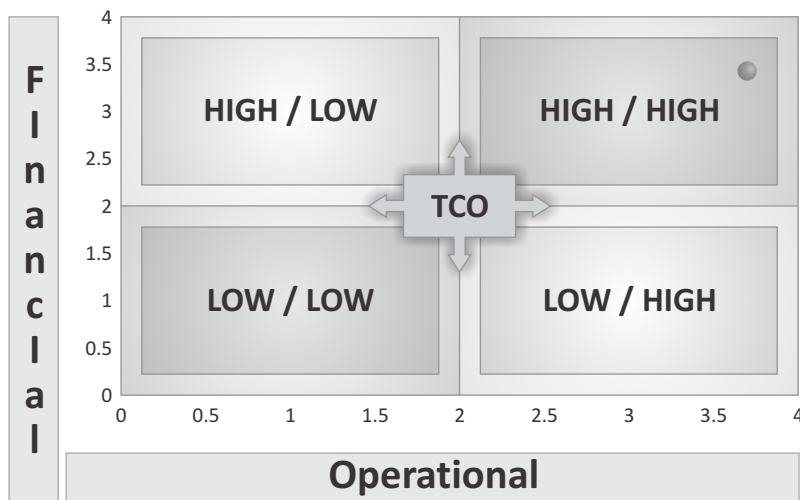
## Steps for the KPI evaluation outputs

1. From the prior step obtain the values for TCO, ROI and QoS
2. There are four quadrants defined based on High / low matrix
3. Get the values of TCO

	Y-axis	X-axis
TCO	Financial KPI	Operational KPI
	2.7	2.7

**Table 2 : TCO values for financial and operational KPI**

4. The graphical representation of the TCO is as follows



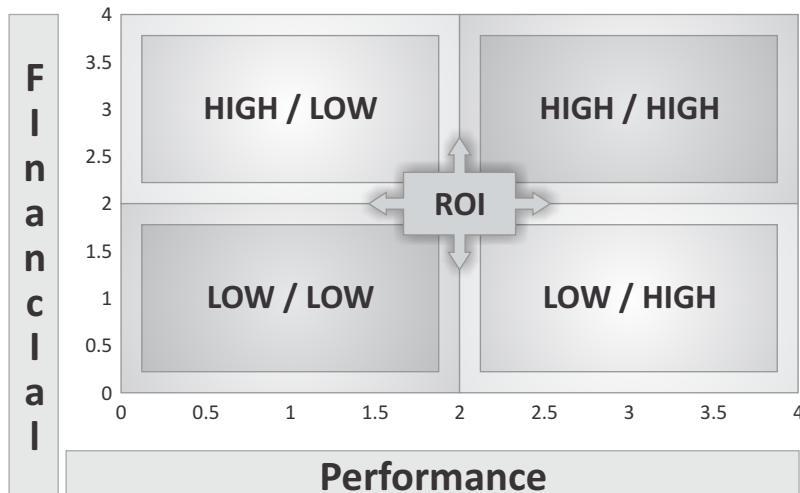
**Figure 3 : TCO matrix**

5. Interpreting the output of this matrix shows that operation KPI as well as financial KPI both are high therefore indicating a considerably good position for TCO, therefore it's a cost effective option
6. Get the values of TCO

ROI	Financial LPI	Performance KPI
	1.6	0.7

**Table 3 : TCO values for Financial and Performance KPI**

7. The graphical representation of the TCO is as follows



**Figure 4 : TCO matrix**

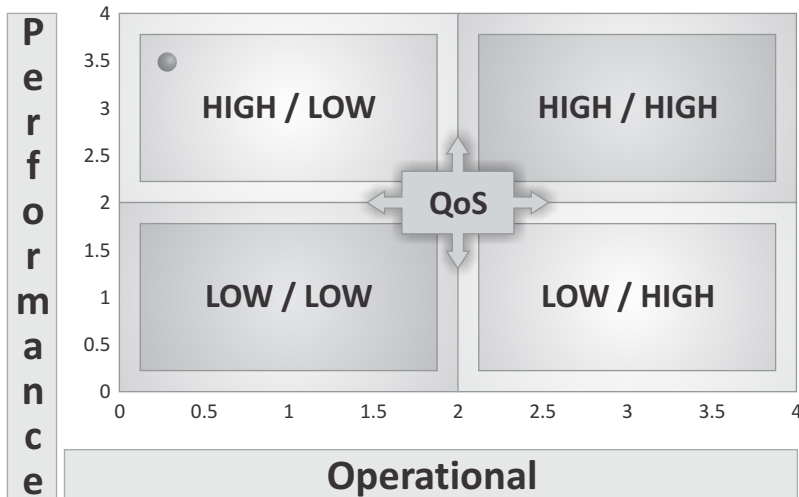
8. Interpreting the graph of ROI, it shows lower value for both financial as well as performance

9. Get the values of QoS

QoS	Performance KPI	Operational KPI
	3.8	1.7

**Table 4 : QoS values for Performance and Operational KPI**

10. The graphical representation of the QoS is as follows



**Figure 5 : QoS matrix**

11. Interpreting the output of QoS, the Operation KPI seems low whereas the performance KPI is high

## Steps for calculating Security constraints

1. Get the values for the security parameters specific from company
2. Get the industry benchmark values corresponding to those security parameters
3. Now calculate the value of company values as a percentage of benchmark value= company specific values/benchmark values.
4. Assign priority weightage as per the preference of the company.
5. Obtain the total value =step 4 \* step 3
6. Find the average of the security parameter values= average of total value.



Security parameters	Company specific values	Industry benchmark Values	Company as a percentage benchmark Values	Priority weightage	Total	Average
Data Centralization	10	20	0.5	2	1	1.36363636
Incident Response	10	20	0.5	2	1	
Forensic image Verification Time	10	20	0.5	2	1	
Logging	10	20	0.5	2	1	
Data Location	10	20	0.5	2	1	
Investigation	10	20	0.5	2	1	
Data Segregation	10	20	0.5	2	1	
Long-term Viability	10	5	2	1	2	
Compromised Servers	10	5	2	1	2	
Regulatory Compliance	10	5	2	1	2	
Recovery	10	5	2	1	2	

Table 5 : Security Parameters

## Steps for obtaining final business model

1. Obtain the following values
  - a. Security-Average of security parameters
  - b. Business Strength -Average of all the financial, operation & performance KPIs of TCO, ROI and Qos

	Y-axis	X-axis
Values	Security	Business Strength
	1.363636	2.295

Table 6 : Security and business values

2. Identify 4 cloud business conditions for the company

- A. PRIVATE CLOUD :** In this case the business strength as well as the security parameters both is high, therefore it is the most desirable condition for the business. The business can use this kind of cloud as a part of their Intranet and all the confidential information like that of sales or revenue related statistics that they desire to circulate amongst the employees. It also incurs additional cost.
- B. PUBLIC CLOUD :** In this case all the parameters of business strength is high but the main concern of security remains therefore the vulnerability is high even though the business is in good shape, therefore various data which are very confidential to the company cannot be shared in this cloud
- C. INEPT CLOUD :** This is the most undesirable scenario wherein both the business strength as well as the security is very low, with this condition the business cannot go ahead with the type of cloud model
- D. HYBRID CLOUD:** Here though the security is high but the business strength is low, therefore we can vacillate the business model between the private and public cloud based in the requirements

3. Plot the XY axis to obtain the final condition of the business

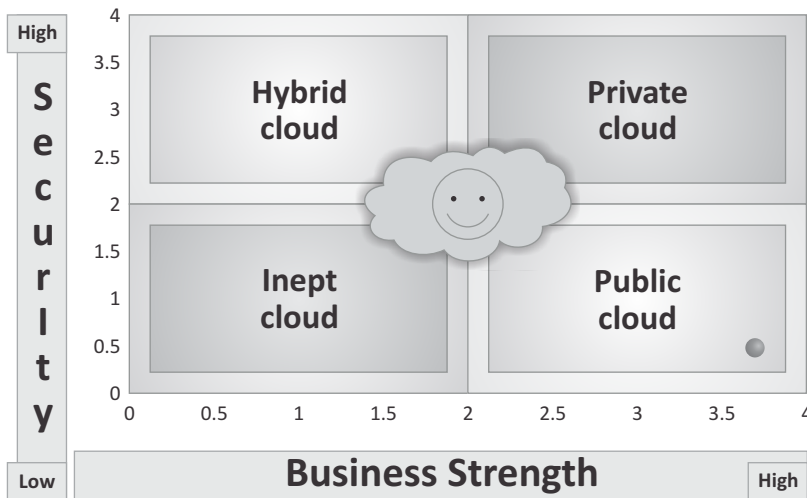


Figure 6 : Security Vs Business Strength

4. Interpreting the result and apply corresponding strategies

Once it is decided that which type of cloud to go forward with, now it is time to decide whether to go for SAAS ,PAAS or IAAS based on the requirement of the company, that is what are the component it wants to put on cloud.

CHARACTERISTICS	IAAS	PAAS	SAAS
Applications	In-House	In-House	Managed
Data	In-House	In-House	Managed
Runtime	In-House	Managed	Managed
Middleware	In-House	Managed	Managed
O/S	In-House	Managed	Managed
Virtualization	Managed	Managed	Managed
Server	Managed	Managed	In-House
Storage	Managed	Managed	In-House
Networking	Managed	Managed	In-House

Table 6 : Strategies for cloud adoptions

As described above, below given are the circumstances and the characteristics in order to select the right kind of cloud services

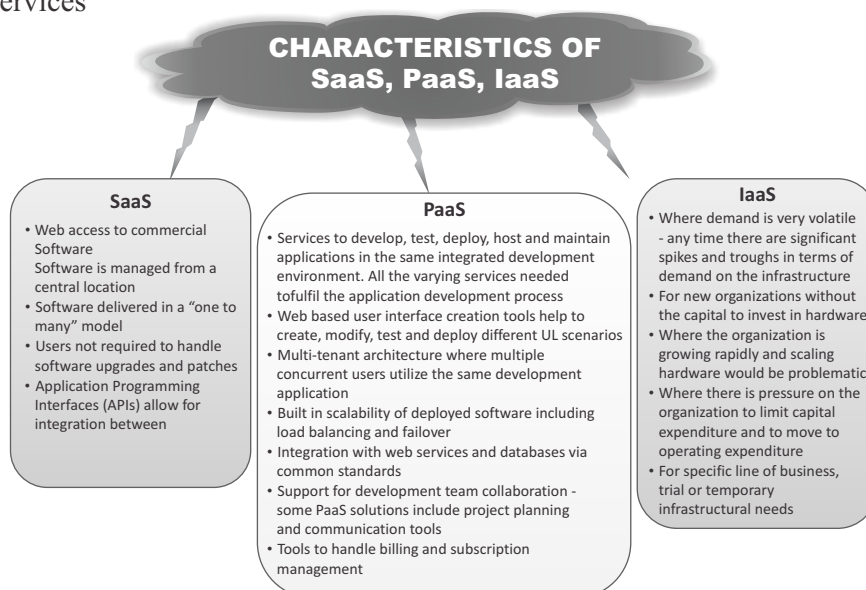


Figure 7 : Characteristics of SaaS, PaaS and IaaS

## Conclusion

This paper not only gives the overview of all the telco products which are currently active on cloud but also provides a huge innovation in the form of “CLOUD PATH EVALUATOR”, the model that we have designed and the tool that we developed will have the values corresponding to every companies contemporary condition and hence help them to understand and determine the kind of business model they would like to employ in order to achieve maximum efficiency out of their operations .Further improvisation is also done to the model to identify whether to go for PAAS, IAAS or SAAS based on the component they want to put on cloud.

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# Cloud SLAs, Pricing Policies and Business Models

Manjari Srivastava, Garima Dixit & Farhan Khan

## Abstract

Cloud computing is a transformative technology delivery model that is altering the way vendors, distributors, resellers, and consumers think about, approach, and implement IT systems. While it is opening many new opportunities for the channel, it is also creating the potential for the disruption of existing business models and go-to market strategies. Moreover, as more and more consumers delegate the IT tasks to cloud providers, Service Level Agreements (SLAs) need to be handled carefully.

Enterprises want to consume cloud computing resources on an 'a la carte' basis and expect pricing flexibility to the point of unique pricing for individual combinations of services or resources. Also, CSPs are moving down the value chain for providing cloud services and competing against non-Telco cloud providers. Though they have edge over non-Telco's in terms of network infrastructure and business advantages, they lack the sheer flexibility, scalability and guaranteed performance that it takes to sell cloud services on the terms that the customer expects. Therefore, the single biggest challenge for implementing cloud services is not security (it can be taken care of by implementing hybrid cloud) but how and on what parameters to meter, rate and finally charge the consumer and do the department-wise allocation of these costs. Therefore, providing innovative pricing models is an imperative.

## Cloud SLAs

As consumers are moving towards adopting a Service-Oriented Architecture, quality and reliability of the services become important aspects. However the demands of the service consumers vary significantly. It is not possible to fulfil all consumer expectations from the service provider's perspective and hence a balance needs to be made via a negotiation process. At the end of the negotiation process, provider and consumer commit to an agreement. In SOA terms, this agreement is referred to as a Service Level Agreement (SLA). This SLA serves as the foundation for the expected level of service between the consumer and the provider. The QoS (Quality of Service) attributes that are generally part of an SLA (such as response time and throughput) however change constantly and to enforce the agreement, these parameters need to be closely monitored.

Four different monitoring demands may be made by consumers:

- Scenario 1:* Consumer demands the data exposed by a service provider without further refinement such as transaction count, which is a raw metric.
- Scenario 2:* Consumer requests that collected data should be put into meaningful context.
- Scenario 3:* Consumer requests certain customized data to be collected.
- Scenario 4:* Consumer even specifies the way how data should be collected.

Amazon EC2, the most prominent cloud provider, puts the burden of proving SLA violations on the consumer, i.e., the consumer should take steps to enforce the SLA. A means of ensuring SLA enforcement in cloud context is a Web SLA. A Web SLA comprises mainly three entities.

**1. Parties:** WSLA contains the descriptions about (i) service provider, (ii) service consumer and (iii) third parties. The task of these third parties may vary from measuring service parameters to taking actions on violations as delegated by either the service provider or service consumer.

**2. SLA parameters:** In WSLA, SLA parameters are specified by metrics. Metrics define how service parameters can be measured and are typically functions. There are at least two major types of metrics.

- 1) *Resource metrics* are retrieved directly from the provider's resources and are used 'as-is' without further processing. For example, transaction count.
- 2) *Composite metrics* represents a combination of several resource metrics, calculated according to a specific algorithm. For example transactions per hour combine the raw resource metrics of transaction count and uptime.

A third metrics referred to as a 'business metric' has been defined. It relates SLA parameters to financial terms specific to a service customer.

**3. Service Level Objectives (SLOs):** They are a set of formal expressions. These formal expressions have the well-known 'if...then' structure. The antecedent (if) contains conditions and the consequent (then) contain actions. An action represents what a party has agreed to perform when the conditions are met.

## Web SLA Architecture

WSLA proposes a dynamic nature of SLAs as the cloud in itself is dynamic and resource usage is also dynamic. Measuring tasks in a cloud context should be performed through functions. Customers might not be comfortable sharing their confidential data with the cloud service providers. In such a scenario a set of tasks can be delegated to third parties to cater for better security.

Cloud services are subjected to load fluctuations and SLA violations are more likely to happen during these transitions. The nature of these fluctuations is unpredictable and hence a static schedule for evaluating conditions may not suffice. SLAs in the cloud context could use dynamic schedule for condition evaluations.

One important observation in the context of clouds is the lack of standardization. As a part of standardization efforts, a set of basic metrics and best practices for measurements must be established.

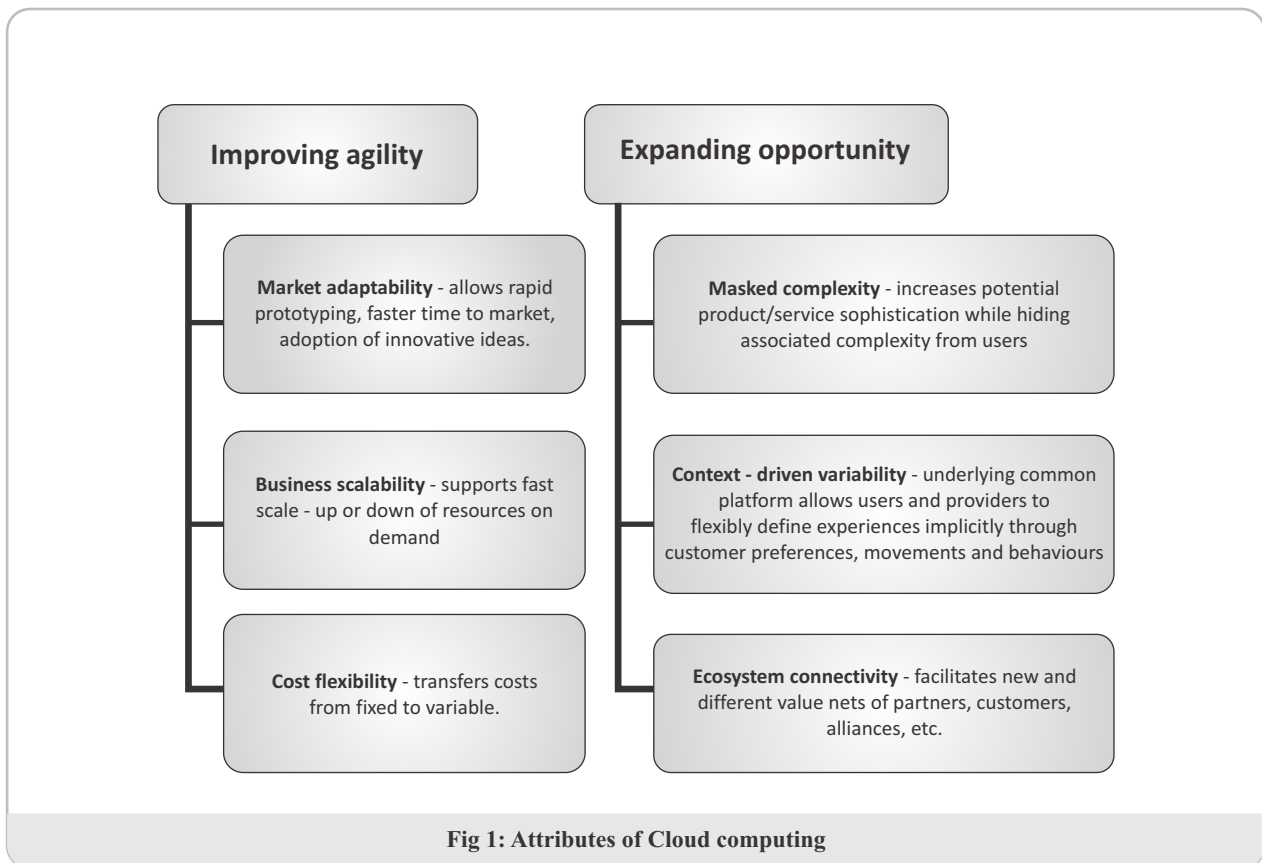
## Web SLA Services

Three common WSLA services and some of their adaptations required in the cloud context have been observed.

- 1. Measurement Services:** These services are responsible for measuring the runtime parameters of cloud providers' resources.
- 2. Condition Evaluation Service:** This service is responsible for getting the results from measurement services and evaluating the Service Level Objectives. If there are violations, the Management service will be contacted. Due to the dynamic nature of the cloud, the condition evaluation needs to be performed more frequently than in a traditional service framework.
- 3. Management Service:** This service is responsible for taking corrective actions on violation of the Service Level Objectives. We anticipate that since the cloud represents utility type computing resources, the management service would be primarily handling financial penalties similar to the real world utility industry practices.

## Cloud Business Models

Cloud capabilities are fundamentally shifting the competitive business landscape by providing a new platform for creating and delivering value to customers. New technology and social connectivity trends are creating a perfect storm of opportunity, enabling cloud to transform internal operations, customer relationships and industry value chains. Organizations must move quickly to seize the advantages of cloud enablement. Survey carried out by IBM among more than 500 business and technology leaders on six continents highlighted six key cloud attributes that expand business choices by improving agility and expanding opportunity.



Organizations are harnessing the cloud to go far beyond new delivery paradigms. They are transforming product and service development and recasting customer relationships. Three cloud-driven business archetypes, representing increasing levels of cloud empowerment, have been observed:

- **Optimizers** use the cloud to either incrementally enhance their customer value propositions or attract adjacent customer segments, while improving their organization's efficiency.
- **Innovators** significantly improve customer value, resulting in new revenue streams or even the disintermediation of existing industry ecosystems.
- **Disruptors** create radically different value propositions, as well as generate new customer needs and segments – and even new industry ecosystems.



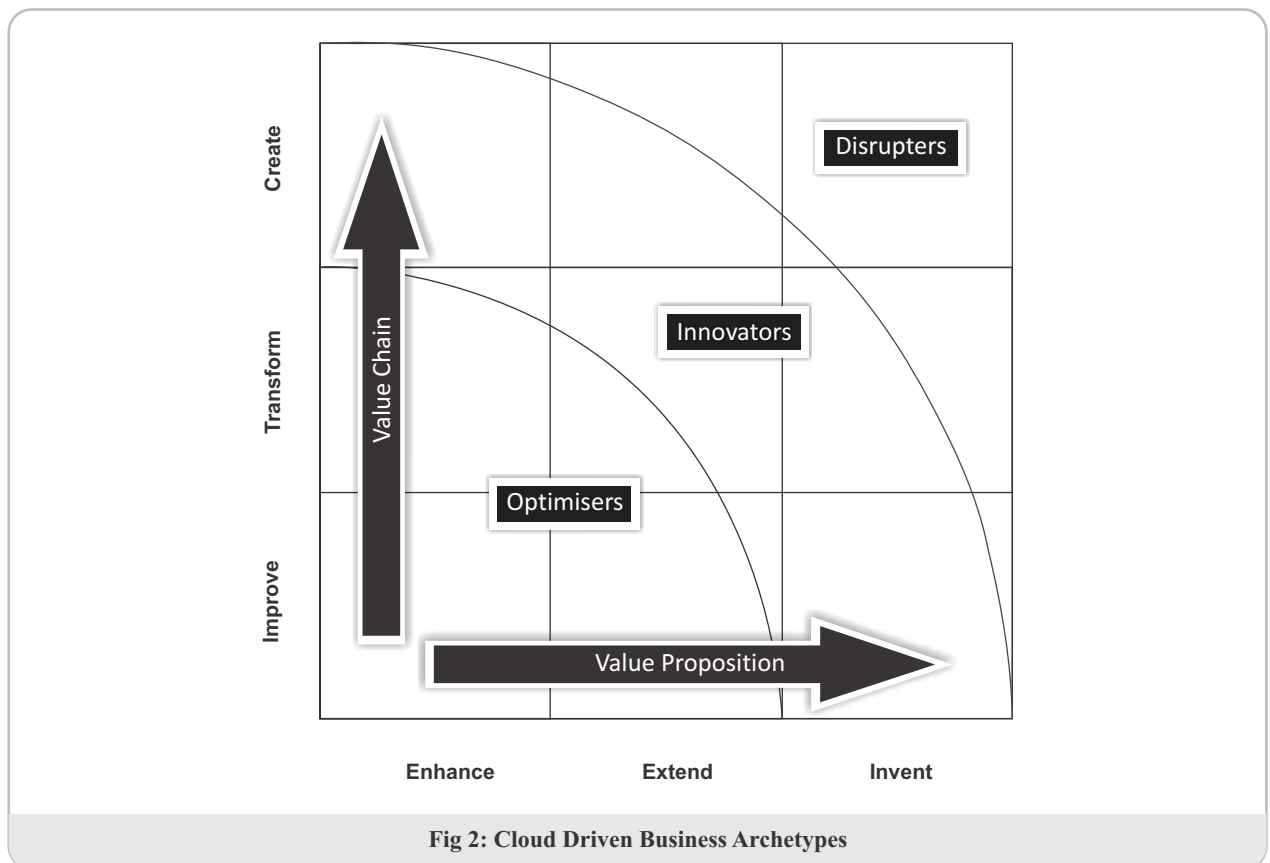
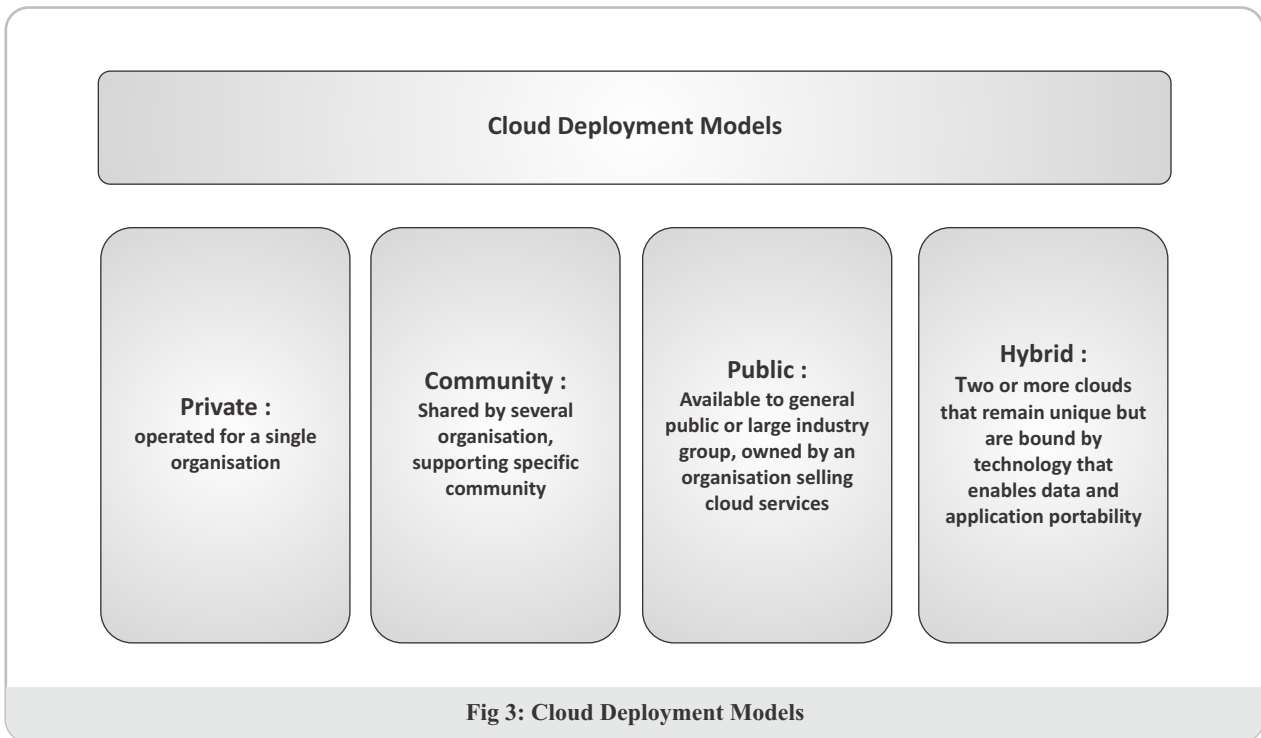


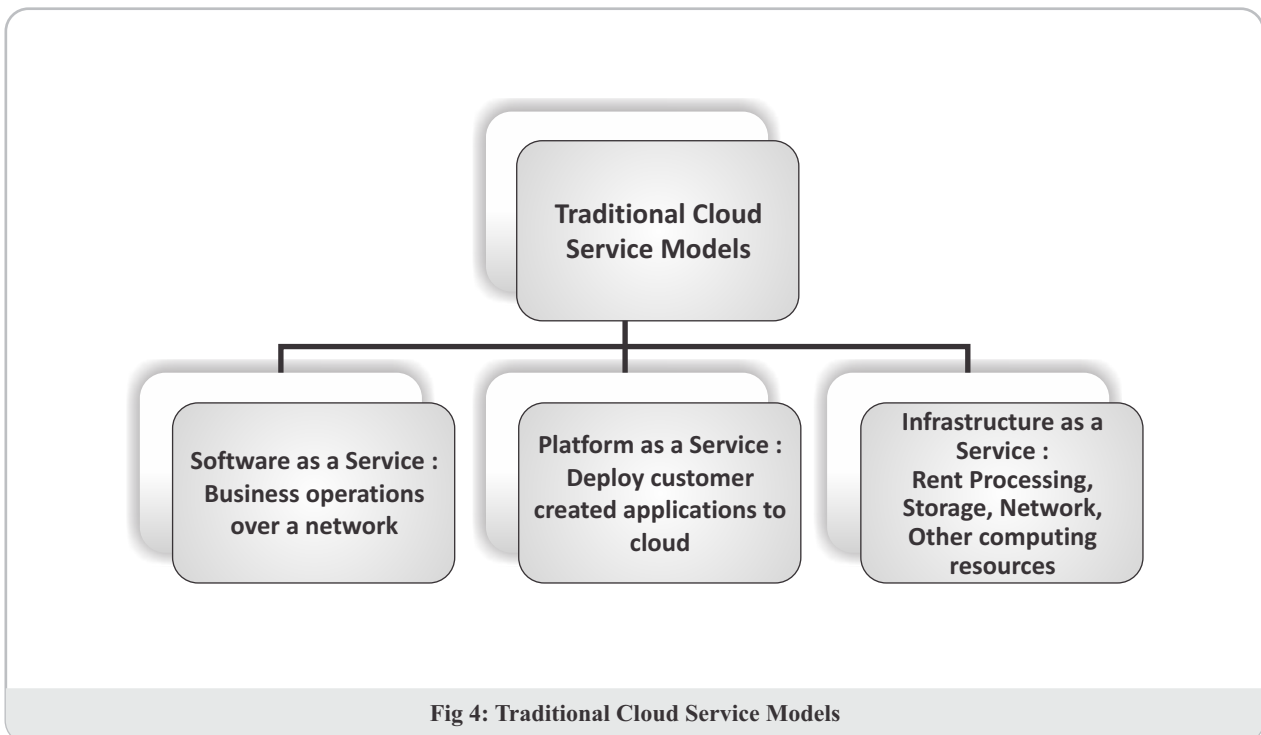
Fig 2: Cloud Driven Business Archetypes

## Cloud Deployment Models

The operation of cloud computing metering and billing is provided in some infrastructures (that is, the public infrastructure) and still required in private clouds built on enterprise application server infrastructures. The main differences are the security requirements, as most application-specific billing and metering are similar for private or public cloud computing. Some additional operational infrastructure items are required for metering and billing, however, such as messaging services to capture the usage data. Basically, additional infrastructure items are deployed to manage the use and cost of cloud computing metering and billing resources.



## Traditional Cloud Service Models



## Upcoming Service Models

Secondary service models are in progress, and many have standardized billing and metering models that have gained acceptance at all levels of business. Because SaaS is gaining acceptance, it is possible that these up-and-coming models will improve in adoption, as well. For example, Database as a Service (DaaS) and Monitoring as a Service (MaaS) are being leveraged from SaaS providers and gaining traction for cloud computing and SaaS IT-focused companies.

### • DaaS: Data as a Service

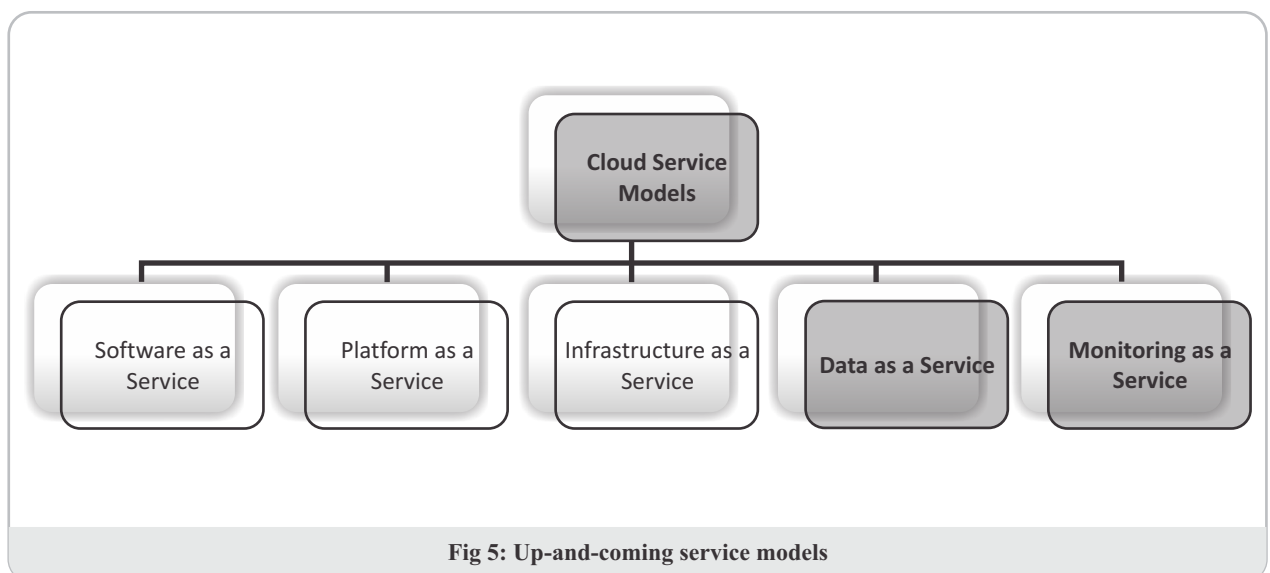
DaaS is based on the concept that the product, data in this case, can be provided on demand to the user regardless of geographic or organizational separation of provider and consumer. Additionally, the emergence of service-oriented architecture (SOA) has rendered the actual platform on which the data resides irrelevant. This development has enabled the recent emergence of the relatively new concept of DaaS.

Traditionally, most enterprises have used data stored in a self-contained repository, for which software was specifically developed to access and present the data in a human-readable form. One result of this paradigm is the bundling of both the data and the software needed to interpret it into a single package, sold as a consumer product.

With increasing software/data packages, EAI (Enterprise Application Integration) was needed to further integrate them which resulted into vendor lock-in. This resulted into additional maintenance costs in terms of software updates. Hence DaaS becomes an attractive option as it allows for separation of data cost and usage from that of a particular platform.

### • MaaS: Monitoring as a Service

An upcoming trend in cloud services is that of supporting parties who are the third parties that come into picture when signatory parties (service provider and service consumer) decide to delegate certain tasks such as measuring SLA parameters. Monitoring through the use of external services has been available for a while, providing availability checking for IT compute resources through pinging or synthetic transactions from the software developer's data centre.



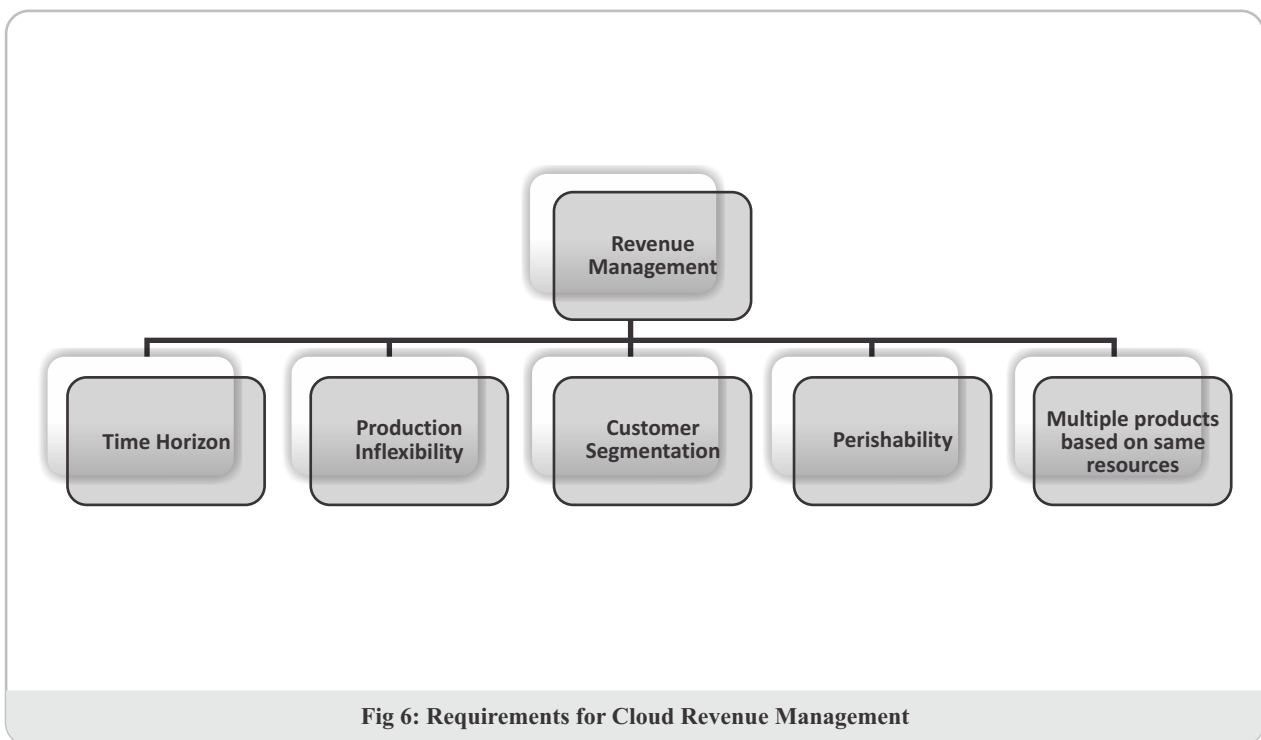
## Cloud Pricing

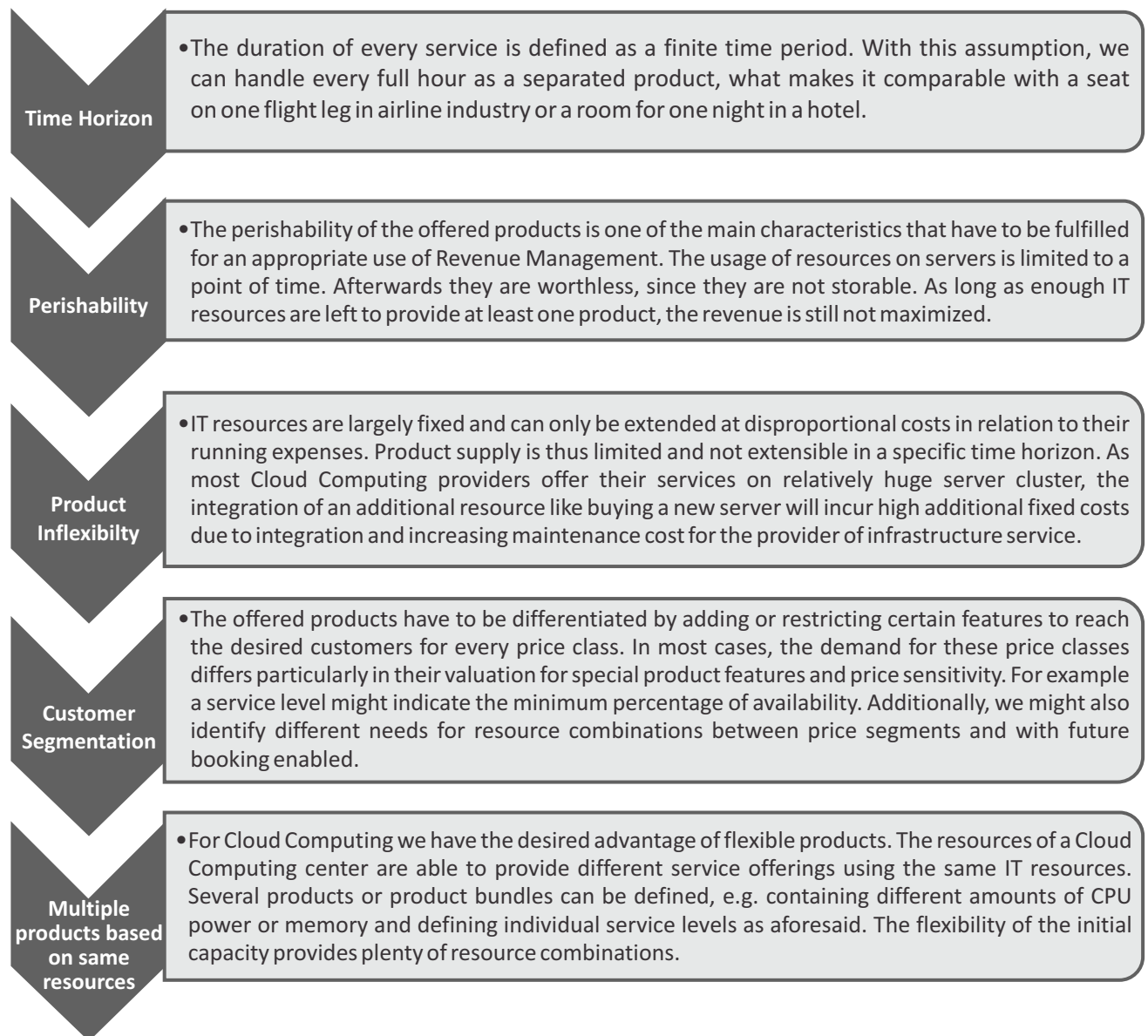
### Revenue Management

The term Revenue Management is most commonly used for the theory and practice of maximizing expected revenues by dynamically adjusting prices for products. Every customer segment can be distinguished by different needs and thus by higher or lower reservation prices. Consequently, the main goal in Revenue Management theory is to find the combination of customers which seems to provide the highest possible revenue.

### Revenue Management in Cloud

The application of Revenue Management in cloud is only feasible, if several requirements are fulfilled. The requirements enable a comparison to traditional Revenue Management approaches which can be useful to formulate and optimize the unique optimization problem analogously to established strategies.





## Pricing of Cloud

Pay for use, that is, charging customers based on their usage and consumption of a service has long been a cornerstone of certain businesses, such as utilities, wireless phone companies, and even web collaboration services. In enterprise computing, pay for use has increasingly gained acceptance, as IT strives to lower costs across infrastructures, applications, and services and pushes back the IT costs to the consumer. And now, with cloud computing, pay for use has become both necessary in a shared environment and easier to implement.

## Chargeback Models for Computing

Chargeback is an IT term for recovering the cost of providing cloud computing services from the service consumers: that is, making the consumer pay for the usage. Enterprises that are deploying private clouds will benefit from developing a chargeback model with billing based on actual resource usage, instead of resource allocation or reservation, as a fundamental component of the cloud architecture, even if intra-departmental billing is not required. A chargeback model in the cloud delivers many benefits, including the most obvious:

- Correlating utilization back to cloud consumers or corporate departments, so that usage can be charged if desired
- Providing visibility into resource utilization
- Facilitating capacity planning, forecasting, and budgeting
- Providing a method for managing IT demand
- Enabling cloud users to know their compute footprint, thus encouraging good citizenship and a perhaps a greener approach
- Encouraging the use of emerging technologies, which might be priced lower than other services as an incentive (For example, virtual machines will cost less than physical servers)
- Bringing transparency to enterprise IT which is a pivotal step in the transformation of enterprise IT from a cost centre to a business enabler
- Providing a mechanism for the enterprise IT function to justify and allocate their costs to their stakeholder business units

Alignment of IT resources with their cost can determine the profitability and allocation of cost per department or user. If an organization can't identify IT resource costs before and after their use along with what or who is consuming those resources, the correct entity may not be paying for on-going support to keep the services available and maintained. For example, if a new service is brought online with a common database, it will be impossible to determine who will pay for the database or server space or for long-term capacity planning – a failure that may affect the organization's customers.

## Pricing Models

Some pricing models were initially thought of as more innovative than functional. However, they are established and considered usable for metering and billing in cloud computing infrastructures. It is important to note which models have been established—for example, server billing at US\$0.10 per hour rather than large upfront procurement costs.



## Account Activity

Welcome Jason Meiers | Sign Out  
Account Number

[view Previous Statement](#)

### This Month's Activity as of July 8, 2011

The billing cycle for this report is July 1 - July 31, 2011. The AWS service usage charges on this page currently show activity for all accounts through approximately 07/08/2011

Summary		Activity by Account
You can download a detailed activity report in Comma Separated value (CSV) format.		<a href="#">Download Report</a>
<a href="#">Expand All Services</a>   <a href="#">Collapse All Services</a>		<a href="#">Printer Friendly Version</a>
		Totals
[-] Amazon Elastic Compute cloud		
US East (Northern Virginia) Region		
Amazon EC2 running Linux /UNIX Reserved Instances		
\$0.03 per Small Instance (m1.small) Instance* hour (or partial hour)	188 Hrs	5.64
Amazon EC2 running Linux /UNIX		
\$0.085 per Small Instance (m1.small) Instance* hour (or partial hour)	3 Hrs	0.26
Amazon EC2 EBS		2.978 GB-Mo
\$0.10 per GB-month of provisioned storage		0.30
\$0.10 per 1 million 1/0 requests	519,963 10	0.05
\$0.10 per 10,000 gets (when loading a snapshot)	14,336 Requests	0.01
<a href="#">Download Usage Report</a> ➤		6.26
[+] Amazon Simple Storage Service		
<a href="#">Download Usage Report</a> ➤		0.05
[+] AWS Data Transfer (excluding Amazon CloudFront)		
		0.01
Bill Summary		
usage charges and monthly recurring fees during this Billing cycle (more Info)		\$6.32
One-time fees during this billing cycle (more Info)		\$0.00
Taxes Estimated Taxes		\$0.00
Total new charges this billing cycle		\$6.32
No payments received to date.		
Current estimated unpaid balance to be charged for this billing cycle		\$6.32

Fig 7: Sample Statement of Bill of Cloud Services

## IaaS Billing and Metering

The primary concepts of IaaS include:

- Servers per hour serving an on-demand model
- Reserved servers for better planning
- Higher and lower compute resource units based on application performance
- Volume-based metering on the number of instances consumed
- Prepaid and reserved infrastructure resources
- Clustered server resources

The billing for most of these elements is on a per-month basis, where each server is decommissioned and returned within a few minutes as initially provisioned. Billing charges accrued over the whole month include instances of servers running for the complete 30 days as well as servers running only up to one minute. Each compute cycle is charged a complete hour regardless of whether it ran for one minute or one hour.

In most cases, scaling back instances during non-peak hours and scaling up during peak hours or seasons help to improve availability and response times. The only concern is third-party resources that are not scaled with the infrastructure exponentially, for example, the database authentication services, and other services that the scalable infrastructure accesses.

## PaaS Billing and Metering

Platform as a Service (PaaS) billing and metering are determined by actual usage, as platforms differ in aggregate and instance-level usage measures. Actual usage billing enables PaaS providers to run application code from multiple tenants across the same set of hardware depending on the granularity of usage monitoring. For example, the network bandwidth, CPU utilization, and disk usage per transaction or application can determine PaaS cost.

The primary concepts for PaaS metering and billing include:

- Incoming and outgoing network bandwidth
- CPU time per hour
- Stored data
- High availability
- Monthly service charge

The bandwidth of incoming and outgoing network traffic determines the usage per user and creates a metric for billing and metering. Transaction and HTTP request metering based on CPU time per hour, minute, or second is the most accurate billing and metering model, as each transaction can be measured for total cost. Because we can't pin-point which transaction user is consuming a given amount of CPU resources per request, it's difficult to allocate resources at the user level. Therefore, a simple and effective measure for billing and metering is to determine the amount of stored data the user is consuming. Doing so helps in capacity planning, billing, and metering for services such as storage as a service, where data is stored in larger amounts on servers across the infrastructure.

## SaaS Billing and Metering

The traditional concept for billing and metering SaaS applications is a monthly fixed cost; in some cases, depending on the amount of data or number of "seats," the billing and pricing are optimized. The number of users is determined by the number of users the organization allows to access the SaaS applications, which increases the price of the monthly fee; in some cases, if certain volumes are met, there is a discount. For instance, sales software provided as a service would cost US\$50 per month per sales agent for a company using the application.

The primary concepts for SaaS billing and metering include:

- Monthly subscription fees
- Per-user monthly fees

The monthly subscription fee is a fixed cost billed per month, often for a minimum contracted length of agreement of one year. The billing model per month changes the high initial investment from a software capital cost to a monthly operational expense. This model is especially appealing to small and medium-sized organizations to help them get started with the software required for their business initiatives. Scalability or pay-as-you-grow models are helpful for organizations that start with a small initial investment and a few users and grow as demand grows. In some cases, these organizations can scale down while providing access to the same data.

## **DaaS Billing and Metering**

The difference between traditional enterprise database infrastructures and software infrastructures is the built-in scalability and billing for what you actually use.

DaaS infrastructures employ these concepts:

- Instances of database servers
- Scalable cloud computing database services

The database instances that exist today in large enterprise infrastructures started with an infrastructure as a service platform using license agreements that already exist. This groundwork helps the implementation of software license agreements in DaaS models. For example, customers with existing licenses can run the same database instances per core in a cloud computing infrastructure. Databases built to leverage cloud computing scalability are available and billed in actual usage, often based on the number of requests executed on the server. This model helps to determine the actual usage of software and infrastructures for databases.

## **MaaS Billing and Metering**

Adding MaaS to an existing monitoring infrastructure aligns with availability requirements for infrastructure services.

MaaS employs these concepts:

- External service monitoring
- Instances of monitoring infrastructure
- Elapsed CPU time

This service is often billed monthly and based on actual usage as well as intervals the monitors execute the transaction cycles and the data is collected. This solution does not require the organization to have administrators on staff to manage the monitoring infrastructure, and is billed on a per-month basis.

## **Conclusion**

Cloud computing is transitioning from industry buzzword to business-critical solution and cloud's accessibility allowing for the “anywhere, anytime, anything access” of information takes centre stage in terms of widespread adoption across the industry. Apprehensions around vendor lock-in, and security and privacy are fast subsiding, or in some cases, are acknowledged as “trade-offs” for the efficiencies needed to remain competitive in this dynamic business environment.

As cloud providers compete for new customers, many will begin to extend more elaborate guarantees, concrete remedies and better data transit awareness. The guarantees will provide better legal protection

on the control of data. Confident providers will also include more detailed service level agreements and financial remedies, covering all aspects of the cloud service that could affect the customer's business performance. Cloud providers will also offer to provide improved visibility into the movement of data to maintain legal requirements.

Hence it is an all positive scenario for cloud providers and adopters in terms of generating business value as well as customer experience.

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# Application of IFRS in Indian Telecom Industry

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## Abstract

The basic objective of any business enterprises is to maximize the profits and create value for the shareholders. In meeting these objectives the management of the enterprise takes various types of decisions such as investing, financial and operational. The financial effect of these decisions is reflected in the financial statements prepared by the management. As of now, the financial statement consists of Profit & Loss Account, Balance Sheet and a Cashflow statement.

The financial statements are prepared on the basis of concepts, conventions, and assumptions and what is more important is - personal judgment. There are a few inherent limitations of the financial statements. There are different accounting policies and practices in relation to various financial elements in the financial statements. Such different accounting policies, even though principally correct may lead to differing profitability and financial positions. To make them comparable, it is important to have them on a common platform for which, the Accounting Standards(AS) were introduced. There are 32 accounting standards as of today which govern accounting policies to be adopted by these enterprises. The Accounting standards are now replaced by International Financial Reporting Standards(IFRS). The first time adoption and convergence are main issues related to adoption of IFRS.

The financial reporting of an entity is governed by 'Laws of Land', local GAAP & Accounting Standards published by the apex body of Accountants of the nation. Naturally, the problem of “comparability” is felt & observed, when we talk about various business combinations, (both organic & inorganic), especially in the nature of cross border transactions. This created a need to harmonize the practices of preparation accounts and presentation of financial information. IFRS is an output of this concept.

In fact IFRS has converted domestic Accounting Profession (which was earlier Geographical) into “Global”. Almost more than hundred nations have adopted IFRS. As such, the accounting practices of all such nations are now one & same.

The applicability of IFRS to telecom industry needs special attention. There are a few unique issues related to application of IFRS to telecom industry. The issues involved consists of adoption of IFRS for the first time, presentation of financial statements, revenue recognition, intangible assets, impairment of non-financial assets, provisions and contingencies etc. The article attempts to review the application of IFRS to telecom industry and issues related thereto.

## Introduction to Present Position of Financial Statements in India: (Pre- IFRS)

The financial performance of an entity is reflected in its financial statements. As per the existing practices, the financial statement consists of Profit & Loss Account, Balance Sheet and a cash flow statement. Profit & Loss account would state the financial performance in the form of profit earned or loss sustained by the company. The financial performance may be judged in the form of OPBDI&T, PBIT, PAT and EPS. These parameters indicate the profitability of the enterprise, whereas Balance Sheet indicates the financial position of the enterprise. It consists of the statement of assets and liabilities. The excess of assets over liabilities indicates increase in the wealth (as per books of accounts) shareholders. Since these two statements are prepared on the basis of accrual system of accounting, a cashflow statement is required to be prepared to indicate the cash flows. The effect of managerial decisions on company's profit is reflected in the Profit & Loss Account, on financial position in Balance Sheet and on cash in a cashflow statement.

The importance of these statements can not be under estimated since major strategic decisions are based on the basis of these statements (like market price of share based on fundamental analysis, mergers & acquisitions etc.)

Even though Income Statement and Balance Sheet is prepared on three accounting rules and with the help of accounting principles, assumptions and conventions, it is not completely free from limitations. These limitations include making estimates, assumptions, personal judgment, and availability of various accounting policies in preparation of financial statement. These limitations sometimes lead to window dressing. There are accounting bodies which govern the accounting practices in a country. The Institute of Chartered Accountants of India governs the accounting policies, principles and practices. For strict control and for benefit of public at large it has issued the Accounting Standards and Guidance Notes from time to time. The Accounting Standards limit the scope of adoption of various accounting policies and there by maintaining the uniformity and consistency in preparation and presentation of financial statements. So far there are 32 Accounting Standards which help the business enterprises in preparation and presentation of financial statements. **It is pertinent to note that a change in accounting policy would bring change in company's profitability and financial position, thus role of Accounting Standard is very important.**

#### **There are inherent features of Indian GAAP**

- a) Application of Accrual concept without consideration of 'Time Value of Money';
- b) Impetus only on 'True and Fair' view and not on 'Faithful Presentation';
- c) Use of estimates while preparing the accounts however not based upon scientific mode of risk assessment;
- d) Use of historical cost instead of fair value;

However so far the existing policies, principles and practices are sufficient to take care of above limitations.

### **The Telecom Sector in India:**

The role of telecom sector in Indian economy is growing day by day. Prior to liberlisation, the telecom industry was in monopoly and the telecom business was owned by the state owned enterprises like Department of Telecommunication. Later on we saw growth of BSNL & MTNL followed by private participation in this sector. It led to introduction of few specific issues like licensing, spectrum allocation, sharing of network and infrastructure There after post liberlisation especially after 1992 telecom sector was liberlised. The telecom equipment manufacturer, telecom service providers from private players started investing in this industry. The amount of investment in this sector is also growing. The parameters judging the growth of this industry are also showing encouraging path such as number of subscribers, teledensity, overall revenue, changing technology, Government support for penetration of this services etc. Since the private players have already invested in this sector post liberalization now they are devising strategies to earn proper return on their investments. Due to Government policies, there are Foreign Direct Investments in this sector.

All the telecom companies' prepare financial statements for the financial year as per existing norms and accounting practices which mainly include compliance with Accounting Standards and existing laws like The Companies Act, 1956 (which will be replaced by Companies Bill 2011). As per existing norms these companies are following Accounting Standards and presenting their financial statements. Out of the total ten operators, four operators are public listed companies and others are not. However over a period of time IFRS will apply to all the companies.



**The alphabetical listings of the Telecom companies are:**

1. Aircel
2. Airtel: Public Listed Company
3. BSNL
4. Idea: Public Listed Company
5. MTNL
6. MTS
7. Reliance: Public Listed Company
8. Tata: Public Listed Company
9. Uninor
10. Vodafone

Most of the telecom companies will be adopting IFRS for the first time i.e. 1<sup>st</sup> April 2011. Hence selecting accounting policies at the time of first adoption is critical since it is going to affect financial statement for subsequent years. Since IFRS 1 is not sector specific, telecom specific provisions would not be found easily however since option is available, telecom companies should use the selection of accounting policies wisely. In case of telecom companies we observe various mergers and combination in the past (which took place prior to adopting IFRS for the first time i.e. 1<sup>st</sup> April 2011). These companies will now require to follow IFRS-3 – Business Combination in the first year of adoption of IFRS however the financial statement will indicate its effect *retrospectively*. This process may be cumbersome. The telecom companies can exercise an exemption in case of application of IFRS -3 on business combination and resulting treatment of Goodwill prior to first time adoption of IFRS. The second exemption will be in respect of valuing tangible and intangible assets in the balance sheet. The telecom operators will have to take policy decision in this respect.

**Applicability of AS and IAS:**

In India the Accounting Standards are applicable to the specified enterprises. These Accounting Standards were issued by Accounting Standards Board (ASB). The telecom operators while preparing the financial statements used to comply with these accounting standards. Thus Financial Statements prepared as of today are based on Indian Accounting Standards. However post liberalisation the conversion with IFRS has become a necessity. Accordingly it was decided that financial statements shall be fully converged w.e.f. 1<sup>st</sup> April 2011 to specified companies and thereafter to all enterprises in phased manner. In the initial period convergence will be mandatory for public listed enterprises. The adoptability will help companies to tap foreign capital markets, enhance comparability and especially useful to multinational companies.

**IFRS as applicable to Telecom Operators:**

The International Accounting Standards and IFRS consist of single set of high quality accounting standards which can be used globally. It will be useful in presenting transparent and comparable information in relation to financial statements. Application of IAS, IFRS along with XBRL will be useful to potential users who need information for taking different types of decisions. For those operators which will be presenting financial statements under IFRS for the first time w.e.f. 1<sup>st</sup> April 2011 have to comply with convergence process for their first presentation of accounts, thus convergence will be important in this year. For the purpose of convergence, the companies have to follow IFRS-1 i.e. First Time Adoption of International Financial Reporting Standards. In subsequent years these companies have to follow relevant IAS. There are in total 9 IFRS and 29 IAS along with interpretation notes (IFRIC 1 to 19). All IAS may not apply to telecom operators (eg: IAS 11, 29, 41 etc) where as out of applicable IAS, a few IAS may

not have major effect in preparation and presentation of financial statements (eg: IAS 1, 2,7,24, 26 etc.). There are a few specific IAS which will apply in unique way to Telecom Operators. This article attempts to review these IAS.

These mainly include –

- ✓ IAS – 2 : Inventories
- ✓ IAS – 16 : Property, Plant & Equipment
- ✓ IAS – 18 : Revenue
- ✓ IAS – 36 : Impairment of Assets;
- ✓ IAS – 38 – Intangible Assets;

And the list of major IFRS includes;

- ✓ IFRS – 1: First Time Adoption of IFRS
- ✓ IFRS – 3 : Business Combination;
- ✓ IFRS – 8: Operating Segments.

## **Comparative Analysis Indicating Differences in Erstwhile Accounting Standards and IFRS for Telecom Services Providers.**

Significant Accounting policies may differ based on whether the financial statements are prepared on Standalone basis or consolidated basis. In the following discussions we have referred to Standalone results of the operators.

### **AS -1 (Disclosure of Accounting Policies) and Corresponding IAS – 1 (Presentation of Financial Statements)**

As per AS-1, the basis of preparation of financial statement is historical cost and accrual basis of accounting. The companies while preparing financial statements are supposed to follow provisions of Accounting Standards as applicable along with the provisions of the Companies Act, 1956. The presentation aspect of financial statement was also governed by Schedule VI to the Companies Act, 1956 together with the Accounting Standards notified under the Companies (Accounting Standards) Rules, 2006. It is expected that the telecom operators follow accounting policies as per the Accounting Standards and these are consistently followed. AS-1 dealt with disclosure of accounting policies. Pre- IFRS the financial statement includes Balance Sheet, Profit & Loss Account, Cashflow Statement and explanatory relevant notes and accounting policies. Under the Companies Act, there is prescribed format of Balance Sheet and the requirements of Profit & Loss Account. The format of balance sheet used to state the Fixed Assets, Investments, Current assets and Share Capital, loans and current liabilities. In this presentation there was no mention of “Operating Cycle”. Another important feature is use of estimates in preparation of these statements which will affect the values of revenues, expenses, assets, liabilities including contingent liabilities. The companies need to account for the variation between estimates and actual results after the events have taken place.

Whereas as per IAS – 1, the basis of preparation is accrual basis and going concern principle and thus while presenting the accounts, materiality and aggregation wherever required shall also be considered. This standard applies to 'preparing and presenting the general purpose financial statements in accordance with IFRS'. IFRS is largely based on Framework. The present IFRS will now require companies to prepare a 'Complete Set of Financial Statement' which consists of a Statement of Financial Position (This statement shall again be presented if there is any retrospective change in accounting policy, restatement of any financial item or reclassification of financial item), a Statement of Comprehensive Income, a Statement of changes in Equity, a Statement of Cashflows and relevant notes and accounting policies. The actual format is not as such prescribed however telecom companies need to find out suitable

presentation so that transparency is maintained. However the now the companies have to comply with provision of the Companies bill 2011 as far as presentation of these statements are concerned. Under IFRS, critical accounting estimates and fair value would play a major role. The financial statements would continue to be presented on historical basis except for those financial elements that have to be measured on fair value basis. Some specific terms have been used in IAS 1 like 'Other Comprehensive Income' which mainly includes changes in revaluation purpose with reference to IAS 16 and IAS 36, gains and losses arising from translating the financial statements of foreign operations with reference to IAS 21 and similarly other items of gains and losses arising out transactions as mentioned in IAS- 9, 19, 39 etc. The Profit or Loss for this purpose total income as reduced by expenses excluding the components of other comprehensive income as mentioned above. Another term used is 'Total Comprehensive Income' which consists of two components all items of Profit & Loss and 'Other Comprehensive Income' as stated above. Due to this, the presentation of Financial Statements under IFRS would differ from Financial Statement under earlier laws and accounting standards. In case of balance sheet the format was fixed under the Companies Act, 1956 with identification of items of fixed assets and liabilities. After implementation of IFRS, some items are required to be reclassified especially into Current and Non Current Assets and Liabilities. The basis of such classification is given in IAS -1 para 66 to 76. Thus it will affect the balance sheet presentation (which will now replace fixed assets with non-current assets and long term liabilities with non current liabilities). However the changes if any in proposed Companies Bill regarding the structure of balance sheet will override this structure. Another crucial aspect which needs special attention is 'Statement of Changes in Equity'. It will be very important for stakeholders. Now onwards, those movements were shown in assorted manner in the financial statements. Post IFRS this changes will be presented in one statement called as 'Changes in Equity'. Earlier it was allowed under AS-5 to indicate extraordinary items in the Profit & Loss Account however under IFRS such disclosure or presentation is not allowed.

### **AS-2 (Valuation of Inventory) and Corresponding IAS – 2 (Inventories)**

AS- 2 Valuation of Inventories applies to telecom operators. In case of telecom service providers the inventory is in the form sim cards remaining unsold. The proportion of inventory held by telecom operators is less as compared to other industries. The inventories are valued at cost or net realizable value whichever is lower. The cost may be determined on weighted average basis / FIFO basis. As a comparison between AS-2 and IAS-2, there are no major changes which would affect the valuation of Inventory. In case of telecom operators, the value of inventory is comparatively less thus after adopting IAS-2, the financial effect would be minimal. IAS-2 addresses the issue related to inventories of service providers. Telecom operators are service providers. According to IAS-2, if service providers have inventory then it should be measured at cost of production and it should exclude the profit margins and non-attributable overheads. While to arrive at cost of inventories, according to AS-2, selling and distribution cost shall be excluded whereas according to IAS-2, only selling cost shall be excluded i.e. distribution cost shall be part of inventory valuation. In case of telecom service providers distribution cost is vital.

### **AS – 3 (Cashflow Statement) and Corresponding IAS – 7 (Statement of Cashflows)**

AS-3 applies to all enterprises except Small and Medium Enterprises. The basic objective of this statement is to provide users the information about the company's ability to generate the cash and how it is utilized. There are no major differences in AS-3 and IAS-7 thus the presentation of cashflow statement and its analysis would continue to be on earlier lines. AS-3 allows entities to use 'Direct' or 'Indirect' method of presentation of cash flow statement. SEBI requires listed companies to follows Indirect method whereas IAS-7 encourages direct method. However in our opinion, if one refers to IAS-1 the change has taken place in respect of identification of current and non current assets and liabilities thus resulting into changes in cash flows under respective activities i.e. operating, investing and financing.

However the net result of cash and cash equivalent will be same. Post IAS-7, there will not be separate disclosure as to cashflows from extraordinary items. In AS-3, bank overdraft were treated as part of financing activity however under IAS-7 it will form part of cash and cash equivalent.

#### **AS – 6 (Depreciation Accounting) (There is no corresponding IAS however it is covered under IAS-16)**

As per AS- 6, the depreciation on fixed assets is governed by Accounting Standard -6 as well as the provisions and the rates prescribed in Schedule XIV of the Companies Act, 1956. The company declares their policy of depreciation. The assets are divided into two types tangible and intangible. Most of the telecom operators provide depreciation on straight line method on the basis of estimated useful economic lives of assets. The companies normally have their own estimates of economic lives of the assets. The company can compare these rates with Schedule. XIV of the Companies Act, 1956 and thus the higher rate of depreciation is charged on assets. Due to this, different companies estimate different useful lives resulting into differing depreciation for same class of assets. (Eg: Idea Cellular estimates Leasehold Improvements economic life equal to period of lease whereas Bharati Airtel estimates it as period of 10 years or lease period whichever is less). In case of intangible assets special attention is required. Cost of Rights & Licenses is amortized over a period of license. Software is amortized over its useful life as estimated by management. In case of bandwidth or fiber taken on Indefeasible Right of Use (IRU) is amortized over the agreement period. Normally the assets costing less than Rs.5000 are depreciated fully in the year of purchase. In case of 3G spectrum fees which is a huge sum, the companies would amortize it over a period of license from the date of launch of 3G services. License fees are amortized over license period i.e. 20 years and IRU bandwidth based on estimated useful life of this asset or the agreement period. Another example is of Tata Teleservices which follows a policy that fixed assets are stated at cost less depreciation and impairment loss.

The depreciation under IFRS is mentioned in IAS-16 (Property, Plant and Equipment). It states that 'Each part of an item of property, plant and equipment shall be depreciated separately'. Eg: For civil structure and tower installed on it will have different rates of depreciation. Similarly earlier the items below Rs. 5000 were depreciated fully, however after IFRS in our opinion; the depreciation has to be charged on all items irrespective of its value. IAS-16 states that each part of an item of property, plant and equipment shall be depreciated separately. The methods of depreciation suggested under IAS-16 are straight line method, diminishing method and units of production method. We should also refer to the provisions related to depreciation under the Companies Bill, 2011. This standard also refers to impairment of assets which is discussed subsequently. In IAS-16, it is expected that management shall review the residual value, useful life and depreciation method every financial year. Depreciation has major effect on cashflows, managerial remuneration and dividend policy as per the provisions of the Companies Act, 1956. I would be interesting study to observe the effect of depreciation under IFRS on these issues, to what extent managerial remuneration and dividend is affected. Thus it may be expected that Companies Bill, 2011 will address the issues related to depreciation.

#### **AS – 9 (Revenue Recognition) and Corresponding IAS – 18 (Revenue)**

According to AS-9, revenue is the gross inflow of cash, receivables and other consideration arising in the normal course of business whereas IAS – 18 defines it as Gross inflow of economic benefits resulting into increase in equity. Due to such inherent difference revenue recognition is crucial for telecom operators. AS-9 requires revenue to include all indirect taxes whereas as per IAS-9 these taxes will not form part of revenue. In case of an operator if total revenue collected is Rs. 1000 million which includes service tax of Rs. 100 million and trade discount and rebates of Rs. 10 million then for the purpose of IAS-18 the fair value of revenue is Rs. 890 million. In AS-9 it would have been the total amount excluding discount and rebates.



Further AS-9 does not require any adjustment of discounting to revenue items whereas IAS -9 requires adjustment of discounting if cashflows are deferred. A major difference would arise to telecom operators since it is a service industry. The recognition criteria for rendering services under AS-9 allowed both completed service method and also proportionate completion method however under IAS-9, one has to use percentage completion method.

As per AS-9, the subsequent discussion illustrates the revenue recognition criteria for telecom operators. The revenue may arise on various accounts to telecom operator. The revenue arising out of mobile services or by sale of handsets / accessories is accounted for on net basis i.e. after deducting rebates or discounts etc. If the revenue is in the form of recharge fees then it is recognized based upon when the subscriber activates the recharge voucher. Revenue recognition in case of unbilled revenue is also important. The provision for doubtful debts is made base upon amount not recoverable up to 90-180 days or as per standard practices. Typically the revenue is recognized when all significant risks and rewards are transferred to the customer. Revenue from prepaid cards is also recognized on actual usage basis. Processing fees on recharge may be recognized over the estimated customer relationship period or voucher validity period. In case of revenue on account of bandwidth services, it is recognized over the contract period. In relation to Internet and Satellite services, the company has to account for registration, installation charges. Activation revenue is amortized over the estimated customer relationship period. The unbilled revenue i.e. revenue represented from the bill cycle date to the end of each month is billed in subsequent period as per the different applicable billing plans. In our opinion, IAS-18 would require recognition of revenue on percentage of completion method. Even the customer activation fees will now be accounted for as amortization over the expected duration of the customer relationship

The telecom operators sometimes offer bundled products consisting of hardware and software or combination of any two or more than two. Eg: mobile handsets along with services, set up boxes, internet connections etc. IAS-18 requires identification and consequent separation of these items for the purpose of revenue recognition. Under AS-9 since there was no clear cut guidance, the telecom operators used to recognize revenue based upon its legal form rather than substance. Thus as per IAS-18, if a single contract includes multiple components then companies should identify and recognize revenue for each component based on applicable revenue recognition criteria. Thus under IAS-18, there is no specific guideline as to how to allocate total consideration to individual component. In practice, the consideration is allocated to each component based on its fair value or fair value of undelivered products i.e. residual method. However determining fair value of each component requires complex estimates and one has to refer to prices of individual component on standalone basis adjusted for volume discounts.

For this purpose, to find out the separation of component it should have a standalone value to customer and its fair value should be determinable. In case the customers are given incentives in the form of free minutes then under present practices revenue is recognized without taking into consideration the bonus talk time, however under IAS-18, revenue is recognized per minute after giving effect of bonus talk time i.e. effective rate. Eg: If an operator is giving Rs. 100 plan for 100 minutes with bonus of 20 minutes then effective rate is  $\text{Rs. } 100 / 120 = \text{Rs. } 0.83$  Here it will be assumed that bonus talk time will be fully utilized. In case of activation charges, the revenue has to be recognized based upon the expected life of customer thus the present allowable practice to recognize it upfront will not be allowed. Similarly the telecom operators need to give special treatment towards customer loyalty programs. At present the expenses towards the same are shown in Profit & Loss Account i.e. Customer retention and customer loyalty expenses are charged to Profit & Loss Account. IFRIC 13 provides guidelines in respect of treatment to customer loyalty programs. It covers all the situations including wide range of sales incentives. Thus the revenue from award credits shall be recognized only after the company fulfills its obligations to provide free goods or services.

IAS-18 indicates the point of recognition of revenue based upon the capacity in which revenue is recognized i.e. as a principle or agent. In case of services directly provided to customer as a principle, the

revenue shall be recognized on gross basis. In some cases, the telecom operators earn commission (like downloads etc) where the telecom operator is not the owner of contents then in such cases, revenue shall be recognized on net basis i.e. commission only. Simple rule is when the company is earning revenue as a principle then it should be accounted for on gross basis whereas revenue is earned as an agent then revenue is recognized on net basis i.e. margin earned.

In case of revenue from capacity transactions, the telecom operator grants 'right to use' known as 'Indefeasible Right to Use' (IRU), one has to refer to facts and circumstances of each case. However by and large it may fall in the category of leasing. For these situations revenue recognition is based on principles of leasing contracts.

As of today most of the operators recognize service revenue on completion of provision of services however as per IAS-18 it should be on percentage of completion basis i.e. proportionate basis.

Specially in relation to telecom operators one of the major expenditure is License Fees- based on Revenue Share. From August 1999, the variable license fees are computed at prescribed rates of revenue ( revenue means adjusted gross revenue) share and it is charged to Profit & Loss Account in the period in which the related revenue is recognized ( as per matching principle). If revenue is changed due to switching over from AS-9 to IAS-18, then there would be difference on account of variable license fees.

#### **AS – 10 (Accounting for Fixed Assets) and Corresponding IAS – 16 (Property, Plant & Equipment)**

As per AS -10, fixed assets are stated at cost of acquisition and installation. All the costs which are directly attributable to bringing the assets to their working condition are capitalized. The borrowing costs which are directly attributable to the acquisition / construction of fixed assets are capitalized. In case of fixed assets acquired out of foreign currency loan, a notification issued by Ministry of Company Affairs dated 31<sup>st</sup> March 2009 is followed. Accordingly long term foreign currency monetary liabilities used for acquisition of fixed assets can be adjusted to the cost of the fixed assets and then it is amortized over the remaining useful life of asset.

Due to its scope, it is observed that different companies follow different policies. For telecom operator's main intangible assets are Goodwill, Licenses, Software and IRU bandwidth capacities. The depreciation / amortization to these assets play key role.

Under IFRS, companies are required to depreciate the assets based on their useful life. It is expected that new Schedule XIV may prescribe the useful lives thus it may not prescribe the minimum rates of depreciation. If the companies enter into credit arrangement for acquiring fixed assets, under AS-6 specific treatment is not required. The gross amount payable to creditor is capitalized and depreciation is charged. Under IFRS, the concept of fair value is important thus, the asset will be capitalized at the present value of the amount payable to the supplier at the end of the extended credit period. Under IFRS, the companies need to disclose measurement basis used for determining the gross carrying amount. The companies need to find out depreciation including accumulated impairment loss. The major change as compared to AS- 10 would be towards determining fair value of assets, revaluation of assets from time to time, determining impairment loss and recognizing the changes or reversal of changes / losses through 'Other Comprehensive Income' in the Profit & Loss.

Account. According to IAS-16, the assets will have entity specific value. The main difference lies in reviewing residual value, useful life and depreciation method on yearly basis which was not required under earlier AS-6 and AS-10. Thus critical issue and change from earlier AS-10 is ascertaining the fair value of the assets and accounting for the same. Thus change in this value would bring change in revaluation reserve and depreciation.



**AS – 17 (Segment Reporting) and Corresponding IFRS – 8 (Operating Segments)**

As per AS-17, Segmental Reporting is done by the companies. For the purpose of reporting the company may identify the segments on the basis of services or geographical areas such as mobile services, Enterprise Services, Telemedia services and revenue generated in India or outside. E.g. Under IFRS – 8 in respect of operating segments, Airtel has identified its operating segments as follows;

- A. Mobile Services (India & South Asia)
- B. Mobile Services (Africa)
- C. Telemedia Services
- D. Enterprise Services
- E. Passive Infra Services
- F. Other Operations;

In IFRS 8 which explains the concept of 'Reportable Segment' which needs to be taken into consideration. According to IFRS 8, an operating segment is a component of an entity which is important from an entity's point of view. The criteria related to this are explained e.g.: the operating results which are reviewed by the entity's chief operating decision maker to make decisions. Thus segmental profit or loss would be reported under IAS-8 whereas under AS-17, only segmental information was published.

**AS – 28 (Impairment of Assets) and Corresponding IAS 36(Impairment of Assets)**

As per AS – 28, this exercise is carried out when it is felt that the carrying amount may not be recoverable. An impairment loss is recognized when the assets carrying amount exceeds its recoverable amount as on a particular date. For the purpose of assessing impairment, the assets are grouped into Cash Generating Units (CGUs).

As per IAS -36, it is expected that telecom companies assess impairment losses to its assets at the end of each year. They will have to assess internal and external indicators which impair the assets. The impairment losses are measured in terms of individual assets other than goodwill at the amount by which carrying amount exceeds its recoverable amount. It may also require telecom companies to identify cash generating units however considering the telecom operators which are carrying heavy infrastructure; it will be difficult to identify CGUs. If we look at the indicators of impairment then out of seven parameters almost all parameters would apply which may not be a case for other sectors.

**These parameters include;**

1. *Market Value is declined or the entity has operating or cash losses*- In Indian situations operators are actually facing this situation;
2. *Technological obsolescence* – It is very much applicable to telecom sector;
3. *Competition*: In India, all operators are facing the intensive competition;
4. *Market Capitalisation* – In these cases the carrying amount of the telecom companies' net assets exceeds its market capitalization.
5. *Significant Regulatory Changes* – Telecom sector is heavily facing this problem;
6. *Physical damage of assets*: Due to geographical dispersion this is possible;
7. *Significant adverse effect on the entity which will change the way the assets are used / expected to be used*: The business models of telecom operators is constantly changing like sharing networks etc.

Considering above parameters, in our opinion, telecom operators need to assess the impact of above on its asset position. Impairment losses related to Goodwill can not be reversed whereas other impairment losses can be reversed.

### **AS-29 (Provisions, Contingent Liabilities and Contingent Assets) and corresponding IAS – 37 (Provisions, Contingent Liabilities & Contingent Assets)**

According to AS-29, companies used to make provisions based upon certain criteria, whereas as per IAS-37, the provisions would be made on the basis of 'constructive obligation'. As per IAS-37, in case of Provisions, Contingent Liabilities and Contingent Assets, the telecom companies need to make provisions based on the probability of occurrence of outflow of resources. In these cases, wherever required time value of money (process of discounting) shall be used. In case of more possibilities exist then provision shall be made as equal to expected value derived from probability weighted approach. Thus under existing standard estimating the provisions were comparatively easier under IFRS, a systematic procedure is required to be followed.

### **AS-26 (Intangible Assets) and corresponding IAS – 38(Intangible Assets)**

As per AS-26, intangible asset has useful and definite life (normally not exceeding ten years from the date on which this asset is available for use) whereas as per IAS-38, intangible asset will have finite or indefinite life. As far as value under IAS-38 is concerned intangible asset may be accounted for on two basis i.e. cost method or revaluation method whereas as per AS-26, intangible assets shall be valued at cost only.

In case of estimating useful life of intangible assets is critical as it affects amortization and financial position. Since telecom operators have observed and undergone various mergers / business combinations, they need to consider the treatment to intangible assets arising out of business combinations as per IAS-38.

- **Licenses & Spectrum Fees:** The estimated useful life is the term of the license. The license term reflects the period over which the company will receive economic benefit. In India the license period is usually 20 years hence it can be said that useful economic life is 20 years. There is no possibility that this period could be less or more than this. The valuation of these assets under IAS-38 will play an important role.
- **Software:** The useful life is determined by management and reviewed regularly. In case of licensed software the company need to compare the license period with its economic useful life. The company need to consider the technological changes and resultant use of the same to company. The amortization amount will very based on this.

A few companies may also consider other intangible assets like customer bases (which is valued based upon average economic life and churn rate. Higher the churn rate, higher the amortization cost). The customer acquisition costs were so far charged to Profit & Loss Account. A few expenses in this area are eligible to be capitalized, under IFRS each and every expenses under this head needs to be scrutinized and then an appropriate decision shall be taken for capitalization.

There are other IAS and IFRS which may apply to telecom operators. The other accounting standards like accounting for investments, borrowing cost, accounting for foreign exchange transactions and leases are also important and post IFRS also applicable IAS will have to be complied by telecom operators however in our opinion, these are not reflected as major one materially affecting the Income Statement and Financial Position.

## Conclusion

- The revenue will largely be affected,
- The major change in accounting for expenses is not foreseen however revenue based license fees may be affected resulting into payment of taxes to Government;
- The depreciation amount charged in the income statement will change;
- The net income will also be affected;
- The net effect of all these changes would be on EPS however detailed study is required; (The companies need to prepare Comprehensive Income Statement)
- Assets will be assigned fair values; In IAS 16, the assets are valued at “Value in Use” as against the concept of “Written down value” thus affecting the valuation;
- Financial Assets and liabilities will be assigned fair values;
- Change in the structure of current assets and liabilities against non-current assets and liabilities; ( The security deposit may have to be valued at its present value);
- The change in profit may bring change in income tax;

Thus it is going to affect the financial performance and financial position due to adoption of IFRS.

## Glossary

- a) **IFRS** – International Financial Reporting Standards
- b) **AS** – Accounting Standards
- c) **IAS** – International Accounting Standards
- d) **GAAP**: Generally Accepted Accounting Practices
- e) **OPBDI&T**: Operating Profit before Depreciation, Interest & Tax
- f) **PBIT**: Profit before Interest & Tax
- g) **PAT**: Profit after Tax
- h) **EPS**: Earning per share
- I) **XBRL**: Extensible Business Reporting Language
- j) **IFRIC**: International Financial Reporting Interpretation Committee

## References:

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# 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 (RPs),
- “Prevision” SITM's Annual Telecom Forecast
- Faculty Research Projects (FRPs).
- 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 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. Sunil Patil, Director, SITM.
- Dr. P.J Joglekar, Telecom Consultant (Ex-Professor, IIT Delhi).
- Dr. Pramod Damle, Professor, SITM.
- Dr. R. Venkateswaran, Business Head, Persistent Systems Ltd.
- Mr. Muddassar Sayed, Head - Innovation Team, Communications Practice, Cognizant Technology Solutions.
- Mr. Giri Hallur, Assistant Professor, (Telecom), SITM.



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