

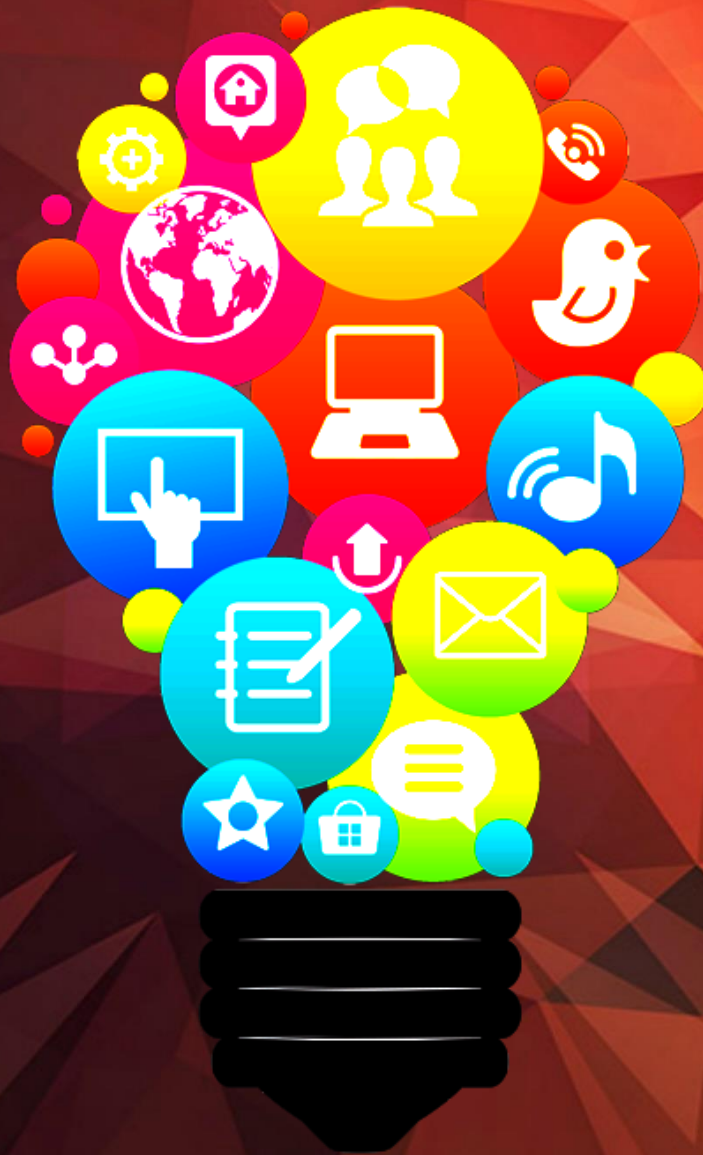


SYMBIOSIS INSTITUTE OF
TELECOM MANAGEMENT

(Constituent of Symbiosis International University)

Prayukti

Student Journal



Prayukti

Presented by
TBR TEAM



**SYMBIOSIS INSTITUTE OF
TELECOM MANAGEMENT**

(Constituent of Symbiosis International University)

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DIRECTOR'S Message



Dr. Sunil Patil

Director, SITM

The aim of Prayukti, a SITM Student Journal is to motivate the students to do research in the area of Information Communication Technology. Students will be writing research articles in the current areas of ICT and the best articles will be published in this journal. This will help students keep abreast of the current happenings in the area of ICT and also help dissemination of knowledge, information and learning. Students are expected to have an enriching and life-turning experience which will enable them to reach new heights in their professional life. We foster sharpening of skills and enhancement of knowledge base in our students through various extra-curricular, co-curricular and curricular activities through faculty who not only keep themselves at par with the current developments in ICT but also contribute to the expansion of the body of knowledge in their field of expertise. To facilitate this, we have launched Prayukti to enhance domain specific knowledge among members of faculty and among students. With very congenial and professional environment our faculty makes substantial contribution to the academia through quality teaching, publications, seminars, conferences, etc.



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PREFACE

Symbiosis Institute of Telecom Management has a vision of motivating students to respond to the changing technology by creating techno-managerial capabilities that can help organizations to manage their technological fundamentals to create competitive advantage. As a part of a techno-management business school that has remarkably evolved into a center for learning and excellence in the Information and Communication Technology (ICT) domain, it gives us a great pleasure to release the first edition of Prayukti. The magazine's members have shown considerable cooperation as well as devotion. It provides a snapshot of different papers written mainly focusing on the ICT sector along with the business impact.

Prayukti was born at the initiative of Symbiosis Institute of Telecom Management. The word "Prayukti" is a Hindi word and indicates the specific aim that this magazine has been designed for that is motivation, application, or result. Simple and interesting articles have been written on specific subjects regarding different fields in the ICT domain. The magazine consists of 7 articles. The areas covered by the articles are Data Privacy concerns for Big Data Monetization, Beacon Technology, AWS Direct Connect, Indian E-commerce, Synergy driven business consolidation, Increasing Profits out of existing 2.5G/3G infrastructure, Next Generation PON. On behalf of the magazine's members, we would like to express our thanks to the teachers for guidance in the right direction and students who have contributed to the magazine by showing utter integrity and dedication. We would also be pleased to receive any suggestion that could assist us with the second edition.



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DATA PRIVACY CONCERNS FOR BIG DATA MONETIZATION IN MOBILE APPLICATION

Pushpendra Thenuan, Ankur Raina

Abstract

The digital consumer economy produces large amounts of customer data at every fraction of a second. These applications or other OTT services are capable of capturing highly personal information such as contact details, locations, history, identity etc. which can be used for monetization in different ways as per mobile application's business model to predict consumer behavior and trend analysis. This consumer data can be exceptionally valuable to the enterprise, consisting insights for market and industries. It rises the concern about data privacy. This article include concept of big data monetization by mobile application, user data privacy concern and controls required for data privacy.

Keywords: Data privacy, Big Data monetization, mobile application, security, data analytics, business intelligence, over the top, privacy issues.

Introduction

The fast paced advancement that we have witnessed in the past few years makes it extremely difficult to figure out any one possible factor responsible for this constant change in business landscape. However, one major reason for this change is the digital revolution that we have witnessed in the past few years. Almost 40% of the world's population is on the internet. Data monetization has emerged due to increase in digital penetration which is 3.17 billion of internet user consisting of 2.08 billion of smartphone users that produce large amount of data. It is predicted that the addressable market for 'telecom data as a service' will grow from \$24.1 billion in 2015 to \$79 billion in 2020. This data is generated by devices captured by the service provider and can become a high potential source of revenue generation for them. This data becomes highly important for telecom service providers owing to the competition they are facing from OTT players and other alternative forms of media and entertainment services delivered over a variety of platforms.

The service providers have therefore an extremely lucrative proposition as they are owners of "Data Mines" that can fetch them high revenue using data analytics by identifying and segregating the relevant information of the targeted audience. This advancement in data exploration and its appropriate use will not only benefit one specific industry, but a gamut of industries and also governments. Consumer preferences, consumer specific insights for organizations and usage of a particular public facility by citizens in a particular area are some of the examples of the different ways in which data can be analyzed and the depth till which it can be analyzed for highly accurate decision making.



Every single moment there are several megabytes of data generated and stored. This raises the question whether the data is secured and if its privacy is maintained. Most of the applications that are heavily used request for personal information such as access to phonebook, location details etc. As it is observed that multiple access permission in mobile application requested by App developer is not required. For example, access to location may not be required by mobile wallets apps, but still it seeks access and captures it. Therefore, there is immense scope for informing the users while installing the application about how application will collect the data and how will it be used further.

Data Monetization

Data monetization deals with generating revenue from available structured or unstructured data sources which is used to create value to the organization using business intelligence. This data could be a stored repository of data or could also be real time streamed data.

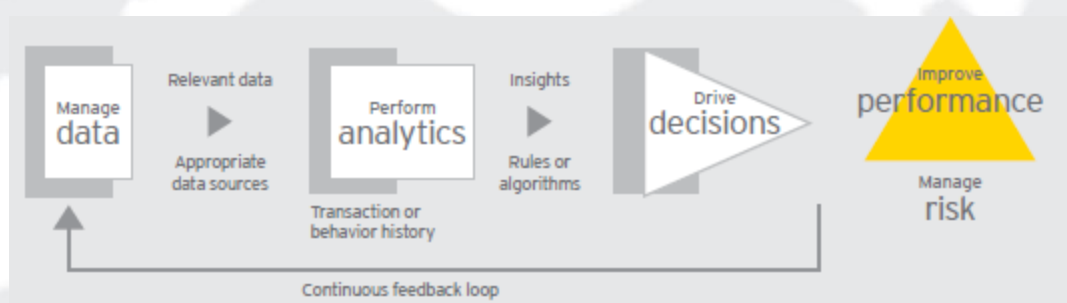


Fig (1): Process of Data Analysis

Many organizations have entered this territory and are leveraging every single opportunity to generate as much useful customer data as possible by tracking user profiles on social media, identifying clicks per page etc. Telecom service providers are in the best position to monetize this data because they have almost complete information of a user using its network as compared to typical Internet companies like Facebook, Google etc.

As discussed earlier this data also raises concerns about its security and identification of relevant sellable data from the unstructured data that is generated. Big data is a very tempting target for cyber attackers as it has a lot of commercial value. Also the current level of security implemented for safeguarding of data is not completely mature giving rise to a significant number of risks associated with the data. Moreover with the advent of big data analytics the hunt for data is always on. On capturing this data it is subject to analysis which might reveal a lot of personal information.

How mobile applications do their business?

- Many of the Mobile applications act as service aggregator like Ecommerce (E.g. Amazon, Flipkart, Snapdeal), Cab Aggregator (E.g. Uber, Ola, Taxi for Sure), Travel Aggregator (E.g. Yatra.com, Redbus, Paytm). These generate revenue from commissions and also from advertisements.
- Some sell advertising space within the app. The app developers earn money from the ads which reasons the free distribution of the app.



- Particular mobile applications offer their basic versions free to user. Their business model depends on users to upgrade the application to paid version with premium features and leads to rise in net revenue.
- A few mobile application permit user to buy more features within the app itself. Generally, users are billed for these in-app purchases through the app store. Multiple devices have option which enables them to block in-app purchase.
- Some mobile apps are offered free to create interest in an organization's products and services. These apps are a form of advertising or cross selling.

Data Privacy Concerns In Mobile Application

In the recent past, the market has been flooded with several thousands of applications providing some service to the users. This has led to a significant increase in superior personal mobile experience and business development. The global mobile phone users are expected to cross 5 billion by 2019. In 2014, approx. 60% of the global population had mobile phones. The mobile phone penetration is predicted to steadily grow approx. to 67% by 2019.

The mobile app development ecosystem functions in a rather different way. Thousands of app developers put their code together to launch the app at an earliest on either Android or Apple marketplace. The app is usually free or at a very cheap rate. The developer is left with a meagre amount after deducting the commission charges paid to the app store, from the 99 cents that he charges.

The developers therefore search for other sources of revenue generation. Ad market is one strong source of income for these developers. Ad networks primarily pay mobile developers for the information they can extract from the users device. This is why many apps request for information that is irrelevant to the apps functioning. For example, battery saving apps asks for your location although there is no need for it. This access of additional information might lead to unnecessary outcomes such as you being tracked.

There are multiple application accesses and permissions required by mobile applications while installing:

Identity: <ul style="list-style-type: none"> ▶ Uses one or more of: accounts on the device, profile data 	Contacts: <ul style="list-style-type: none"> ▶ Uses contact information 	Location: <ul style="list-style-type: none"> ▶ Uses the device's location 	SMS: <ul style="list-style-type: none"> ▶ Uses one or more of SMS, MMS. Charges may apply
Photos/Media/Files : <ul style="list-style-type: none"> ▶ Uses one or more of: files on the device such as images, videos, or audio, the device's external storage 	Camera: <ul style="list-style-type: none"> ▶ Uses the device's camera(s) 	Microphone: <ul style="list-style-type: none"> ▶ Uses the device's microphone(s) 	Wi-Fi connection information: <ul style="list-style-type: none"> ▶ Allows the app to view information about Wi-Fi networking, such as whether Wi-Fi is enabled and names of connected Wi-Fi devices
Device ID & call information: <ul style="list-style-type: none"> ▶ Allows the app to determine the phone number and device IDs, whether a call is active, and the remote number connected by a call 	Device & app history: <ul style="list-style-type: none"> ▶ Allows the app to view one or more of: information about activity on the device, which apps are running, browsing history and bookmarks 	Others: <ul style="list-style-type: none"> ▶ Receive data from Internet. Full license to interact across users. Read Home settings and shortcuts. 	Phone: <ul style="list-style-type: none"> ▶ Uses one or more of: phone, call log. Charges may apply

Fig (2): List of Accesses Required By Mobile Applications



Most of the apps today ask for a bunch lot of permissions, even though they are just providing a simple service that has no relation to the permission being asked for. Users tend to just press the “Accept” button without paying much attention to what all accesses have been requested for. In case of users who do actually know what kind of access is being asked for, by the app, are still rendered helpless as the app won’t install unless you grant permission to each and every option that the app is seeking access to. In case of most of the users, they perceive that they are granting permission to a limited portion of their data, but in reality the app can dig very deep into the data. These apps have codes built in which can retrieve your complete data and sell it to some ad network. The access requests to user data are also generically worded, resulting in the user not knowing what kind of permission he is granting. Some apps claim to finish their tasks in the background, so that the user can focus on his/her work without being worried about the app’s execution. However these so called “continuously active” apps might actually be secretly collecting your data all the time. The interesting part of ad developers associated with an ad network is that they get paid as long as their app is on the users device, irrespective of whether it is being used or not.

How do stakeholders of mobile ecosystem ensure data privacy?

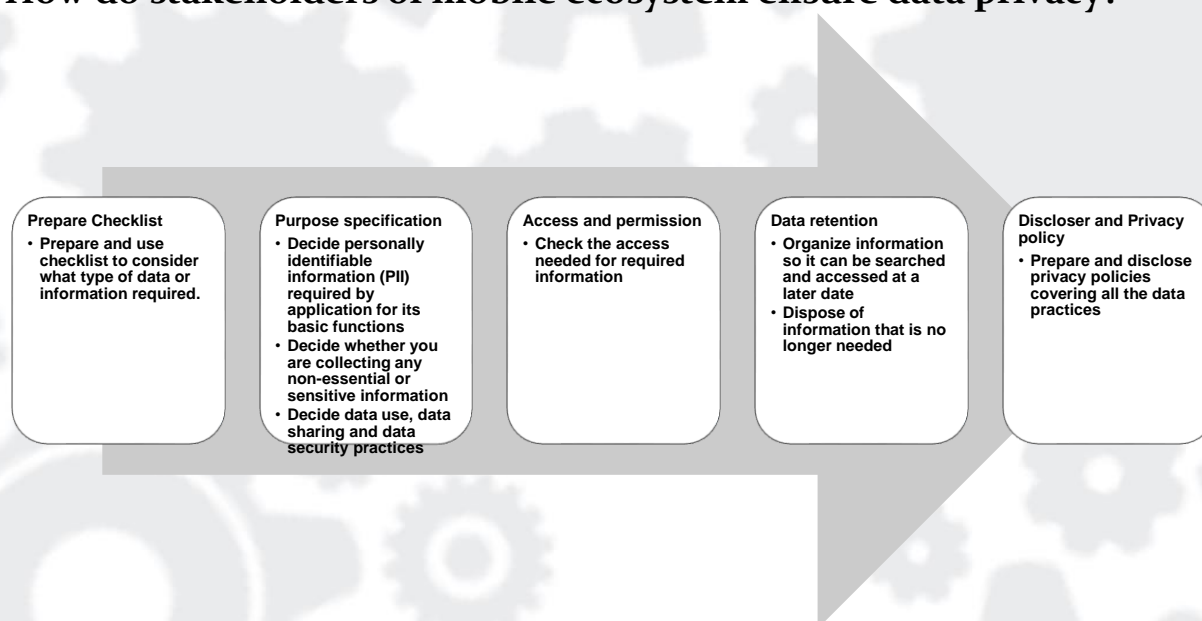


Fig (3): Steps for ensuring data privacy

Application developer:

- The application developer should first analyze and make a list of the personal information the app could collect and utilize this list to decide on the privacy policy.
- Refrain from gathering personal information that is not required for the app’s basic execution.
- Frame a policy on privacy that is very transparent and unambiguous.
- Use some kind of attention grabbing tactics so that the user knows that there might be some unexpected use of data, enabling the user to make an informed decision.



App Platform Providers

The privacy policy should be made available on the platform itself, so that the user makes an informed decision to download the app or not.

For Mobile Ad Networks

Develop a robust privacy policy and inform the same to app developers using your platform for advertising.

Operating System Developers

Provide options to the users to make selections that control the data and features accessed by app.

Mobile Carriers

Try to develop a stronger bond with customers by informing them regularly on mobile privacy, especially on child's privacy.

Conclusion

Data owing to its immense scope of commercial use is most sought after by organizations. Data generation and accumulation is continuously increasing. Therefore data privacy and security is a major area of concern that needs to be addressed. Applications are one of the strongest sources of data generation, but to what extent should they access a user's personal data and before doing so, has the user authorized the application to do so, are some of the areas of data privacy that need to be looked into for data monetization to be completely secure.

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IS BEACON TECHNOLOGY A NEW PROXIMITY TO OMNI-CHANNEL IN RETAIL?

Nayan Jyoti Bhuyan, Falgun Barot

Abstract

Technology trends in marketing strategies are empowering the retail sector. There has been significant increase in the competition in the market with the retailers shifting their focus from Multi-channel to Omni-channel business strategies. Beacon technology in retail plays an upper hand in acquiring the target market. The customer activity in terms of their shopping behavior is trapped by the retailers and analysis is done to understand the customer buying patterns. Beacon technology is a latest trend that is adopted by many big players across the globe while its presence in India is in a nascent stage. This study is an attempt in explaining in brief how Beacon technology can be a vital factor in retail.

Keywords: Beacon, Omni-channel, Retail

Introduction

In the current fast moving world, the presence of Beacon technology in Omni-channel retail will be a major success story. Emergence of Beacon technology will visibly enhance the user experience as this magical technology will act as a catalyst between the online and the offline world. With the rise in e-commerce business, Beacon technology will be a stepping stone in competing with the brick and mortar retailers. The adoption of Beacon in Omni-channel retail is a latest strategy to attract the customers. Marketing with the blend of technology is a vital weapon for the retailers to compete in the existing market. The change from Multichannel to Omni-channel is a blue ocean strategy adopted by the retailers to aggregate their customers but delivering Omni-channel experience is not a cake walk. With a large supply chain and logistics network without a middleman, online shopping sites have been enticing consumers with aggressive discounts and thereby putting market share ahead of profitability. Retailers are struggling to keep up with Omni-channel demands of customers as major players experience challenging in integrating back office technology. With the advent of e-commerce, the retail stores lack a seamless experience as online shopping is outplaying the offline retail market. Customers are now more prone to online transactions as they are lured with discounts and offers. However, customers want their products to be delivered at the doorstep with a single click. Over the past few years, footfalls at retail stores have been impacted by sales evidently shifting online which is hurting the larger ecosystem of offline retailers. Beacon technology is adopted to take Omni-channel experience to a new dimension as it gives a seamless and consistent retail experience with the combination of online and offline shopping. Beacon is not only confined to shopping but it also has vast applications in restaurants, groceries etc. The rapid pace of technology has impacted many sectors. Increase in the use of smart gadgets has changed the scenario quite significantly. A new application is developed every hour. The advancement in telecom with the rise of OTT players is something new as compared to the last decade. E-commerce is changing the trend and lifestyle of customers



in the current scenario. This mixture of technology with data speed and seamless visual experience is fulfilling the needs of the customers today. Some loop holes still exist in the path which forces every sector to adopt new strategies. This is where Beacon technology highlights itself in taking the retail sector to further heights.

Statistics and analysis suggests that 40% (Mobstac, 2014) of the Omni-channel demand is struggling. This is not unusual as brick & mortar retail stores are also offering variety under a single roof with brands like Shoppers Stop, Pantaloons, and Big Bazar etc. The competition is rising and both the parties i.e. the customers & retailers are more or less benefitted. Adoption of Beacon technology in Omni-channel market will blur the line between online and offline market by aggregating mass and giving retailers a 360-degree view of their target audience. 67% of the consumers search grocery online but only 26% purchase online which is very less in the current state. Both online and offline stores have negative sides which can be made fruitful with the new technology. It can play an integral role in enhancing consumer's in-store shopping experience. In 2015, 40% of global shoppers used smart phones in shopping process which is expected to rise to 6.1 billion by 2020 and only 58% of retailers provide the consumers with an Omni-channel shopping experience (Nada, 2016).

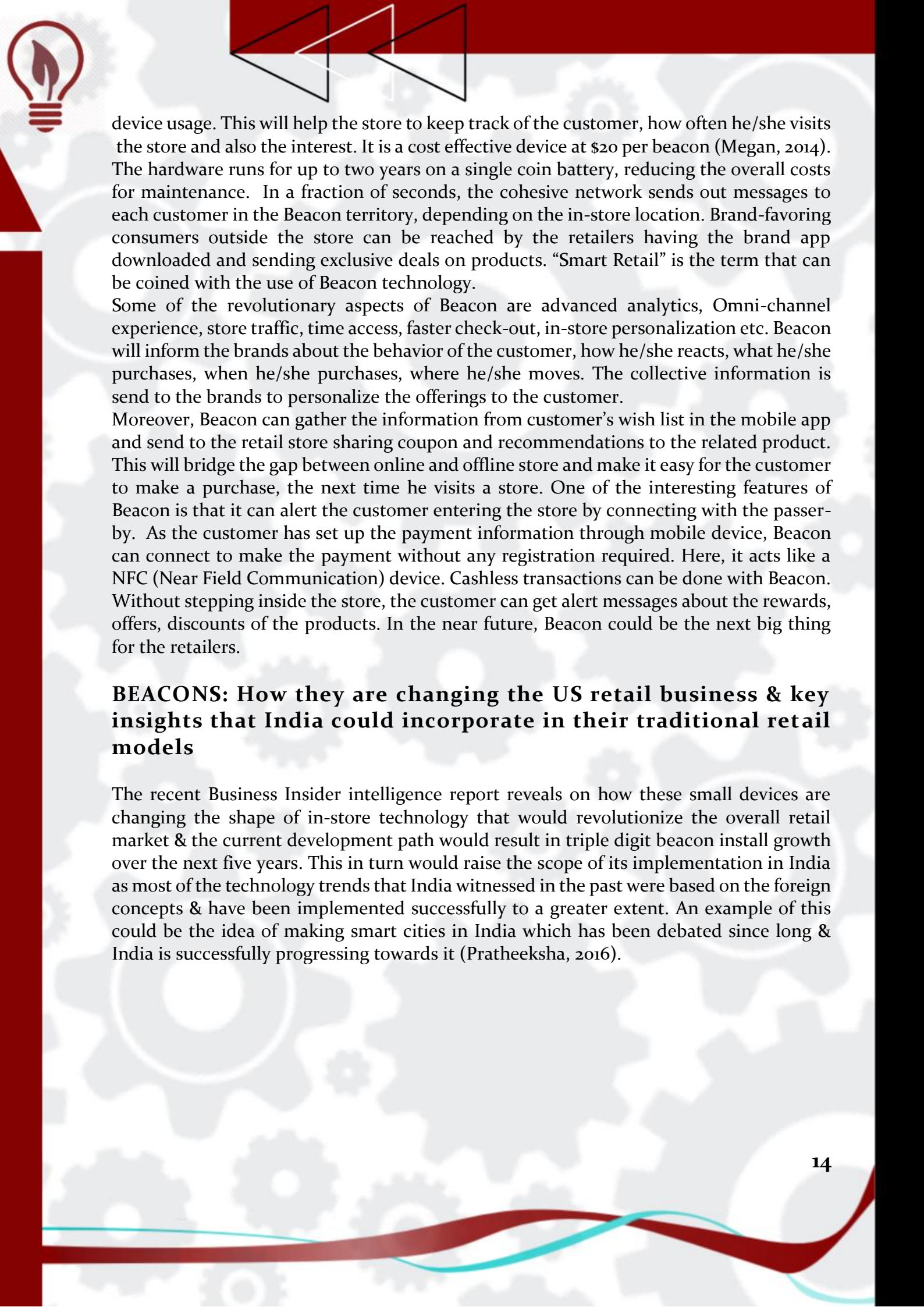
What Are Beacons?

Beacons are battery-powered, Bluetooth Low Energy (BLE) devices which work up to 50m (Mubaloo, 2013). They broadcast message in the smart gadgets that are Bluetooth enabled. They use geo tracking method in finding indoor services, notifications, promotions, etc. and a low frequency chip which is similar to the ones used in mobile devices that communicate with each other via BLE. The first to experiment this technology was Apple with the product iBeacon. For the pilot project, it was installed in iOS7 software, enabling push notifications to shoppers' mobile when they roamed through Apple stores. This innovative technology has the capability to connect in-store environments with the shoppers through smart gadgets.



Fig (1): Working of beacons (Radhika, 2015)

Smart device users can personalize recommendations and notifications inside brick and mortar stores, and thereby enhance the shopping experience resulting in growth of in-store traffic and sales. The Beacon technology opens up many opportunities like providing a convenient, specialized experience to “click and collect” customers. It can sync to customer's wish lists, by taking them to the accurate section of what they need. Also it can collect useful data of customer interests, behavior, amount of in-store visits and tracks



device usage. This will help the store to keep track of the customer, how often he/she visits the store and also the interest. It is a cost effective device at \$20 per beacon (Megan, 2014). The hardware runs for up to two years on a single coin battery, reducing the overall costs for maintenance. In a fraction of seconds, the cohesive network sends out messages to each customer in the Beacon territory, depending on the in-store location. Brand-favoring consumers outside the store can be reached by the retailers having the brand app downloaded and sending exclusive deals on products. “Smart Retail” is the term that can be coined with the use of Beacon technology.

Some of the revolutionary aspects of Beacon are advanced analytics, Omni-channel experience, store traffic, time access, faster check-out, in-store personalization etc. Beacon will inform the brands about the behavior of the customer, how he/she reacts, what he/she purchases, when he/she purchases, where he/she moves. The collective information is sent to the brands to personalize the offerings to the customer.

Moreover, Beacon can gather the information from customer’s wish list in the mobile app and send to the retail store sharing coupon and recommendations to the related product. This will bridge the gap between online and offline store and make it easy for the customer to make a purchase, the next time he visits a store. One of the interesting features of Beacon is that it can alert the customer entering the store by connecting with the passer-by. As the customer has set up the payment information through mobile device, Beacon can connect to make the payment without any registration required. Here, it acts like a NFC (Near Field Communication) device. Cashless transactions can be done with Beacon. Without stepping inside the store, the customer can get alert messages about the rewards, offers, discounts of the products. In the near future, Beacon could be the next big thing for the retailers.

BEACONS: How they are changing the US retail business & key insights that India could incorporate in their traditional retail models

The recent Business Insider intelligence report reveals on how these small devices are changing the shape of in-store technology that would revolutionize the overall retail market & the current development path would result in triple digit beacon install growth over the next five years. This in turn would raise the scope of its implementation in India as most of the technology trends that India witnessed in the past were based on the foreign concepts & have been implemented successfully to a greater extent. An example of this could be the idea of making smart cities in India which has been debated since long & India is successfully progressing towards it (Pratheeksha, 2016).

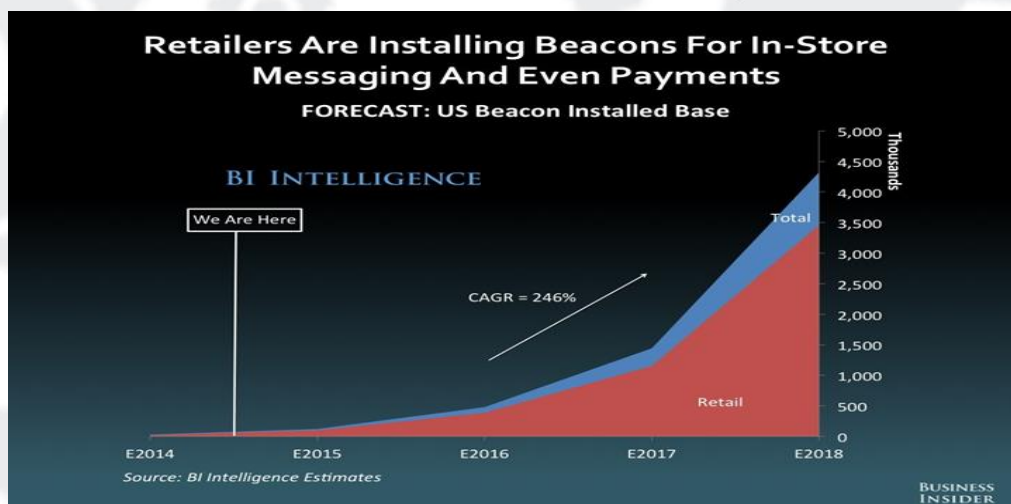


Fig (2): US beacon install base (Smith, Beacons, 2014)

As per the report, the growth in number of beacons installed is expected to be 4.5 million by the year 2018 of which 3.5 million is expected to be used by the retailers. They in turn can use it for the purpose of in-store messaging for shopping purposed as well as making payments in which the retailers can merge with third party payment merchants & integrate it to their mobile application.

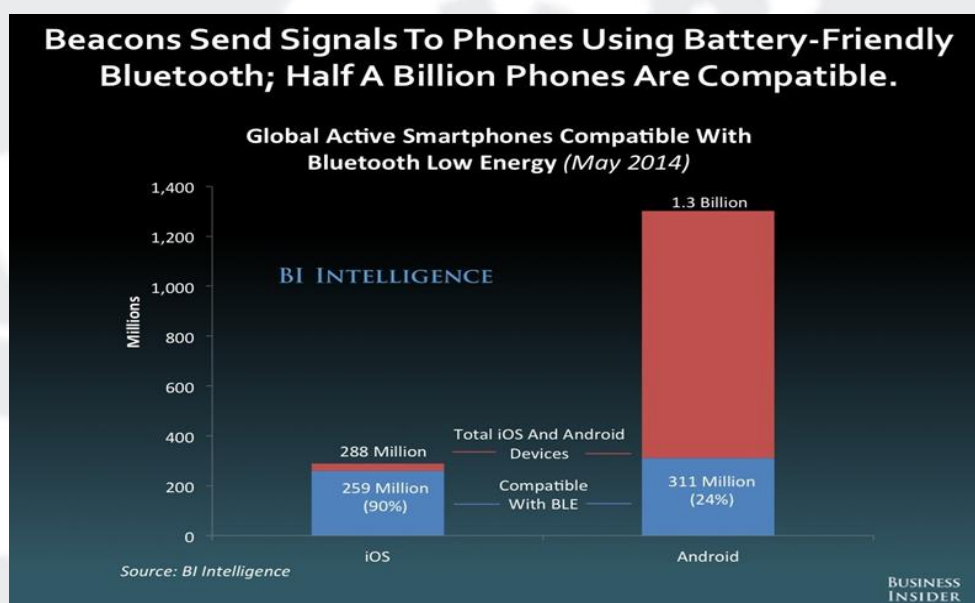


Fig (3): Smartphones compatible with the BLE

According to a report, it is estimated that globally 570 million Android & Apple smartphones will be compatible with the Bluetooth Low Energy (BLE), the signal emitted by the beacons to wake up the smartphone app. This number is equivalent to the one-third of the smartphone user base over the globe. The facility of enhancing the shopping experience for the customers using beacons is an add-on service provided by the retailers along with the traditional service offerings. Hence, customers may be reluctant in embracing the methodology as there are some minor security issues which can compromise the user data if hacked by someone. Also, at times it might be the case that the geo-location tracking can access the data if that feature is enabled by the user. **15**



But As Long As It's 'Opt-In' Rather Than 'Opt-Out' Consumers Seem Receptive

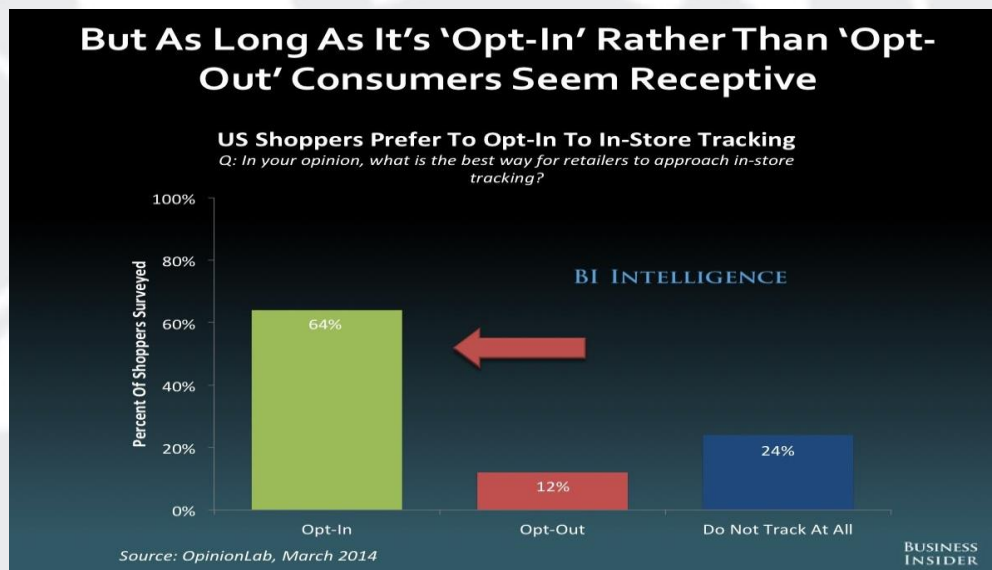


Fig (4): US shopper's preference for In-Store tracking

Nevertheless, most of the time this data is used by the retailers to analyse the user buying patterns & in turn help the retailers formulate the marketing & advertising strategies in future. As per the BI intelligence report (Smith, Beacons: The Humble, Low-Cost Device That Is Changing How Big Retail Chains Do Business, 2014), most of the US shoppers chose to access the beacon methodology as it helped them ease their overall shopping experience & ease in usage. Statistics show that 64% of the users opted for the in-store tracking as compared to 12% against it. It clearly indicates the fact that shoppers have built trust in their retailers in their service offerings which helps both the retailers & shoppers in achieving a collaborative goal.

Beacon Technology: Global companies which have incorporated the beacon technology in its portfolio

The \$10 device is attracting unique attention amongst companies of different domain. Companies from supermarket to software – all of them are leveraging the benefit of Beacon technology in order to make the shopping more useful & convenient for their customers. Surprisingly, even the non-retail companies are incorporating Beacon technology. Some of them are as mentioned in the table below: (LTP Team, 2014)



Company name	Company domain
American Eagle Outfitters	Clothing
Giant Eagle	Supermarket
Universal Music	Recording Studio
Gilbarco Veeder-Root	Business Development Service
Apple Stores	Retail Store
Macy Stores	Retail Store
Rubens House Museum	Museum
CES	Software
Exact Editions	Software

Table 1 – Companies using beacon technology

Beacon Technology: Indian Context

The scope of Beacon implementation in India has to happen in near future as the brick & mortar retail outlets are struggling to increase the customer base because of fierce competition from the online retailers (VIJAYAKUMAR, 2014). With the implementation of Beacon technology, these stores would definitely have an edge over the online players & it would eventually help in increasing the market share as well as the sales volume. Some of the primary reasons attributing to a definite future of Beacon technology are as follows:

- The smart phone penetration is increasing tremendously with over 200 million smartphone users currently (India to overtake US in smartphones by 2016, 2016).
- The android market share in India is close to 70% (Market share held by mobile operating systems in India from January 2012 to June 2016, 2016) which is a boon to retail industry & by leveraging this user base, wide scope of opportunities exist for the Indian retailers which could take their business to greater heights. Also it is estimated that India can overtake the US as the second largest smartphone market & hence offer new development opportunities in the retail sector.
- As the beacon technology is already prevalent in most of the foreign countries & many of the foreign brands have already entered into the local malls, these brands would not hold back seeing its potential in India.
- With the emergence of smart cities in India & the integration of technology platforms like IoT & Big Data, the beacon technology can leverage these platforms & can be a major driver for smart cities in various sectors & especially retail. Some of the key players who have shown willingness to be a part of this initiative in Beacon technology are Bfonics, Beacon stream & Mobstac.



Beacon Technology: Case Example- India

One of the finest examples of its success story is the deployment of beacons to create an IoT enabled shopping district by a Bangalore (DQINDIA, 2015) based start-up in which Interaction One has partnered with Virtuous Retail. In this flagship development, 300 beacons have been deployed across the centre which would in turn help in enhancing the overall shopping experience.

The company – Interaction One has come up with a mobile application called Mobmerry which interfaces retailers to the customers. The application allows the retailers to have a comprehensive interaction with the customers with services like real-time push notifications of new products, deals & offers & discounts in the consumers' surrounding areas.

Some of the key highlights of the application powered by the beacon technology can be summarized as below:

- The application allows the customers to receive personalized offers in food & product categories for example & help them virtually explore the city based on these services on real time basis.
- The location of the customer is identified on the real time basis & they can be driven to a particular store in case a person is unable to locate a store or show them the nearby stores based on his/her preferences.
- The detail of a particular store is immediately disclosed as soon as he/she is in the proximity of that beacon so as to notify the person about the offerings by the store.

The centre of attraction before designing this application was the customer. However shopping experiences have changed & the retailers can't wait for customers to come to them. Instead, they need to showcase their products to them so as to attract the pool of shoppers. The target customer kept in mind is one with an average income & basic understanding about the smartphones.

Conclusion

After the indoor positioning with Wi-Fi, beacon technology is the next revolutionizing step for the Omni channel presence in retail as it would allow for background positioning & detection – giving new power to the mobile phone making it literally 'smart'. Incorporation of this technology will result in wonders for retailers especially in India as the concept is in its nascent stage & the growth in terms of numbers would be enormous for retailers & also beneficial for the customers in multiple ways.

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LEVERAGING ON THE BENEFITS OF AN AWS DIRECT CONNECT WITH AN ENTERPRISE LOCATION SPACE

Arnab Mohapatra, Abhishek Sapra

Abstract

This paper is aimed at exploring the benefits of an AWS Direct Connect in India where the IT has become an indispensable part of the business. Huge amount of data is being pumped into the cloud space. AWS Direct Connect, in this case becomes a strategic fit, helping firms associated with the IoT Industry and the ICT Sector to optimize on operational expenditures while exploiting the enterprise insights derived from the use of this service. This paper provides an understanding of how firms can make use of the Direct Connect to help convert their metadata into useful business insights.

Keywords: AWS Direct Connect, Tire IV Data Center, Co-location

Introduction

The Amazon Web Services Direct Connect provides an alternative pathway to gain accessibly to the Amazon Web Services without making use of the internet. This in turn makes the Network Service very secure as the transmission of data is not done through a Wide Area Network like the Internet. The Data gets delivered through a private connection that is created between the collocation space and the corporate network. AWS may come in handy for both IT Start-ups as well as the big giants. Optimization of resources has been a major concern for the IT Firms and is often a point of debate between the IT Department and the Finance Department of a particular firm. This is where AWS Direct Connect strategically fits in. Private Network connections have been known to reduce costs and increase bandwidth without hampering the network experience, which is at par or even better, when compared with the Internet.

Benefits of Using AWS Direct Connect

Many IT Companies have been making use of AWS Services because of the numerous benefits that it provides and Direct Connect acts like a catalyst, enhancing the experience of the firm making use of the Services. For example, a Firm using an Amazon Elastic Compute Cloud (EC₂), Amazon Virtual Private Cloud (VPC), Amazon Simple Storage Service (S₃) or an Amazon DynamoDB can bundle its Services on the Direct Connect and derive useful insights on enterprise governance while significantly reducing costs and saving on bandwidth.

Secondly, two or more Virtual Interfaces can be clubbed on a single Direct Connect, may it be a VPC using a private IP Space or Services on a Public IP Space like the EC₂ or the S₃. Lastly, the service can be used even if an enterprise's network is not present in the AWS Location. In such a case accessibility can be provided by connecting through Amazon's APN Partners. These APN Partners can help a firm's pre-existing Data Center's or the in-house facility to connect with the Service.



GPX India Private Ltd. has partnered with Airtel, Colt Technology Services Co., Ltd., Global Cloud Xchange, Hutchison Global Communications, Sify and Tata Communications to provide for direct connect services in Asia Pacific Locations with its point of presence at Singapore.

How does AWS Direct Connect Work?

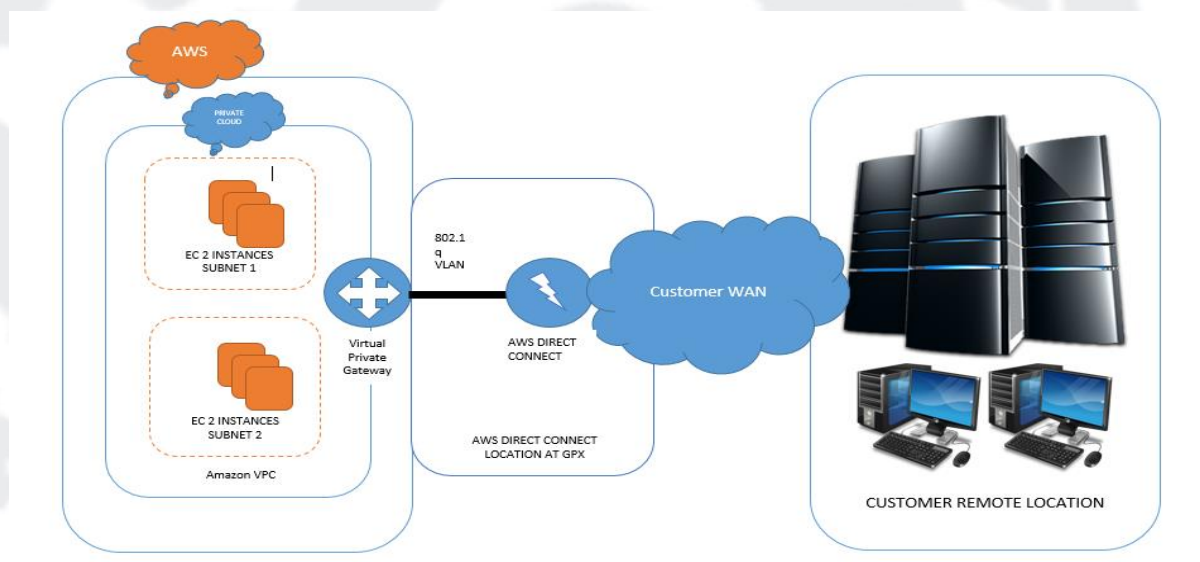


Figure 1: AWS Connectivity to Customer Remote Location

The 7 Simple steps that help one to get connected to an AWS Direct Connect Location are:

- Step 1: Sign Up for Amazon Web Services
- Step 2: Submit AWS Direct Connect Connection Request
- Step 3: Complete the Cross Connect
- Step 4: Configure Redundant Connections with AWS Direct Connect
- Step 5: Create a Virtual Interface
- Step 6: Download Router Configuration
- Step 7: Verify Your Virtual Interface

GPX India Pvt Ltd. is the only Data Centre in Entire India that provides for AWS Direct Connect Services. Apart from being a “State-of-the-art” Data Centre with its architecture Certified as Tier-IV by the Uptime Institute, its Direct Connect Services ensure a secure dedicated connection to its clients.

Insights for IOT Companies

IoT Companies are picking up fast in India and have been responsible for generating lots of Real Time and Unstructured data which needs to be converted into business insights much required for formed decision making.



AWS Direct Connect helps in providing businesses:

- i. Ways to move mission critical business data traffic and providing various ways to work with large data sets.
- ii. Constant latency to improve the experience of audio and video content from applications, making use of real time data feeds.
- iii. Satisfying regulatory requirements by creating a hybrid environment that provides for both elasticity and economy of use.

Benefits to Companies in the field of Tele-Medicine

Most Cloud Based Medical companies for insights on analytics have preferred the use of AWS to others for its security of interaction with the management interface. E.g. Amazon API Access Keys and X.509 Certificates can easily be accessed using the secure methods of transaction.

For Speeding up research and breaking down data into useful information and for offering flexibility in the private IP Space, AWS Direct Connect provides for 1 GB and 10GB Ethernet links which have increasingly become an attraction for pharmacies which are moving to “medicine over cloud”. Since Medical data is highly mission critical, AWS Direct Connect can become a good solution for backing up the enterprise data.

Advantages to Digital Marketing Firms

Digital marketing firms are said to be the backbone for organizational promotions. Search Engine Optimizations, E-Mail Marketing, Social Media Marketing are platforms that have changed the way marketing is looked at, these days. But these platforms can become cluttered unless and until the products and services have been positioned as a proper target market and segment.

Digital marketing firms for strategy formation and planning are dependent on Predictive and Descriptive analytics for informed decision making. It is important that these companies transmit their data over a secured network rather than taking them over the public internet. Though it may not be advisable for the company to invest heavily in building an on-premises data centers, they can always have the option of collocating with a Data Center that provides an SLA of 99.999% Uptime and Near Zero down Time.

GPX's supportive collocation spaces with the necessary infrastructure in place are always in a state to provide for a strong framework that can support the business motives.

Most Digital Marketing firms use AWS Services but over the internet. A better way of making use of these services would certainly be through a direct connect, which, in turn would give the company a dedicated connection to harp on, save bandwidth and optimize the IT Resources.



Capturing the Needs of the E-Commerce and the Internet Centric Companies

E-Commerce in India has seen an exponential growth. Reports suggest that that the E-Commerce sales will be valued at \$24.61 billion in the Year 2016. The Sales have risen from \$6.1 billion in 2014 to \$14 billion in 2015.

Factors that have been driving E-Commerce Sales are:

1. The Number of Digital Buyers in India has doubled.
2. The Average B2C E-Commerce spend per online shopper in India is on the rise.
3. The Online Retail Sales have also risen by \$5 billion from 2014 to 2015 .

More Sales would mean a stronger infrastructure to support the demand. It is advisable for E-Commerce companies that they shift their focus from investing in capacity intensive data centers to core competencies like customer acquisitions.

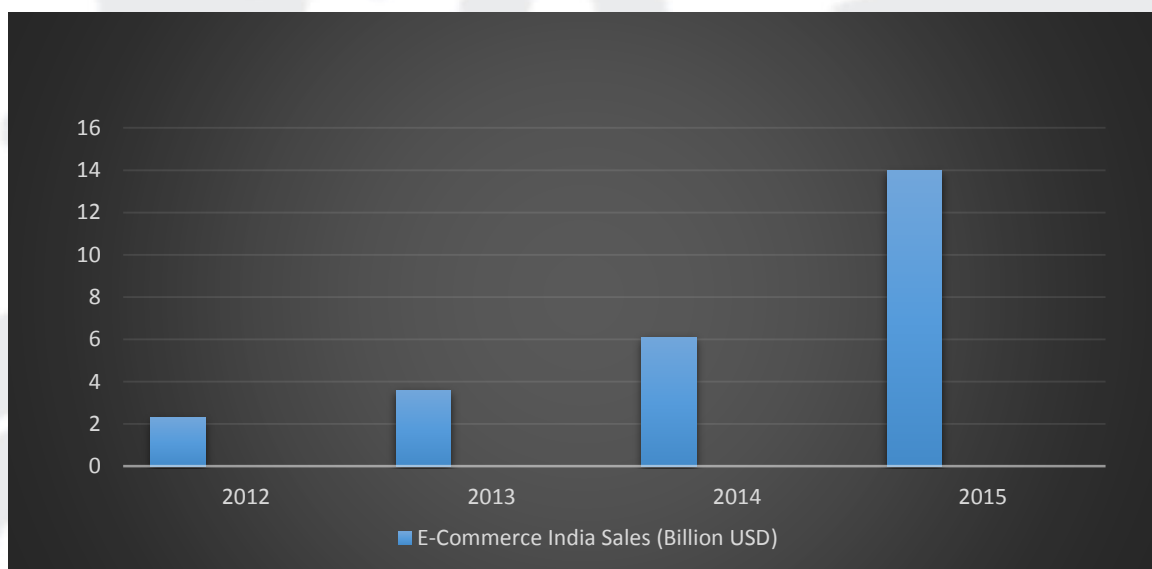


Fig 2: Ecommerce India Sales

Benefits to Manufacturing Companies

Generally, the nature of data that manufacturing companies have is enterprise and classified. Interviews have suggested that some manufacturing firms can afford a few hours of downtime owing to the fact that a major chunk of the data they generate may be of importance but not necessarily very urgent. Their priorities are focused on the security of their data plus the network quality with which they can manage it.



Another trend in this industry is the realization of the importance of a disaster recovery site. Although not a new concept but it has taken time to flourish in each firm. Moreover, there can be significant advantages to those firms who are already using AWS. Keeping in mind all the above points, the following is the mapping of AWS direct connect offering v/s the requirement for this sector:

<u>AWS DC Offering</u>	<u>Push to firm</u>
Dedicated and secured connection to AWS	Data Security
Improved latency and connectivity	Network quality
DR site can be maintained via a simple CAT 6 connection	Disaster recovery
No need to be present in AWS location, plus very nominal switching costs	Ease of switching

Conclusion

AWS Direct connect is a unique business offering by Amazon to enhance the value propositions of Amazon Web Services. Apart from providing flexibility to end users, it also addresses their security concerns. Amazon's "pay per use" policy makes this business offering, all the more attractive.

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SYNOPSIS OF THE INDIAN E-COMMERCE SPACE AND ITS FUTURE PROSPECTS

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Abstract

This paper takes a comprehensive view of the Indian E-commerce Industry and the factors that have promoted its growth in a place where the network infrastructure and mobile network penetration is limited. It also aims to predict the future of such online market places and how they can affect a common person's life. The Indian online business and E-commerce industry has been on a roll ever since the emergence of online market places like Flipkart and Amazon. The buzz around all these online market places keeps on increasing as more and more subscribers are now getting added to this endless network of connected devices. The online business industry or the E-commerce industry in India is set to witness another year of growth as the valuation is predicted to be around \$38 billion in the year 2016 and with big time players like Amazon pouring in billions into the existing market, things are only going to get better.

Keywords: Online marketplaces, Tech startups, FDI, Digital India, Mobile network penetration, Gross merchandise value, GST, Digital platforms

Introduction to E-commerce industry

India registered an internet user base of around 350 million as of June'15 and expects to cross 500 million by the end of 2016. In spite of having the second-largest user base in the world, only behind China (652 million), the penetration of e-commerce is less when compared to more developed markets like the United States or France.

E-Commerce is not limited to online market places and online retail like Flipkart, Amazon, Bigbasket, etc. It also includes online travel ticketing, online deals and classified listings. Also there are a huge number of job portals now coming up online like monster.com, naukri.com, etc. Online places to buy, sell or rent goods or properties are now coming up. Top online businesses other than retail include travel, property, matrimonial sites, cabs on demand, movie ticketing, restaurant locator, etc. Examples of these are Makemytrip.com, Redbus, Paytm, MagicBricks.com, Bookmyshow, Ola, Zomato, Shadi.com etc.

Key drivers of E-commerce

- The increasing number of people across the country now joining the internet by subscribing to 3G services.
- The introduction of 4G networks will enable faster transactions, ability to scroll through large range of products in lesser times, quick payments and confirmations,



less cancellations and network errors, reduction in perceived risks regarding online payments and transactions. This will also ensure quick launch of online stores and round the clock availability.

- The Rampant growth of Smart phones having 3G/4G capabilities in India that will promote M- commerce as an important platform for online businesses.
- The big billion sales and jaw dropping discounts on most online stores are attracting more and more attention from smart phone users and almost everyone on the internet.
- Evolution of variety of innovative online startups that have opened doors to activities that are not possible using the brick and mortar stores. E.g. OLA cabs, OLX etc.
- The huge funding that many E-commerce players have received and continue to receive.

A Brief History of Online Businesses

It all started in 1991 when internet became commercially available. Since then thousands of e-businesses have took off around the world and in India and those already having the "brick and mortar" store have started going online to increase the visibility and sales of their product.

The internet then started becoming popular in general public in 1994 and in the next 4 years security protocols like HTTP and DSL were developed which permitted rapid access and a continuous connection to the internet. By the year 2000, a large number of businesses in US and Europe began their services over the World Wide Web. Online retail also gained popularity slowly and steadily in this period.

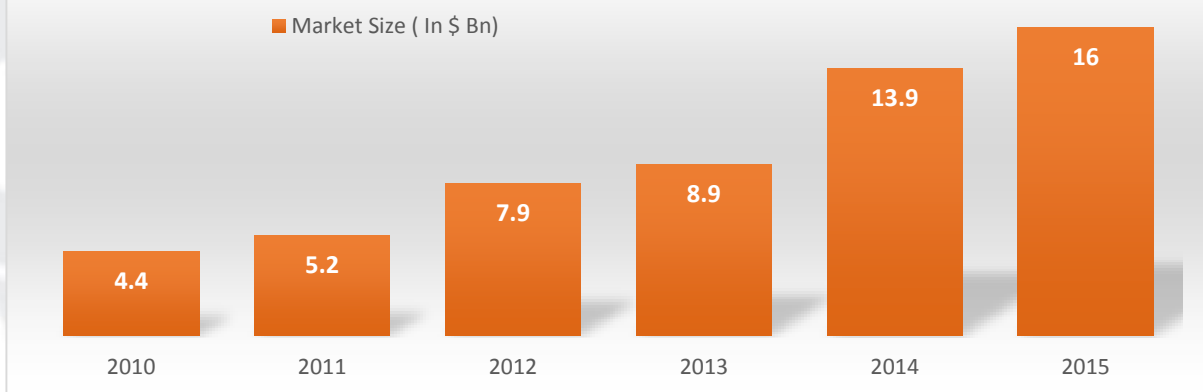
India's first interaction with E-Commerce was made in 2002 when the Indian Railways experimented its online strategy to provide public the ease of booking tickets without having the need to stand in long queues. This was made possible on the IRCTC website which was then predominantly used for booking train tickets as opposed to a variety of other things that it is used for today.

The IRCTC success led to rise in online ticketing and now various airline operators began online ticket booking to make hay while the sun shines! The online ticketing was started by Air Deccan, Indian airlines, Spice jet to name a few in the aviation domain. This increased the number of users using E-commerce platform and gave e-commerce wide scale popularity.

In 2007, When Flipkart was introduced, people were greeted by huge discounts and price cuts across various consumer goods. This gave online shopping tremendous popularity as a concept and people started using it to save money and buy across a huge range of products. Post this, online retail businesses became hugely popular and companies like Amazon, Jabong started viewing India as one of the target destinations for setting up their online retail businesses.



THE ECOMMERCE INDUSTRY IN INDIA



A look at the Present Status

Today, online shopping has become a regular norm with more and more online businesses coming up every day and offering something new and innovative to the customers. The companies like Flipkart, Amazon and Snapdeal have cemented their place in the lives of many customers. The Gross merchandise value of these online market places is ever increasing. According to a report in Economic Times, India received a whopping \$6.6 billion in venture capital and private equity investment in the year 2015. This was a 50% increase from the previous year which was probably the reason why there was a steep growth in Gross Merchandise Value for E-commerce companies.

Morgan Stanley in a report said that the GMV of the country's leading 3 E-commerce firms have exceeded that of the leading 10 offline retail business firms the previous year and that the Indian market has great potential and large number of opportunities that will attract huge investments from global investors.

Following the steep rise in Venture capital investments, Morgan Stanley in a report, increased its 2020 estimate of Indian E-commerce market to \$119 billion from \$102 billion and also estimated the total internet market to be at \$159 billion. It also said that India will be the fastest growing E-commerce Market in next 3 years. The combined share of the top 3 E-commerce retail platform players namely Flipkart, Amazon and Snapdeal was 83% in 2015.

The Crisis Period

The big players of Indian E-commerce industry have been subjected to stress like any other business in maintaining market share as well as in making profits. Seeing the huge potential of E-commerce players in India like Flipkart and Amazon, many investors have put in billions of dollars into these companies. The market for these companies is ever



increasing but the point of concern is the profits that Flipkart and similar players like Snapdeal are making. These investors are now putting pressure on the firms to have better control on their operations, logistics and slash discounts to increase overall revenues and profits. The market has no signs of dipping but the companies are now in need of new investors especially Flipkart and Snapdeal who face tough competition from Amazon who is a global player and has been making profits globally.

Flipkart has been in the forefront when it comes to market share and total customers using its service and according to media reports, has been able to raise close to \$1.4 Billion. But in recent times investors are wary of investing due to uncertainty around soaring valuations of privately funded tech start-ups. Snapdeal, on the other hand who has been successful in attracting investors like Japanese Giant SoftBank and Alibaba at Ontario Teacher's pension plan Funding in February, 2016 saw a lot of existing investors sell off their shares. A lot of money raised in that funding went to these investors.

Government's initiatives towards E-commerce

In recent times, Indian businessmen have been continually reading reports on the government's attempts to market local production and creation of start-ups. For most folks who are first time entrepreneurs, these are incredibly encouraging signs. Although these are positive signs but on the other hand, the nationwide government legislations and rules belies the optimism we experience about these ambitious programs. In the area that e-businesses operate, the existing policy regulations for e-commerce are almost contradictory to intended government objectives.

The Entire Eco-system around E-commerce sector will be impacted greatly by the growth of this sector. To keep up with this pace the E-commerce firms will need investments amounting to \$25 billion in the coming 5 years in order to satiate the exponentially rising demand of storage and warehousing, logistics, datacenters, customer relationship management, technical improvements, Delivery mechanism and finding ways for shorter time to deliver products etc. This would directly result in creation of close to 7,00,000 jobs and a lot many indirectly. The growth of this sector hence becomes very valuable for the government of a country like India.

Since a large portion of these investments would come through Foreign Direct Investment, allowing a higher percentage of FDI in this sector will allow the E-commerce industry to grow naturally and achieve its full potential. The recently launched "Make in India" initiative by the government of India focuses on manufacturing of electronics and goods in India and bolstering the manufacturing sector, is also dependent on government's policies on FDI. The "Make in India" policy, the FDI policy and the online businesses are all correlated. The growth of E-commerce sector has allowed many new brands to sell exclusively through online platforms and gain popularity. The Make in India initiative along with large percentage of FDI and growing popularity of brands on E-commerce platforms will now encourage companies to manufacture these products in India. For instance, Xiaomi is now setting up its plant and Data Center in India after its huge success on sale of smart phones through E-commerce platforms hence the government's initiatives are set to create a win-win situation for both, the Ecommerce sector and the Government's long term objectives of these initiatives.



Start-up India

The E-commerce industry may be burgeoning at first sight but on having a closer look at the industry, we realize the truth. There are still many small to medium sized e-businesses that are either getting eaten up by large fishes or are succumbing to severe pressure due to cash and funding needs, regulatory policies and starting troubles and others to name a few. These are the issues that make people over cautious and usually create fear in the minds of those thinking of starting a venture. Hence, the new initiative of government namely "Startup India" emphasizes on removal of hassles and anxiety of existence that new startups face today.

Some of the notable features of this campaign that directly or indirectly affect the E-commerce industry are:

- A total of \$100 billion has been reserved for this purpose.
- There will be single window clearances and mobile applications can be used for the same.
- 80% Reduction in patent registration fee, Tax Exemption from capital gains for 3 years, no Taxes on Profits for 3 years.
- Tailor made Bankruptcy and Insolvency codes that ensure a 90-days Exit Window in case the startup fails.
- Wiping out Red-Tapism.

This new step from the government towards the betterment of young entrepreneurs can boost the spirits of those who wish to start on their own. If the entire environment around such startups becomes supportive and business friendly with large opportunities to compete, these new businesses including those online can do a lot more than just surviving and this can also bring about growth in the supplementary ecommerce businesses. These include, but are not limited to logistics, packaging, warehousing, content marketing and more. In this way, not only the mainstream industry players like online retail stores and marketplaces but also the supplementary and complementary E-commerce industry players can start flourishing.

Digital India

This initiative will directly affect E-commerce players as it is obvious with the name of the initiative itself. Online businesses are built over digital platforms and making digital platforms prevalent and widespread for providing a variety of solutions is what the government aims to achieve by this initiative. The idea here is simple and straightforward and that of increasing the number of people on the internet. The increase in number of people will directly affect the E-commerce business and now more number of people will be exposed to their services.

The main purpose of the Digital India initiative is to empower a mobile user with large scale capabilities by providing him easy access to internet. Currently the internet user penetration in India stands at 34.8 % which proves there is huge scope for growth. Once



the project is underway, the government will disburse services via mobile phone connectivity and this will result in high speed internet and broadband facilities available to people in remote and distant corners of the country. This will enhance and enlarge the E-commerce reach and result in expansion of market size.

Under the same Project, the Government of India is also making reforms in India Post to make it a distribution channel for E-commerce services and other related services. The Rural part of the country will be targeted to provide connectivity and hence the E-commerce will be able to reach up to tier 4 cities. The overall efficiency and effectiveness of delivery services and cash transactions in such areas will also be improved.

Impact of GST Bill

In India, there are different states which levy different taxes on products which affect the sellers in many ways. If there is a common Goods and Service Tax irrespective of the state then it would be beneficial to sellers as well as for those linked to the Ecommerce Industry. Vijay Shekhar Sharma, CEO of Alibaba backed Paytm said that "Lack of clarity and difficulty in compliance has led to companies such as Paytm stopping delivery in crucial markets such as Noida and Ghaziabad".

The government has been contradicting itself in terms of the initiatives it has taken and the regulations that are in place currently. GST will help the small and big E-commerce players to have uniformity in tax rates and regulations across the country. This by the nature of it will invariably help in achieving ease of doing business in India and allow free-play to market dynamics and deeper penetration of their services.

Impact of E-commerce Proliferation

E-commerce has also been appreciated by people around the globe for its ability to provide countries with stronger foothold in the multilateral trade around the world. It enables a country's economy to benefit more out of trade. E-commerce is different to traditional businesses where we require physical space to have the physical products in display and also to store things. In this there is no requirement of storage space or physical infrastructure and hence the investment costs are cut down substantially.

Since E-commerce sites are internet based, these businesses have as much access to internet space as bigger multinational players.

As customers to various Ecommerce businesses we have our own advantages as well as disadvantages of using such platforms to shop online. Some of them are - Variety of goods, services available, convenience and ease of access, commodities available at discounted rates, free delivery on many items, cash on delivery option available, purchases and transactions can be clubbed with many offers to avail cashbacks and other benefits, etc. On the flip side of this, there are still issues which can cause severe inconvenience and difficulties to customers like dubious security regulations, reception of faulty product, concerns regarding exchange and returning of certain products, authenticity of certain site and their products, hidden charges and payment related concerns.

Conclusion

The Ecommerce sector in India is at an all-time high when it comes to growth and opportunities. Also the government has been proactively



trying its level best to improve the internet user penetration in the country and make broadband internet access available to every nook and corner of the country.

While the projects like Startup India, Digital India and Make in India will collectively help in making E-businesses reach a large section of the society, a lot still needs to be done in terms of regulations and ease of starting a business. Without these regulations which are in line with the new policies and projects of the government, the intended objectives will be hard to achieve.

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SYNERGY DRIVEN BUSINESS CONSOLIDATION

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Abstract

Businesses around the world work on the principles of collaborations. These collaborations can be best worked out when there is a proper amount of synergy between the two collaborating parties. Synergies refer to improving quality, growth opportunities and capital benefits when worked in collaborations. A correct projection of synergies is needed to produce a successful transaction. This research paper aims to analyze synergies in regards to mergers and acquisitions, the success and failure rates, a study of qualitative and quantitative factors that impact the synergies of both the acquired and merged. This paper also aims in studying the synergy on various categories across various domains with pin pointed results and analysis, and what steps could have possibly been taken to evolve from critical break points.

Keywords: Synergy, Global, V-Four model, Consolidation, Companies, Tata, Telecom, Synergy biases, Synergy Constructor, Synergy Destructor, M&A

Introduction

'Barter system' is the thing of the past, but its spirit is not. History has redefined barter system to greater context in today's world. Barter was used for survival of the clans across the world; today we call it 'Synergy' for businesses. *"Synergy -The bonus that is achieved when things work together harmoniously"*-Mark Twain. *"The interaction or cooperation of two or more organizations, substances, or other agents to produce a combined effect greater than the sum of their separate effects"*-Cambridge.org. Simply put-'Charlie and Ana enjoy working together on group projects, because their synergy produces great work that always receives good marks.'

Synergy Constructors:

Synergy plays a major role in mergers and acquisitions (M&A) of a company for its success or failure. Research shows that such M&A creates value for the company. Shareholders benefit if a company's share price increases due to the synergistic effect of the deal. If two firms fuse together, they may be able to use greater powers to negotiate cheap prices from suppliers, or to demand better gains from their distributors.

Synergy Destructors:

There is other side of the coin as well -Around 50% of the companies that are involved in such M&A fail due to lack of synergy. Acquisitions nearly always involve the downsizing of duplicates in the two businesses. For example, if a publicly-quoted firm is taken by another firm, there is no need for both firms to retain their full senior management in operation. There only needs to be one man who plays all roles. The cost optimization gives a herculean effect over all levels of senior management.



The Negative aspect of synergy of businesses-synergy biases

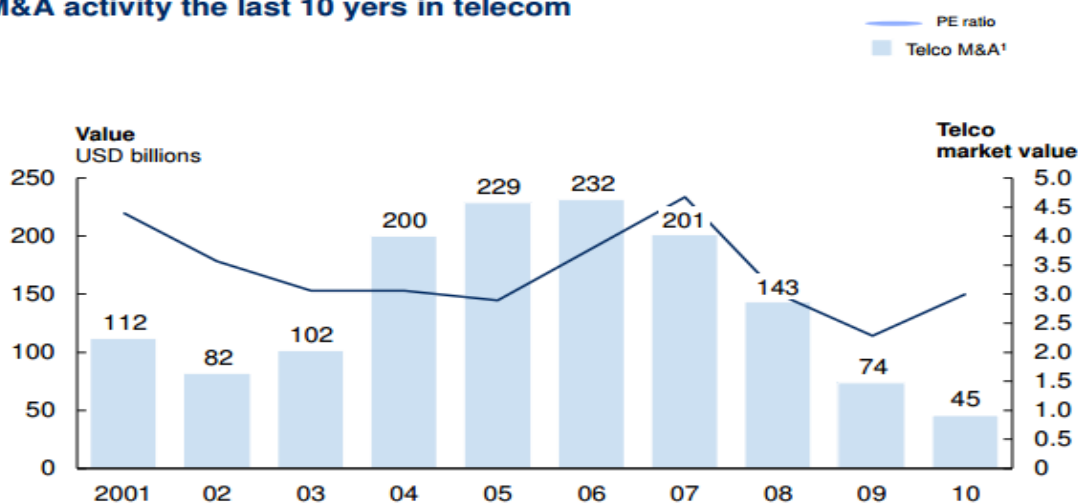
Managers around the world strive to gain synergy for maximizing profits; this works sometimes, but often leads to addiction. Striving desperately to gain more profits can adversely affect the wellbeing of a strong company. M&A fails when too many smart individuals come together and produce bad results in desperate search of only profits from synergy. This could be due to incorrect strategy applied, inefficient commitments or poorly operational functional business joints. This is the major reason why 4 out of 10 mergers or acquisitions fail.

The best example suited for such case is Bank of America and Merrill Lynch merger in 2008-09. This was when Lehman Brothers were under severe liquidity pressure. The merger that was anticipated to be worth 2.2 trillion dollars failed post-merger, Merrill Lynch shares were sold at 61% discount. Major reasons quoted later were due to lack of synergy that included lack of communication, honesty, leadership goals improperly communicated and delay in taking early decisions. Internal mails released later said that Bank of America was threatened with the sackings of the management. The major lesson that can be learnt from this case is taking timely decisions and communicating the same across organization.

Applying synergy in Telecom

Studies have revealed that synergy in business helps in funding more than 50 % of the purchase price as well the synergy with less amount of importance is equally benefitted by the host. Telecom M&A reached a pinnacle in the last ten years in the stint of 2004-07, hence initiating the industry valuations.

M&A activity the last 10 years in telecom



¹ Based on completed deals where acquirers are telecom service players and which have disclosed deal values greater than USD 25 Mn; year as per announcement date

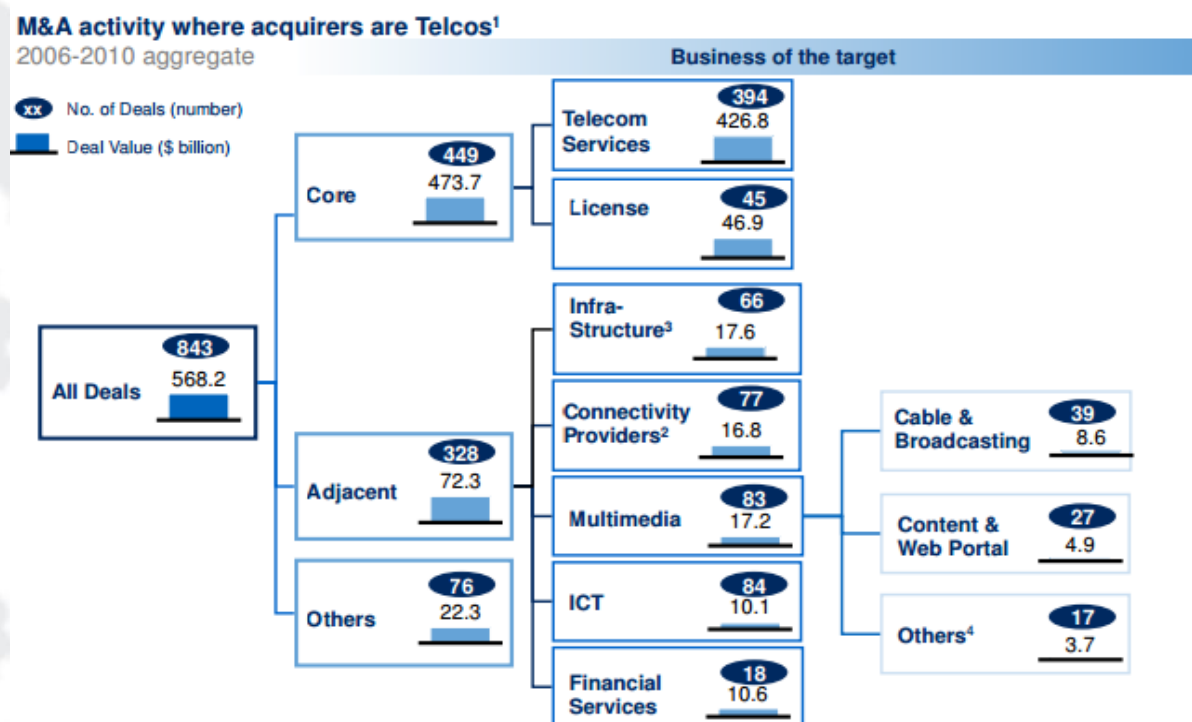
SOURCE: Dealogic



Global market analysis for Mergers and Acquisitions in telecom domain

Mergers and Acquisitions in Telecom domain had reached its peak in 2005-06 due to increasing M&A in European and US markets, Post that in 2007 the global markets experienced stagnancy due to external factors such as global recession and a slow growth in subscriber base. However in 2009 the European and US players entered the Asian markets and identified the potential of future investments as how M&A have efficiently worked out for them.

The majority of deal value have been in core markets



¹ Based on completed deals where acquirers are telecom service players and which have disclosed deal values-USD 5 mn
² Independent ISPs and broadband service providers ³ Network equipment & services ⁴ Advertising, Directory services, Entertainment etc.,

SOURCE: Dealogic, McKinsey Analysis

From the diagram its evident that most of the chunk for synergies has been weaned from the core sector, the share of deals in core sector is 53.26%, and the number of deals in others and adjacent accounts to 47.91%, telecom services and license being the major contributor, telecom accounts for 394 out of the 449 deals and that of license are 45, the Infrastructure, Multimedia, ICT are relatively on the lower side, hence the core sector can be said to be a major part of competency.

A forward leap in Synergy

Bharti Airtel is said to be in its introductory stage of discussion with Tata Teleservices. Also there can be amalgamation between the telecom business heads Mukesh and Anil Ambani. The synergy between these players is considered in various fronts.

Bharti group and Tata Teleservices together have 3G licenses in 19 out of 22 circles. So

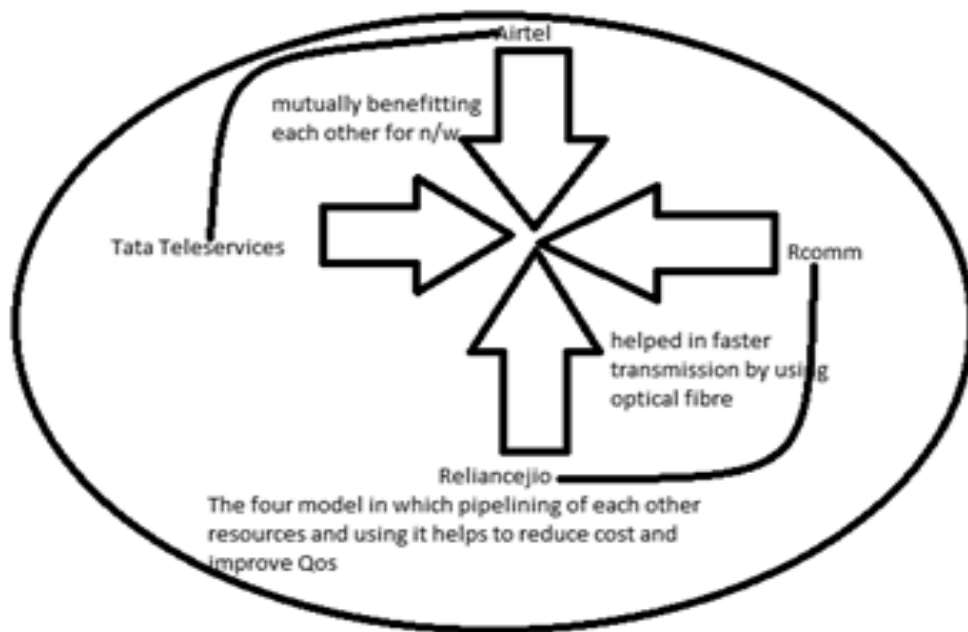


sharing of technologies will surely help in reducing traffic and advancing each other in terms of resources and a better network for connected devices. The various sectors in which Reliance Jio and RCom could work as one are roaming across India, Infrastructure sharing and Spectrum sharing. Bharti Airtel had acquired 800 MHz spectrum in the last auction and the alliance would be helping Tata Teleservices to filling the gaps, also fusing of 800 MHz CDMA networks and deploying it with LTE on 2300 MHz is fast evolving as an effective resolution.

A lot of communication chips are leveraging upon chips so networked devices apart from mobile phones, may help enhancing 4G network by deploying it on 800 MHz also leading to decongestion. Also some issues pertaining with Tata Teleservices needs to be addressed like the pending regulations on spectrum sharing and trading, so Bharti Airtel would take into consideration the future prospects before forming an alliance with Tata so as to reduce the risk of Tata being a challenger rather than a contributor. The four group synergy would set an example for the telecom industry as how to consolidate business by synergies and cost cutting methods, efficient solving of issues mutually and improving the QoS provided to the customers. The consolidation in the market in the near future has to happen in the form of sharing, partaking and contributing to each other if not from synergies or mergers and acquisitions.

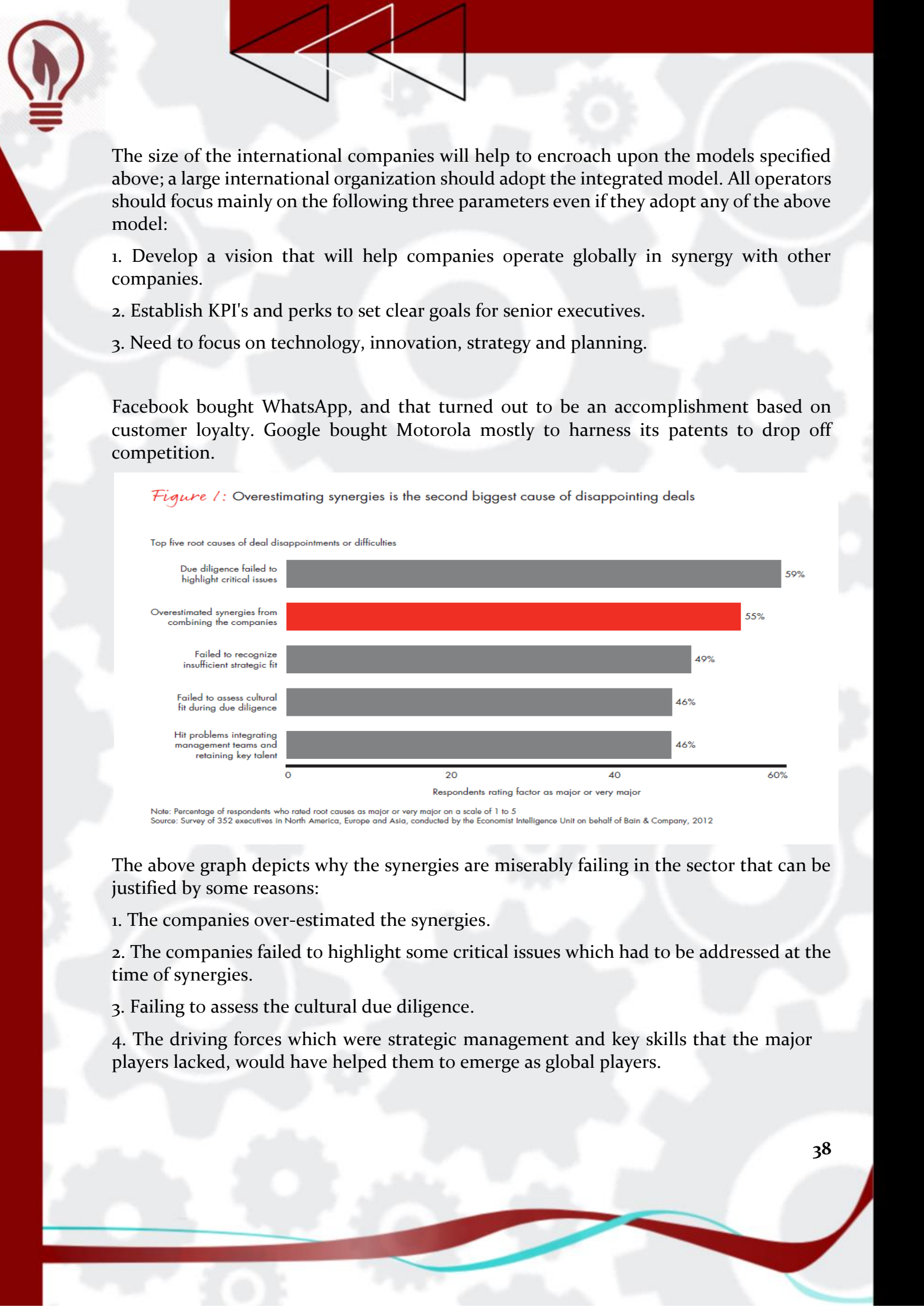
A Solution based approach – The V-four model

V-four group model (Model driven industry in broader terms)-The model can be applied to the telecom industries where the four groups can be from different domains of service. The recent synergy of Bharti Airtel and Tata Teleservices in forefront with Reliance Jio and Reliance Communications which can consolidate to produce the required services and reduce the congestion and increase QoS along with cost efficient solutions so that all the groups are leveraged, and hence the customers are benefitted. *“The telecom operators that evolved successfully into remunerative, well-functioning global giants focused on building the right organizational model to manage their slouching operations in different countries and, at the same time, developed governance and operating models to grip scale and realize synergies.”* said Goussous. Synergy programs within successful global operators have evolved in abrupt with the evolution of the overall organization.



Synergy is typically divided in three stages:

- **Ad-hoc synergy model:** This synergy model lacks the basic foundation required to carry on the process, they have a basic operational level and a set of undefined model to carry on the process between the holding companies. The basis of this model lies in the efficiency of one of the targeted firms and if the synergy fails, there is no assurance for the company to succeed.
- **Collaborative approach:** This model can be related to a startup which now looks to expand and establish relationship with Global players at the C-suite level. When the global chassis is not established enough to give a push to such startups, the global companies often create a shell for such companies for effective execution. Thus the emerging startups can benefit hugely from such model while improving on its own core sectors.
- **Fully integrated:** This model best describes the global players which are fully integrated to generate profit from across line of businesses. If a working model for one Line of business makes maximum profit the same can be replicated to other. Thus a prototype of such working model can be re-used by applying a synergized approach. This helps the company to scale profit from robustness of technology and managerial skills.

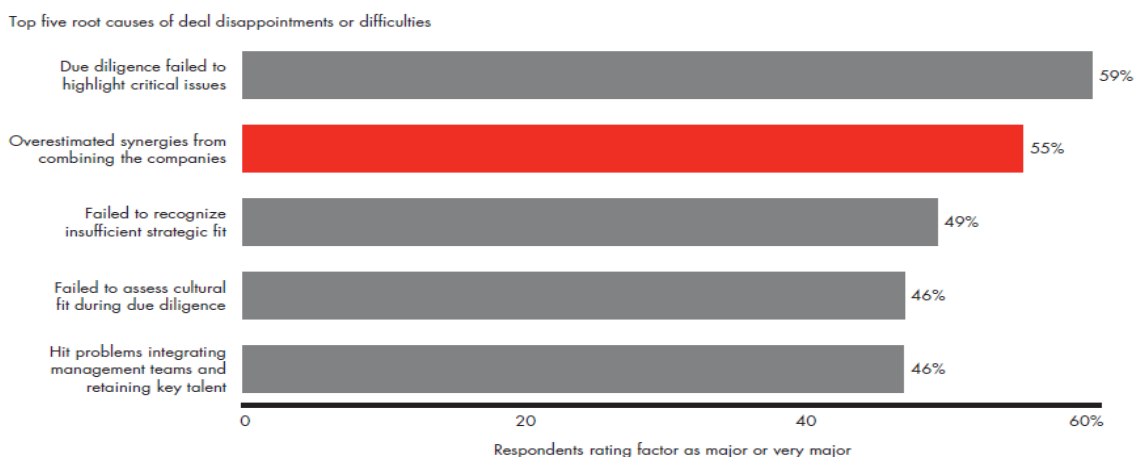


The size of the international companies will help to encroach upon the models specified above; a large international organization should adopt the integrated model. All operators should focus mainly on the following three parameters even if they adopt any of the above model:

1. Develop a vision that will help companies operate globally in synergy with other companies.
2. Establish KPI's and perks to set clear goals for senior executives.
3. Need to focus on technology, innovation, strategy and planning.

Facebook bought WhatsApp, and that turned out to be an accomplishment based on customer loyalty. Google bought Motorola mostly to harness its patents to drop off competition.

Figure 1: Overestimating synergies is the second biggest cause of disappointing deals



Note: Percentage of respondents who rated root causes as major or very major on a scale of 1 to 5
Source: Survey of 352 executives in North America, Europe and Asia, conducted by the Economist Intelligence Unit on behalf of Bain & Company, 2012

The above graph depicts why the synergies are miserably failing in the sector that can be justified by some reasons:

1. The companies over-estimated the synergies.
2. The companies failed to highlight some critical issues which had to be addressed at the time of synergies.
3. Failing to assess the cultural due diligence.
4. The driving forces which were strategic management and key skills that the major players lacked, would have helped them to emerge as global players.



Conclusion

The Telecom operators are realizing the need to expand globally which will not only help to establish their roots deeper but also create a value beyond expansion. Targeting the right markets should be the main concerns for synergy. Post targeting, their main aim should be to establish an organizational model, which will help them reap benefits in near future. The complexity comes in picture when the organization needs to offer a variety of services pertaining to customer needs. However, this complexity can be reduced by adopting strategy, running and planning for a better governance, also recruit people at par excellence in their own skill sets. Only those companies would survive and sustain successfully who would work in synergy with global and local companies and emerge as a strong player. This will also help them attract more investors globally.

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INCREASING PROFITS OUT OF EXISTING 2.5G/3G WIRELESS NETWORK INFRASTRUCTURE

Neha Priyadarshini, Sarbari Chakraborty

Abstract

The advent of 4G technology marks a new era in the telecom world. All the major telcos worldwide are making a huge investment in the transition from 3G to 4G technology, primarily to obtain excellent data speeds. What, however, is the guarantee that it will succeed? Hadn't the operators also made a huge investment in 3G network infrastructure which promised high data speeds but unfortunately could not meet up the expectations?

The prime focus of this paper is to understand the flaws in the existing 2.5G/3G technologies pertaining to data speeds, which would help the operators in improving data speeds on the existing network infrastructure, simultaneously helping them to recover their costs of investment.

Keywords: Wireless network infrastructure, KPI, QoS, Data throughput, Packet loss, Web browsing speed

Introduction

In the existing wireless network infrastructure, there are several factors that the operators should focus on. Telecom operators spend billions to acquire new spectrum for providing 3G and 4G services, and all this money is recovered from the end users in the form of tariffs. Higher data tariffs is holding back mobile data uptake in India. At present, mobile data accounts for only about 20% of the operators' revenues. The proportion of mobile data services revenue to total mobile service revenue is significantly lower. In the current Indian telecom market scenario, telecom operators are actively expanding their 3G network coverage and rolling out 4G. Current focus of the telcos is to improve profitability and hence, they are increasing the price of the data packs. The advent of Reliance Jio is expected to bring about a price war for data. Operators need to improve the data speeds on the existing infrastructure to recover their investments made. Otherwise, the customers will face multiple problems related to data speed, latency etc. The problems at customer-end will hinder the data adoption rate in India. Correctly identifying the technical issues help the operators to rectify the problems by providing relevant solutions, in the context of the KPI's identified. The Key Performance Indicators help the operators to analyze the problem before it manifests at the customer-end.

The relevant solutions are aimed to be provided either by capturing the KPI's on the external tools or inside the network systems itself. The flow will be as follows:

Problem Statements ➡ **Key Identifiers** ➡ **Solutions**



The main aim of this paper is to identify the root cause of problems that occur on the network end of GERAN (2.5G) and UTRAN (3G). GSM EDGE Radio Access Network (GERAN), a type of radio access network architecture is based on GSM/EDGE radio access technologies. The GERAN blends completely with the UMTS Terrestrial Radio Access Network (UTRAN) through a common connectivity to the core of UMTS network. This enables the building of a combined network for GSM/GPRS and UMTS.

Architecture of 2.5G and 3G networks

The demand for higher data speeds led to the development of 3G (UMTS) from the existing 2.5G architecture. The 3G services enabled faster communications that included voice, fax and Internet, with seamless global roaming. The BTS and BSC of 2G infrastructure had to be replaced with Node-B and RNC in 3G for better connectivity.

The Packet switched core network includes the SGSN and GGSN components which are common to both 2.5G and 3G technologies. These components are the supporting nodes, in which GGSN connects to the external Packet Data Network.

It has been observed that the root cause of the problems pertaining to slow mobile data speeds lies in the network elements as specified in the architecture of the packet switched networks of both 2G and 3G. Slow mobile data speeds also occur due to problems detected in the PDN which we shall soon observe in the findings.

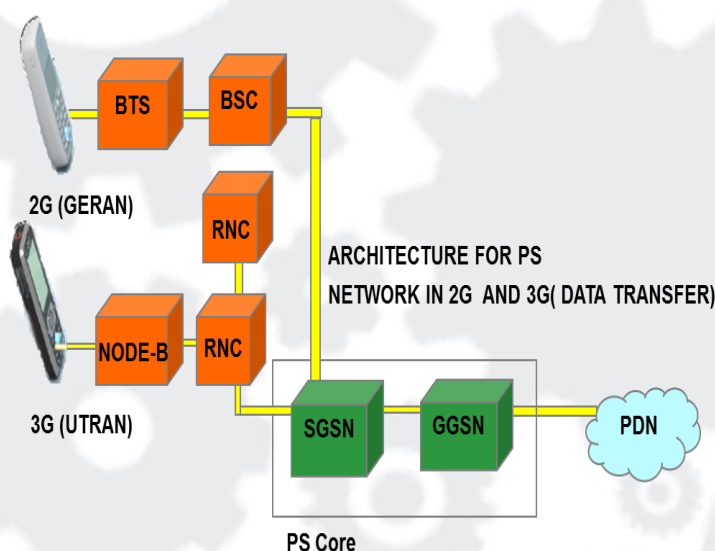


Fig. 1. 2G and 3G architecture

Problem Statements

- Customers activate 3G pack in their mobiles but receive 2G speeds (no difference between the 2G and 3G speeds). Thus, improper internet services results in customer dissatisfaction.
- Customer disappointment because of multiplayer gaming (online) on mobile phones facing slow speeds, delayed real time response and poor quality.
- Sporadically and randomly clients would see jitter (which implies that the picture freezes for a small number of seconds) while viewing live video streams such as news.
- While browsing the web with their mobile phones, the users are denied access to a wonderful experience leading to inaccessibility of relevant information which is a huge issue .
- Customers (especially those paying a premium amount) exclaim dissatisfaction on downloading files and movies using mobile internet.



Key Identifiers

The key identifiers on which focus is required when dealing with data speeds are:

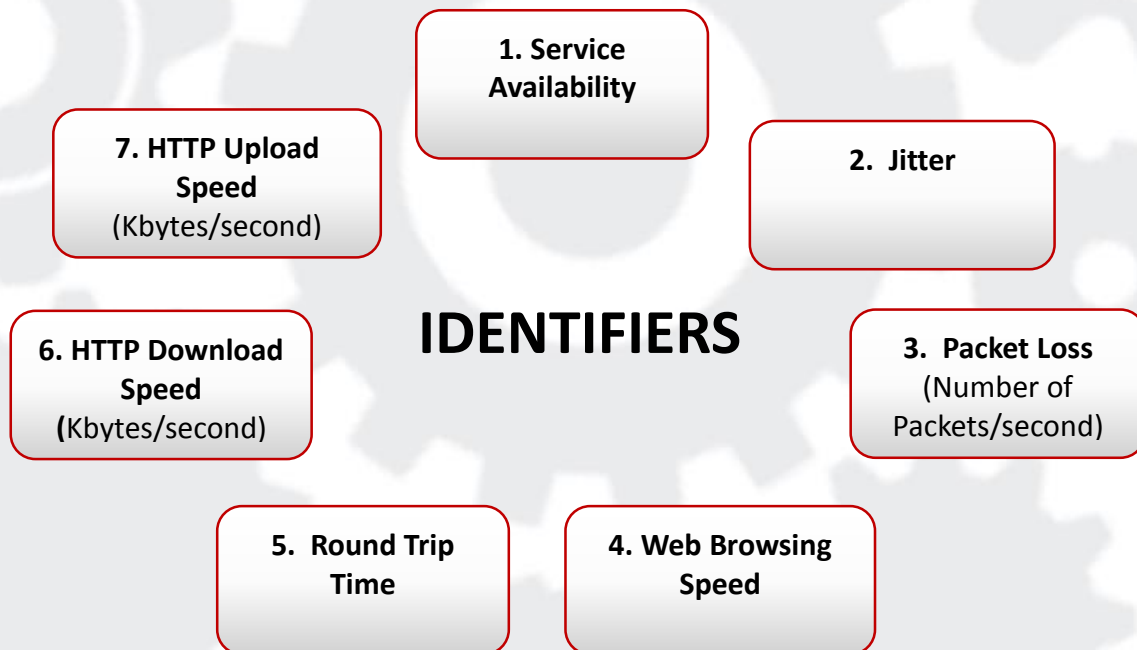


Fig. 2. Identifiers for data speed

Solutions

Service Availability: The telecom operators need to undertake technical measures to prevent non-availability of the internet service availability. The factors leading to this problem are PDP Activation failure, QoS levels restricted by the SGSN components, more static IP addresses causing shortage of IP address for dynamic allocation. So, the operators should focus on PDP context, PDP type, and IP address format which are some of the KPIs used to resolve this problem.

Jitter: It is the difference of the latency that occurs from packet to packet, primarily impacting online gaming speeds adversely. Latency is caused by buffering of packets in routers and switches that terminate on highly utilized links (especially on lower bandwidth links) such as broadband or 3G links.

The factors leading to jitter are ISI, improper queuing of packets, improper payload handling and network configuration parameters. Few of the KPI's which the operator needs to focus on are amplitude of data bits, high priority traffic, PDU (QoS delay classes) etc.



Packet Loss (Number of packets/second): This can be easily calculated using the “ping” command. Continuous packet loss starts impacting smooth online game play adversely.

Some of the factors leading to packet loss are link congestion, multi path fading and faulty network cabling. Thus KPI that needs to be focused upon are the maximum link capacity, frequency modulation and transmitted bandwidth of the signal.

Web Browsing Speed: It can be measured by loading an ETSI-standard reference page and thereby recording the amount of time that this page takes to load. This parameter, recorded in seconds, is calculated using a standardized web page hosted on a dedicated server meaning that the conditions for downloading this page remain the same for each test. This produces a time in seconds. Some of the factors which the operators should look into include page load time and the timer value monitoring in the SGSN.

Round trip time: It is the time taken by the traffic to reach a particular destination and return back. The measurement methodology includes obtaining IP address of BSP’s BRAS Ping or Trace-route in command mode. The factors that impact round trip time leading to poor data speeds are latency, buffer bloat and retransmissions and the operators should analyze these factors in-depth.

HTTP Upload & HTTP Download Speeds: 3G operators promise to give mobile Internet speeds in the range of 7.1 megabit per second (mbps) to 21 mbps. If that were true, then at 7.1 mbps speed, a mobile user would be able to download a complete movie in around 12-14 minutes. But invariably, it takes up to 40 minutes easily, to download a file equivalent to the size of a movie even on the best network. Thus, the various causes leading to poor HTTP upload and HTTP download speeds are network congestion, bandwidth, poor signal strength and quality, latency and backhaul.

The KPI that needs to be addressed by the operators are maximum packet discard ratio, maximum link capacity, BER, Data throughput and amount of traffic.

Conclusion

One of the foremost challenges for telecom operators is the infrastructure. 2G dominates the Indian market, and network connectivity of 3G is quite low. The different issues in infrastructure and resultant low speeds are making it tough for the operators to convince customers to move to 4G. In 2016, the number of Indian Smartphone users is expected to reach 204.1 million, the increasing number of users will require the operators to increase the efficiency of the existing infrastructure to manage the increasing pressure on spectrum. It is not possible for any one technology to completely solve spectrum issues. But, by elevating the level of efficiency of the existing 2.5G and 3G infrastructure, the user’s problems can be reduced to a great extent.

The main aim of this paper was to help the operators solve some of their problems that result in disproportionate returns to them when compared to the heavy investment that they made in the construction of 2.5G and 3G network infrastructure.



Moreover correctly identifying the technical issues help the operators to rectify the problems by providing relevant solutions in the context of the few KPI's identified. This will also result in enhanced customer satisfaction resulting in a better CRR.

Glossary

ISI- Inter Symbol Interference, BER- Bit error rate, QoS- Quality of Service, KPI- Key Performance Indicators, CRR- Customer Retention Referral, SGSN- Serving GPRS Support Node, GGSN- Gateway GPRS Support Node, PDN- Packet Data Network, GSM- Global System for Mobile Evolution, GPRS- General Packet Radio Service, UMTS- Universal Mobile Telecommunications System, PDU- Protocol Data Unit, BSP- Broadband Service Provider, BRAS- Broadband Remote Access Server.

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NEXT GENERATION PASSIVE OPTICAL NETWORKS

Ayantika Biswas

Abstract

With the ever increasing demand for bandwidth rich applications, many countries worldwide are implementing technologies that can serve this widespread demand. Subsequently, the Indian telecom sector is expected to witness very fast growth in the next few years. This report talks about the evolution of high-speed and high capacity optical access technologies of GPON, which are being deployed in applications like FTTH, to achieve higher bandwidth demands and increased traffic. The major driving factors, challenges, feasibility, pros and cons for the same are discussed.

Keywords: FTTH, GPON, WDM, TDM, NG-PON₂, TWDM

Introduction

A Passive Optical Network (PON) characterizes a point-to-multi-point architecture to provide broadband access; which these days has become the most favored and widespread solution for FTTx deployment among operators. PON architecture consists of a central Optical Line Terminal (OLT), Optical Network Units (ONUs) and passive optical splitters. The connection from an OLT to ONUs is referred to as the Optical Distribution Network (ODN). Recent developments in this technology have led to the emergence of Gigabit capable Passive Optical Networks (GPON) which uses optical Wavelength Division Multiplexing (WDM) to support bidirectional communication of upstream and downstream data over a single fiber. It is specified by the ITU-T standard G.984 and is capable of delivering data rates of 2.488 Gbits/s downstream and 1.244 Gbits/s upstream. The basic working principle is that for downstream distribution, all users will receive the same data on a single wavelength of light from the OLT to ONU. It is then the ONU's work to differentiate the data targeted at each user. For the upstream, a Time Division Multiplexing (TDM) technique is used from the OLT to ONU where each user is allotted a timeslot on separate wavelengths of light. The upstream transmissions occur at random when a user needs to send data and the system assigns a slot as needed. These are called burst-mode operations. The splitters act as power combiners under this arrangement. Since TDM comprises of multiple users on a single transmission link, the upstream data rate is always slower than the downstream rate.

Researches and investigations undertaken by Full Service Access Network (FSAN) and ITU-T on these high-speed and high capacity optical access technologies of GPON have evoked great interest in its future development; to achieve extended reach, higher bandwidth demands and increased traffic. After a continuing study on this area, FSAN introduced Next Generation PONs (NG-PONs) which was divided into two phases based on their application demands and technological maturity.



The evolution of NG-PONs can be seen in two stages as –

a. NG-PON₁: This is a mid-term upgrade compatible with legacy GPON ODNs which is further divided in two components: XG-PON₁ (asymmetric data rates of 10G downstream and 2.5G upstream) and XG-PON₂ (symmetric data rate of 10G for both).

b. NG-PON₂: This is a long term solution of PON evolution which is independent of the GPON standards and can be deployed over new ODNs.

In this paper, we discuss and compare both these evolutions of NG-PONs.

NG-PON₁:

XG-PON₁ is the next generation GPON standard, the selection of which was a trade-off between technology and cost. The anticipation of increasing bandwidth demands and requirements of higher line rates has led to the addition of new features and modification of GPON to improve the applicability and assure future proof investments. This gave rise to XGPON₁ which can be deployed under affordable migration conditions from GPON, over the same ODN, with some optional extensions.

The following are the two migration scenarios possible for the deployment of XG-PON₁:

i. Service-oriented introduction: This scenario takes the advantage of the existing fiber infrastructure to establish a new higher capacity carrier service via XG-PON₁. Depending on the users who want to migrate to XG-PON₁ from GPON, the network operators will upgrade their services to higher speed tiers. For other users who would still want to stay with GPON, their services wouldn't be altered due to the consistent co-existence of both the technologies over one ODN.

ii. Service-independent introduction: This scenario refers to the Greenfield applications where GPON technology hasn't been deployed yet. Since co-existence with GPON isn't necessary, this helps the operators to achieve better economics while supporting same bandwidth requirement per user as compared to GPON.

The motive for the prime attraction behind the improvement of GPON to XG-PON₁ is driven by the thirst for bandwidth while enhancing the performance of access nodes; all over their existing technology – in other words, interoperability. This motive is further supported by the transmission convergence layer of XG-PON₁ (called XGTC) which helps in enhancing the QoS by improving framing structure, activation mechanisms and dynamic bandwidth allocation (DBA) by optimizing the GPON TC layer. Improved security and power saving are the two most vital characters offered by XGTC. The operators demand improved security right from the initial stage of PON activation. There are three methods of authentication specified by XG-PON₁ standards. Those are:

- ONU authentication scheme based on a logical registration ID.
- Bi-directional authentication based on the inheritance of OMCI channels from GPON.
- New bi-directional authentication schemes based on IEEE 802.1x protocols.



XG-PON₁, being an improvement of GPON, acquires the same P2MP architecture to support diverse access scenarios such as Fiber to the Home (FTTH), FTTCurb etc. ITU-T G.987.1 specifies the co-existence of XG-PON₁ with the ODN of currently deployed GPON. The wavelengths allotted to XG-PON₁ are the same as used by 10G-PON; 1260-1280 nm for upstream (O- band) and 1575-1580 nm for downstream to promote technological maturity. This allocation acknowledges the present status-quo while respecting the future developments (like WDM-PON). The fundamental criteria is to provide higher data transmission rates than GPON which XG-PON₁ fulfills, by allowing four times the bandwidth of GPON for downstream and twice for the upstream. It reuses the optical fibers and splitters from legacy GPON systems due to the fact that XG-PON₁ completely inherits the framing, management and ODN of a GPON thereby providing full-service performance via higher data rates and larger split to support a flattened PON network structure. Since, it coexists with GPON over the same ODN, this protects the huge investments made by operators on GPON ensuring the users a seamless migration from GPON to XG-PON₁. The compatibility between these two systems is attained by implementing WDM in the downstream and WDMA in the upstream for XG-PON₁.

There are two main evolution scenarios proposed by FSAN and ITU-T for Greenfield and Brownfield. Greenfield doesn't have any pre-existing optical fiber distributions and therefore they require deployment of new PON systems whereas, Brownfield scenarios take leverage of the pre-existing GPON deployment of operators. With increase in the bandwidth requirement, while migrating to XG-PON₁, the telcos can choose to upgrade ONUs over the ODN either batch by batch or all at once. This choice of selection between the two is determined with respect to time till when GPON and XG-PON₁ can co-exist over the same ODN.

Apart from all these features, some of the other principle facets which make XG-PON₁ the most prominent candidate for the technology upgrade are excellent environmental and mechanical stability, good uniformity, and very low polarization dependent loss:

NG-PON₂:

More technologies for long term evolution are available when evolving from NG-PON₁ to NG-PON₂. A number of approaches to NG-PON₂ (including WDM-PON) were examined by FSAN's participants on the basis of cost and operational analysis. Time and Wavelength Division Multiplexed Passive Optical Network (TWDM-PON) was the chosen solution for NG-PON₂ since it offers a new direction towards reduced cost, increased revenue and lower risks in the implementation of next-generation fiber access technology.

TWDM-PON follows a point to multipoint network architecture which integrates GPON's cost advantage that uses a single wavelength to support multiple subscribers, with WDM-PON's wavelength flexibility that allows dedicated wavelengths only to particular applications or subscribers. It can basically be seen as multiple XG-PON₁ systems operating on various pairs of wavelengths, in order to be "stacked" onto the same physical fiber plant. TWDM-PON can provide eight wavelengths of 10G each resulting in a maximum capacity of 80G. Nonetheless currently only the following 4 variants of TWDM-PON are being deployed by ITU-T:



- **Basic:** It uses 4 wavelengths providing, 40G downstream and 10G upstream capacity.
- **Extended:** It uses 8 wavelengths providing, 80G downstream and 20G upstream capacity.
- **Business:** It provides symmetrical services of 40/40 G and 80/80 G.
- **Mobile front haul:** It provides point-to-point WDM overlay.

Similar to NG-PON₁, the transition to NG-PON₂ can be done in one of the two ways:

- **Upgrade Scenario:** Even though TWDM-PON can co-exist with XG-PON₁, some operators may skip that and instead target a migration directly from GPON to NG-PON₂. To make sure that no changes are required in the ODN and that the current GPON ONUs are equipped with the WDM filters as, an operator needs to place a coexistence element (CE) in the central office. TWDM-PON needs the wavelengths to be multiplexed, which can be done by inserting a NG-PON₂ card at the OLT and routing the fibers to the CE which combines/splits the different wavelengths. An operator can support TWDM- PON-based services, once this card is installed. However, for subscribers upgrading to NG-PON₂, new ONTs would require to be installed.
- **New Network Scenario:** In the case of new GPON FTTx network builds, an operator has the option to either install TWDM-PON from the beginning or place integrated GPON/TWDM-PON line cards. Nonetheless, the former scenario provides flexibility in terms of “pay as you grow”, which allows operators to deploy different technologies (GPON, NG-PON₁, NG-PON₂) on the same ODN.

The major challenges in the way of deploying NG-PON₂ are spectrum allocation and the need for “colorless ONTs”. The ONT transmitter must be tunable as well as the receiver requires a tunable filter with accurate tuning. These equipment are more expensive than the general GPON ONTs. A solution to this could be the use of photonic integrated circuits (PICs) in the ONT since a low cost manufacturing process would enable mass deployment. Since tuning technologies majorly depend on temperature control, maintaining a low power consumption in the ONT will be a key challenge which can be tackled by using resourceful power saving mechanisms. Additionally, optical component agents are devising new technologies that could help in bringing down these costs. Further research can be contemplated to guide towards an improved tuning accuracy and further cost reductions.

When seen from the market point of view, operators shied away from NG-PON₁ since there is only limited near term demand for 10G residential services that can justify investing on a new technology. In contrast, NG-PON₂ allows 8 time higher bandwidth along with optimal flexibility relative to bandwidth per user, resource sharing, service convergence and fiber management. Hence, TWDM-PON opens up a new range of possibilities for fiber networks.

Following are the major advantages and applications of implementing TWDM-PON:

- **Coexistence and selected upgrades:** Firstly, it preserves the GPON network investment since no changes are required to the ODN. Secondly, since TWDM-PON can be built on top of legacy GPON (or XG-PON₁) network, it provides



operators with enormous expansion flexibility and network planning. It could be used in various other applications like for the internal support of 4G LTE's front haul and backhaul needs.

- **Pay as you grow flexibility:** This allows wavelengths to be added one by one as needed to support high-bandwidth applications and customer growth.
- **Enabling faster network monetization:** It can support different types of subscribers and applications on different wavelengths and bit rates. This ability of supporting more applications, subscribers and network sharing at the same time, leads to faster network monetization. Apart from this, TWDM-PON also allows sharing of the FTTx network because dedicated wavelengths can be assigned to different operators.
- **FMC access platform:** In the recent years, many wireless operators have acquired wire line telcos. The reasons for this include use of wire line network for front haul and internal MBH, offering of bundles wireless and wire line services and growth in the ever growing data center market. TWDM-PON very aptly fits the requirement of these converged operators who want a unifying access platform which can support both wireless as well as wire line services while lowering the OPEX and CAPEX.

Business Implications in Indian Market

“According to a market report published by Transparency Market Research **Passive Optical Network (PON) Equipment Market - India Industry Analysis, Size, Share, Growth, Trends and Forecast, 2014 - 2020**, India passive optical network equipment market was valued at USD 268.6 million in 2013, growing at a CAGR of 21.0% from 2014 to 2020 to account for USD 1,175.5 million in 2020. By volume, **India passive optical network equipment market** is expected to grow at a CAGR of 15.7% during the forecast period from 2014 to 2020 to reach a market size of 38.3 million units by 2020. In 2013, volume of the market was 7.1 million units.”

An increasing demand for high bandwidth connectivity along with reliable network and security is the major driving factor for PON equipment market in India. Furthermore, PON equipment provides a high return on investment at low total cost of ownership. This along with research in technological advancements provides as outstanding opportunities and is predicted to positively drive the growth of the PON market in future.

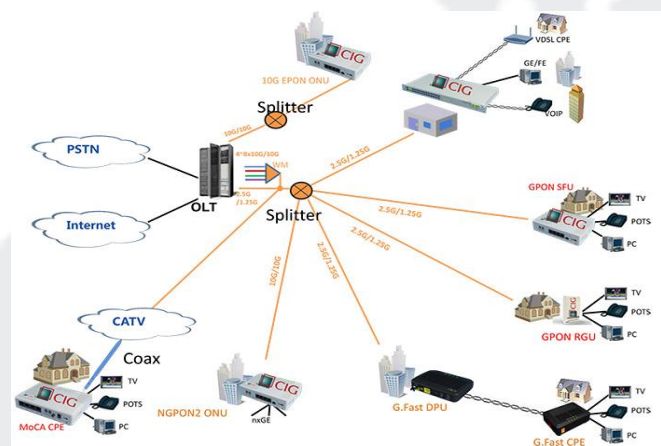


Fig (4.1): Single platform use by NG-PON2



According to figure 4.1, we can see that NG-PON2 can be used to support a wide number of applications. It provides a single platform for CATV, Internet, PSTN and Mobile Broadband. Therefore even with a high initial investment, it will give us much better returns because of reduction in CAPEX and OPEX. The following statistics and data will further ascertain my claim for above:

- According to a research by International Data Corporation (IDC), India is expected to touch \$37 billion in total mobile services market revenue by the year 2017. It predicts that India will become the second largest smartphone market globally by 2017, surpassing USA.
- With the establishment of Digital India and Smart City Campaigns, the Government of India has devised the roll out of free high-speed Wi-Fi across 2,500 cities and towns in the country over the next three years. This program will be implemented by state-owned Bharat Sanchar Nigam Ltd (BSNL) and it involves an investment of up to \$1.06 billion.
- As per a Microsoft report, by the end of 2025, India will emerge as a leading player in the virtual world having 700 million internet users out of the 4.7 billion global users.
- RailTel, one of the major implementing partners of National Optical Fiber Network (NOFN) can hugely benefit due to the wide bandwidth and higher speeds of TWDM-PON.
- 4K and UHD videos consume a lot of bandwidth. NG-PON2 can be used to support high definition Audio-Video over optical fiber.

With all the above points and with 4G services hitting the market along with the government's favorable regulation policies, the Indian telecommunication sector is expected to witness very fast growth in the next few years. And the evolution of next generation PON will play a huge role in it .

Conclusion

With all the above points and with 4G services hitting the market along with the government's favorable regulation policies, the Indian telecommunication sector is expected to witness very fast growth in the next few years. And the evolution of next generation PON will play a huge role in it.

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