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4G Network Services in India: Emergence and Current Competitive Mar ket Situation

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Abstract: Since the introduction of 4G network services by Airtel in 2012 in India, all mobile service providers are making hard efforts to create an edge over others in this segment. With the recent entry of Reliance Jio in the market, it is viewed as a game changer. This paper describes how different 4G network providers are moving in terms of pioneer's advantage and market leadership. Other business aspects such as merger and acquisition, advantages for stakeholders, etc. are discussed. The paper also focuses on such aspects as spectrum allocation, infrastructure (particularly mobile towers), handset availability, call drop issue, competition etc. Comparison among all 4G-service providers is shown with reference to number of circles, tariff, customer base, and financial performance and challenges are elaborated. Role played by Telecom Regulatory Authority of India is also mentioned.

Keywords: *4G, mobile, technology, India, telecom*

Introduction

For last couple of decades, booming revolution in digitization and information technology sector has led people to seek for innovation and up-gradation. The world is in need for speed, which has brought them towards the change. Communication technology is the paradigm of digitization, which has become something that people live with and has become an integral part of life. Mobile wireless industry has started its technology creation, revolution and evaluation since early 1970s. In the past few decades, mobile wireless technologies have experienced 4 or 5 generations of technology revolution and evolution, namely from basic mobility to 4G. The cellular concept was introduced with the 1G technology, which made the large-scale mobile wireless communication possible. Digital communication has replaced the analogy technology in the 2G, which significantly improved the wireless communication quality. Data communication, in addition to the voice communication, has been the focus in the 3G technologies and a converged network for both voice and data communication is emerging. With continued R&D, there are many killer application opportunities for the 4G as well as technological challenges.

4G is the fourth generation of wireless mobile telecommunications technology, succeeding 3G. It is a gigantic improvement from its roots of 1G transmission which was designed in 70s and introduced in 1981, and is highly demanded by retailers and consumers alike for its lightning-fast speed, which eclipses that of 2G and 3G

technologies. Frattasi *et al*. defined 4G technology from the users' perspective. The authors proposed a top-down approach of the wireless communications such as recognizing functional needs and expectations of the users, developing user scenarios from these needs, identifying interrelations of features of 4G services, and identifying technical set up of 4G technology.

Table 1: Advancements in Cellular Generations

Generations	Time period	Features
1G	1970s	Analog technology
2G	1980s	Digital signal processing, Standards (e.g. GSM, CDMA, TDMA, etc.) developed
3G	1990s	Higher voice quality, broadband data up to 2 Mbps
4G	2000s	Wireless Internet, peer-to-peer networking

4G was first used for wireless USB modems, but presently the primary use of this technology occurs in smart phones. Two 4G candidate systems are commercially deployed: The Mobile WiMAX standard and the first-release Long Term Evolution (LTE) standard. The LTE standard is prominently used in India. The word 'MAGIC' is also referred to 4G technology, which stands for mobile multimedia, anywhere, global mobility solution over integrated wireless and customized services. Speed of data transfer is also a challenge in 4G services. 4G requires a data transfer speed rate of minimum 100 megabits per second while a user is physically moving at a high speed and 1 gigabit per second when a user is in a fixed position. In addition to fast data rates, other benefits of 4G will be low latency, efficient use of spectrum and low implementation cost, remarkable user interface; and gaming, image, and video quality. Different signals sent from systems are processed by devices and then are connected to a network. Different wireless service providers have different protocols. The process of selecting the most appropriate technology may get complicated. Quality of service may be affected due to this diverse nature of 4G technology.

In the current market scenario, Reliance Jio owns 58% of the total wireless high-speed data capacity (3G+4G) in India while Bharti Airtel owns only 28% and other operators own rest 14%.

Table 2: Subscriber base of cellular operators in India

Operators	No. of Subscribers (as on April 2016)
Bharti Airtel	252. 21 million
Vodafone India	197.99 million
Idea Cellular	174.68 million
BSNL	87.48 million
Reliance Jio	16 million (Sept. to Oct.)

Spectrum Auction 2016

In the year 2014, Department of Telecommunication, Government of India auctioned 2G spectrum of 900 MHz and 1800 MHz 1800 MHz now used for 4G coverage in India. Before this, in 2010, an auction of 2300 MHz frequency–known as Band 4–the second frequency, on which a telecom carrier can offer 4G connectivity, was held by the Government of India. Now, in the recently concluded 4G - 700 MHZ spectrum auction, all the major telecom companies played exceptionally. The spectrum auction, which was

publicized as the biggest sale of the mobile airwaves, finished with INR 657.89 billion of bids as against expected INR 5600 billion. Sixty percent of the airwaves, including premium 4G bands, remain unsold. This auction has been observed as the game changer in the current market situation, where in brand Jio has emerged to be the most competitive player in the Indian telecom market providing its services in nearly 14 circles. Though Airtel had sluggish start in the 4G telecom market, it acquired 173.8 MHz of spectrum for 142.44 billion in circles such as Kerala, Assam, Maharashtra, Delhi, Mumbai and North East. Aditya Birla Group's Idea Cellular acquired 349.20 MHz of spectrum for the bid of 127.98 billion and received 20 circles. Vodafone remained the highest bidder, with a bid of 202.80 billion. Jio own sub-1 GHz 4G band, and matched up to the same level of other operators, which are gearing up for the battle of market domination in 4G LTE in India.

Table 3: 4G Bidding amounts and number of circles

Company	Bands (MHz)	Bidding (billion INR)	Circles
Vodafone India	1800, 2100, & 2500	20,280	17
Bharti Airtel	1800, 2100, & 2300	14,244	15
Idea Cellular	1800, 2100, 2300, & 2500	12,798	20
Reliance Jio	850,1800,2300	612	22

Mobile network service providers are struggling to bid over 700 MHz and this huge amount kept operators far from bidding for the effective frequency band that single handedly could bring over 4000 billion at the base price of government. This is the probable reason behind 60% of the airwaves left unsold in the auction. It has also been expected that government would slash down the prices of this spectrum in the near future. BSNL (former Department of Telecom., Government of India) is also making efforts to enter into 4G market seeking to buy pan-India 700 MHz license.

4G in India

Airtel was the first to offer 4G services in India in as early as in 2012. It offered its 4G network service in more than 350 Indian cities across 15 circles. Being the pioneer of 4G has given Airtel a user base of over INR 2.5 million subscriber-base as per its first quarter results for 2016. Airtel has access to 8 out of 22 circles namely Delhi, Mumbai, Kolkata, Karnataka, Maharashtra, Haryana, Kerala, and Punjab. It has recently acquired access to Aircel's spectrum assets in eight addition circles namely Tamil Nadu, Bihar, Jammu & Kashmir, West Bengal, Assam, North East, Andhra Pradesh, and Orissa. The recent entry of Reliance Jio in the 4G market has started an ongoing price war leading to Airtel providing 4G connectivity at 3G rates. There are policy implications weaved with technological changes in the Indian telecom sector as Deshmukh, et al. (2013) noted the delay in commercialization of 3G service in India and outlined the current trend of next-gen wireless communications. The authors investigated 4G technologies and based on their investigation, discussed four scenarios to predict and analyze 4G technologies along with discussion on policy implications and other issues. There is both – bright and dark side of any phenomenal change. Prasad and Aithal (2016) presented ABCD (Advantages, Benefits, Constraints, and Disadvantages) analysis and noted the challenges of 4G technology such as security, backhaul, multiple frequency, VoLTE, price, cell phone penetration, service quality, etc. among other issues. The authors also enlisted opportunity

on the other hand such as affordability, personalization, advanced technology, coverage, mobile banking, m-learning, etc. Very important factor here is first 'A' of 4As model of marketing, i.e. acceptance. Jhamta (2013) predicted acceptance among Indian 4G service users and showed the intentions for adoption of 3G technologies. This research also estimated the acceptance of 4G technology using Grey Prediction Algorithm, an algorithm often used for short-term predictions. The constructs considered in this experimental study for the prediction were–perceived usefulness, perceived ease of use, behavior intention, perceived enjoyment, price level, and perceive quality. Theses constructs, then, were correlated with such variables as with age, gender, education, experience, individual impact, organizational impacts, and with behavior intension. The study found a strong relationship between the constructs of TAM model and shows that users do not prefer price level for social influence while they accept the remaining factors.

Competitors' Strategies

To win the 4G customer base race, when one company came up with free data, the other offered reduced tariff. As relatively latest player Jio was mounting at its unmatchable pace, it was anticipated that other major operators such as Airtel, Vodafone India, Idea, and BSNL will not fail to come up with substantial improvement in services by competitive offers and services to stop their customers switching to other telecom operator and to attract new customers looking for the best 4G service provider in India.

Reliance Jio invested INR 612 billion to win the bid and became the only company to have an all-India PAN license. It then got access to over 14 circles in the 1800 MHz frequency and entered into voice service. The license is valid for 20 years. The government auctioned airwaves in this spectrum to Aircel, Airtel, Reliance Jio and Tikona. Reliance Jio's PAN India network will primarily rely on the 2300 MHz frequency for cellular coverage. Band five (850 MHz) will be used by Jio and Reliance Communication in 10 circles. To test the quality of the 4G services provided by it, Jio launched an "Invite Only Trial" on December 27, 2015, where they presented free SIM cards to over 1,00,000 members of their staff, partners and their families with the bonus of free data and voice calling facility for a year. Within 90 days of launch the subscriber base of company has crossed over 1 million customer mark using over 1 GB data. Earlier in 2016 reliance Jio and Reliance Communication entered into a spectrum trading and spectrum sharing agreement termed as "Virtual Agreement" wherein both the companies decided to offer quality telecom services across 2G, 3G and 4G networks. This coalition resulted to a wider array of resources and better survival opportunities for both the companies. The merger has provided two-fold benefits such as 1) 75% cut in company's debt, and 2) Agreement of fiber and tower sharing. However, there were challenges poised in front of the biggest market player. Initially convincing disinterested retailers towards trading for Reliance Jio as their profit margin tended to be lower for Jio than for other operators as the company offered their SIMs free. It was relatively easier for competitors to graduate their 2G or 3G customers to 4G, unlike Jio, which has to create brand awareness and build it in no time. Call drops on other GSM networks like Airtel, Vodafone, and Idea was another challenge. Superfast 4G connectivity resulted to quicker exhaustion of data packs. Approximately 172 million 4G devices were shipped in this first half-year. More than 18.2 million 4G mobile phones were shipped in the second

quarter of 2016, according to research firm Cyber Media Research. In the first quarter this year, this figure was INR 154 million.

Airtel, the leading telecom operator in India came up with the 'Airtel Infinity Plan' which offered unlimited voice calling, local, STD and national roaming along with packaged 4G/3G data, SMS, free subscription of Wynk music and Wynk movies. The company also offered free packaged data with facility to Apple's new iPhone 7 and iPhone 7 plus users who can realize 10 GB data free 4G/3G each month for a whole year with any Airtel Infinity plan. Being the pioneer in 4G services, Airtel has also been one of the most consistent market players in the Indian telecom sector and has the biggest customer base. At present, Airtel is attracting its existing 3G service users and new customers by promoting Open Network, where this company helps users find the network available around their cell phone location.

The only foreign player in the 4G race today – Vodafone India provides similar service to maintain the stability in the market. The recent announcement by Vodafone - that it would provide a free data plan of 10 GB 4G mobile service at the price of 1 GB plan. It comes with various riders though. Under this offer, the Vodafone customers with new smart phones will get additional 9 GB of 4G mobile broadband usage when they get this 1 GB plan. The service can be availed by both postpaid as well as prepaid customers. Sandeep Kataria said in a recent interview "Only 4G, low tariff and free voice calling not enough. We are giving greater reason to customer to upgrade to 4G handset , with this offer we are encouraging new 4G handset users to enjoy Vodafone super net experience to the fullest also we strongly believe that tariff are not long term differentiator".

The only government owned aggressive telecom company in India is BSNL (Bharat Sanchar Nigam Limited). For BSNL's pre-paid mobile service users, the company has launched 'Freedom Plan'. This plan is available throughout India and offers such benefits as freebies for new customers, reduced call rates, roaming benefits, extra data for limited time, etc.

Idea Cellular, own by Aditya Birla Group, was compelled to reduce the rates to 80% overall, and 67% in 3G/4G packs, after witnessing cutthroat competition. The current rates are INR 990 for 10 GB, INR 649 for 3 GB and INR 349 for 2 GB. A monthly internet data pack starts INR 100 for 2G service. Here follows comparison of tariff rates:

Table 4: Data packs and cost offers by competitors

Telecom Operator	500 MB			1 GB			2 GB			3 GB			4 GB		
	Data Offered	Validity (days)	Cost (INR)	Data Offered	Validity (days)	Cost (INR)	Data Offered	Validity (days)	Cost (INR)	Data Offered	Validity (days)	Cost (INR)	Data Offered	Validity (days)	Cost (INR)
Airtel	500MB	28	144	1GB	28	255	2GB	30	455	3GB	30	655	4GB	30	755
Vodafone	550MB	21	189	1GB	28	297	2GB	28	397	3GB	28	497	4GB	56	852
Idea	–	–	–	1GB	28	249	2GB	28	449	3GB	28	598	5GB	28	851
Jio	300MB	28	149	750MB + Unlimited Night Time Data	7	199	2GB + Unlimited Night-time Data	21	299	–	–	–	4GB + Unlimited Night-time Data	28	499
BSNL	NA*	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Not *Available

Table 5: Maximum data plan offers

Telecom Operator	Data Offered	Validity (days)	Cost (INR)
Airtel	10 GB	30	995
Idea	15 GB	28	1849
Vodafone	40 GB	28	3999

Jio	75 GB + Unlimited Night-time Data	28	4999
BSNL	NA	NA	NA

Apart from competing on pricing front, technology will also play a pivotal role in the competition. 4G market in India has opportunities and challenges on the both hands. In their research, Hooda (2013) *et al.* described opportunities, challenges and proposed solutions for 4G network services. The challenges enlisted were – security and privacy, service quality, architecture issues, signal processing and optimization, intelligent antennas, trans-receiver designs, etc. Authors find 4G services offer service varieties in addition to such vital features as efficiency, scalability, and reliability. At the same time, there is also a need for revisiting issues like security, privacy, architect and billing technologies.

Conclusion

The fierce competition of 4G services in India is mainly based on two factors – price war and technological advantages. It is imperative to note that the companies with relatively larger customer base will have an edge over the competitors in the future times as well as in the current era. Experience in this sector is becoming secondary and irrelevant as new players are taking over customer base through attractive pricing. Branding is being replaced with distribution, so the concept of pioneer's advantage is not felt true and legit. In addition, Indian telecom companies have realized the importance of handsets, which are now becoming crucial for advanced 4G services.

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