

TELECOM BUSINESS REVIEW

A Journal of Symbiosis Institute of Telecom Management

Analysis Of Cashflow Statement As A Tool To Appraise Financial Decisions Of Companies

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Turnkey Solutions In Mobile Infrastructure - Market Analysis, Feasibility Study & Evaluation Of Implementation Strategy

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TBR

Business Viability Analysis & Technological Study : WiMax

Mr. Ashutosh Singh & Mr. Taru Gupta

Mobile/ Utility Payments: Life Made Easy

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Invited Papers :

Mobile Base Station Antenna: a Health Hazard?

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Spectrum for 2G & 3G Mobile Services

Mr A. M. Joshi



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From the Director's desk.

It gives me immense pleasure in presenting to you the second issue of Telecom Business Review (**TBR**). The TBR was started last year by Symbiosis Institute of Telecom Management to provide a platform for scholars, teachers, professionals & students to contribute & showcase their knowledge, experience, study results & findings in the relevant areas of Technology & Business Management.

I am happy that this aim has been achieved by the fact that in the last year's issue we published articles on diverse topics like optimization of product development process, thin computing, rural telecom and telecom finance. I am sure that this year's issue of the TBR too will help to trigger quality studies in field of telecom business management and enlighten and educate the telecom fraternity

I would like to express my gratitude to Mr A.M.Joshi Former Advisor (Wireless) Govt of India for contributing a very informative research article in our “**Invited Papers Section**” on Spectrum allocation.

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

Virender Kapoor
Director, SITM

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ANALYSIS OF CASHFLOW STATEMENT AS A TOOL TO APPRAISE FINANCIAL DECISIONS OF COMPANIES

By:

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Abstract:

The management of a company takes various types of decisions to attain financial objective. The financial objective is to maximize profit of company and maximize wealth of shareholders. The financial impact of these decisions is reflected in the Financial Statements prepared by Management. The financial statements include Income Statement (i.e. Profit & Loss Account) and Position Statement (i.e. Balance Sheet.) The Balance Sheet indicates net financial position and Profit & Loss account indicates increase in financial worth during the year. Company is a separate legal entity which indicates separation of ownership i.e. shareholders from management. The shareholders, even though the owners of an enterprise are not actively engaged in decision making process. However the shareholders can analyse the impact of decisions taken by management on the basis of financial statements. The financial statements are not prepared on cash basis i.e. these are prepared on Accrual System of accounting. In this system, the entire profit reported by the Company may not be realized in cash. In this system of accounting, actual cash paid or received is immaterial. Hence to provide information of transactions on cash basis 'Cashflow Statement' is prepared. As per the proposed Companies Bill 2008 (Section 117) every company is required to prepare Cashflow Statement. Earlier only listed companies were required to prepare Cashflow Statement. This article attempts to 'analyse financial decisions taken by management on the basis of cash flow statement.'

Introduction

“Profit is just an opinion. The real happiness is cash in the bank.”

Mr. N.R.Narayan Murthy quoted in Annual Report of Infosys 2005-06. This quote indicates the importance of cash for any organization.

The term finance relates to money. It has two aspects viz: money coming to the business (cash inflow) and money going out of business (cash outflow).

Objective of Financial Decision making:

There are two basic objectives of any enterprise - maximization of profits of company & maximization of shareholders' wealth.

Scope of Finance Function & Decision making in Financial Management:

To achieve the above objectives, management of an enterprise takes following financial decisions; Financing Decision (Capital Structure decision): It relates to raising of funds at required quantum, at lowest cost and at right time.

- 1) Investing Decision: (Capital Budgeting decision): It relates to investing these funds in various assets to get maximum returns. It is long term decision.
- 2) Working Capital Decision: It relates to short term financial decision making i.e. management of current assets and current liabilities.
- 3) Dividend decision It is distribution of profits to shareholders in cash. In financial decision making, “any proposal which maximises value of the firm is always accepted.” The value of the firm will increase only if present value of the future stream of net cash benefits is more than initial cash investment. As such it relates to cash inflows and outflows. The fundamental principle and theme line of any business decision is cash and not always profit as such. The accounting is based on 'accrual basis' whereas managers will like 'Cashflow' basis for decision making.

Financial Decisions and Financial Statement:

The financial statement reflects the impact of financial decisions. The financial statements are prepared on accrual basis. In the balance sheet, we state sources of funds as 'Liabilities' and application of funds as 'Asset'. It indicates the net position of shareholders. Profit & Loss account indicates income and expenses along with appropriation of profits. Apart from these two statements, one can evaluate decisions on the basis of Cashflow statement also.

Structure of Cashflow Statement:

The cash flow statement is prepared on the basis of Balance Sheet of two different dates and Profit & Loss Account during that period. It is prepared in accordance with requirements of Accounting Standard -3. The Cashflow statement appears in Company's Annual Report. The cash flow statement reveals cash inflows and outflows from three main activities: Cashflows from operating activities, Cashflows from investing activities and Cashflows from financing activities. In a cash flow statement, cash outflows are indicated in brackets whereas cash inflows are indicated without brackets. The net balance of inflows and outflows under each activity is shown separately. The total of three activities' net balances indicates increase or decrease in cash and cash equivalent during a given period. Such increase or decrease also indicates the difference between opening and closing cash.

- 1) Cashflows from operating activities: This is based on the enterprise's principal source of revenue generating activity. This is prepared on the basis of Profit & Loss Account adjusted for non-cash and non-operating items of income and expenses. It is further adjusted with changes in working capital and payment of income tax.
- 2) Cashflows from investing activities: This is prepared on the basis of firm's cash inflows and outflows related to long term fixed assets and investments.
- 3) Cashflows from financing activity: This is prepared on the basis of firm's cash inflows and outflows related to long term sources of funds like Share Capital and long term loans.

Cashflow Statement (CFS) as tool to evaluate financial decisions of company:

It is an external analysis and useful to outsiders of an entity including shareholders;

➤ **Company's Operating level decisions and Cashflows from Operating Activities:**

The net profit earned by an enterprise is not represented in cash balance. There may be difference between net profit and cash profit (cash generated from operations). The operating net Cashflows is indicator of companies overall financial health. The excess of inflows over outflows (net inflow) from this activity is always a better indication of Company's financial health. Since Operating Cashflow ignores other income like dividend, interest, profit/loss on sale of asset & investment, it is absolute measure of company's operating performance. The cash generated from this activity should be sufficient to cover taxes, dividend, interest and other obligations. It also indicates the way cash generated from operations is deployed / invested. It may be investment in working capital (working capital decisions), investment in fixed assets (Investing decisions) and towards repayment of liabilities if any (Capital structure decisions). It also provides information regarding sufficiency of cash to pay dividend. It provides information about company's ability to pay on different accounts like dividend to shareholders, payment of obligations to lenders, payment to employees and other suppliers, payment of taxes to government etc. In cash generated from operations, one should also consider exceptional items and income tax. It may also be possible that while company's net profit may increase; there may not be corresponding increase in cash balance or vice versa. The net profits' reliability can be assessed on the basis of cash flow statement. If one assesses operating cashflows over a period of time are increasing, then the company's financial health could be considered sound, otherwise it may indicate incipient financial sickness which can be anticipated in advance. The management's operating decisions, if sound, would result into better position of cash inflows under this activity and increase in this inflow would indicate better operating efficiency and decision making. On the basis of Cashflows from operating activity one can also calculate cash EPS which is also one of the indicators of company's financial health.

➤ **Company's Investing Decisions and Cashflows from Investing Activities:**

The nature of business will determine the nature of investments required. The investments are normally made in fixed assets which are specific to particular industry. The capital expenditure may be like License for telecom sector. These decisions are also called as capital budgeting decisions. For huge/infrastructure projects, investments are made in phased manner. Cashflow Statement indicates the nature of investments, its timing pattern, and amount of investments. In capital budgeting, evaluation of project is based on Cashflows generated from that project. Cashflow statement is useful in this manner. One can also monitor whether investments are made in line with the requirement of business or otherwise like investment in mutual funds etc. The companies overall decision criteria regarding investments decisions can be evaluated on this basis. It may have investment in fixed assets to generate regular revenue, investment in trade investment to boost business, investment in mutual funds, inter corporate deposits, loans to subsidiary companies etc. It also indicates inflows from sale of assets, investments, interest & dividend received, net proceeds from sale of divisions/units. One should also focus on the sources from which investments are made. It may be out of cash generated from operating activity or financing activity. The utilisation of cash flows indicates the long term objective of business. The company having growth requires huge capital expenditure and working capital expenditure. It is found that cash rich companies finance their growth by cash generated from operations. Long term investments capital expenditure requirements can be financed through long term funds like share capital, ploughed back profits and long term loans. Company may have the policy to finance its growth by internal cash accruals instead of by outside borrowing like a few IT companies which are zero debt companies.

➤ **Financing decisions and Cashflow from Financing Activities:**

The capital structure decisions like financing from shareholders by way of issue of share capital at premium/par and outsiders, the ratio in which it is raised can be analysed. One of the basic principles that while the long term investments are financed through long term funds, the short term investments should be financed through short term funds. Cashflow from financing activity reveals payment of dividend, interest and loan repayment.

Further analysis can be done on the basis of intra/inter Cashflows generated from three activities. Like comparison of Cashflows from financing activity with Cashflows from investing activity.

➤ **Increase in cash and cash equivalent:**

If there is increase in cash and cash equivalent it generally indicates healthy financial sign for company. However it is necessary to investigate the reasons for such increase. The increase may be due to operating, investing or financing activity. If increase is due to net cash generated from operations then only it would indicate healthy financial position.

➤ **Financial decisions not reflected in Cashflow statement:**

It is worthwhile to note that non-cash items of income and expenses or financial decisions having no impact on cash do not appear in cash flow statement. The decision may be important however it has no impact on cash flows like issue of bonus shares, conversion of debt into equity etc.

➤ **Cashflow Statement (CFS) as tool for future planning and controlling activities:**

CFS can also be used as a tool by internal management for further analysis; It provides the basis to management to explain the sources of cash and its use during a given period. One can co-relate the financial decisions and its impact in the current period. The management can undertake cash management on the basis of cash flow statement. It helps in understanding movement of cash along with reasons. Overall impact of investing and financing decisions taken in the past and its impact in the current year(s) can also be evaluated. The CFS also provides basis to analyse solvency, liquidity position and ability to generate cash flows under different activities. Cashflow statement is also best tool for inter firm and intra firm comparison since it neutralizes the impact of adopting different accounting treatment for same transaction.

Cashflow statement is a useful tool to evaluate different decisions. It is also useful for long term planning and control. However there are also inherent limitations of Cashflow Statement. However Cashflow statement analysis should be done along with balance sheet and profit and loss account analysis.

References:

1. Accounting Standard 3 'Cashflow Statement' issued by Institute of Chartered Accountants of India.
2. Annual Report of Infosys 2005-2006 for comment by Mr. Narayana Murthy.

“IDENTIFYING ALTERNATIVE MEANS FOR INCREASING RETAILERS' LOYALTY - CELLULAR SERVICE PROVIDER (CSP)'S PERSPECTIVE”

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Abstract :

The retailer is the one who actually deals with the end user of various services offered by cellular service providers and therefore plays an important role in the entire distribution channel. Retailers generally stock & sell goods & services of all cellular operators. According to the Cellular Service Providers (CSPs), retailer's loyalty towards a service provider is one of the most important aspects from cellular service provider's perspective. Retailers are at the best position to understand the customer's buying behavior with respect to the various segments (age, sex, location, culture, spending capacity, etc.) and act accordingly so as to increase, retain and attract customers. The objective of this investigation was to find out the various factors that increased the retailer's loyalty so that they can help the company to increase, retain and attract customers. The objective was also to understand the shortcomings of the existing system and suggest new ideas to overcome them. The study has taken a holistic view of the entire system to understand the gaps between different entities which led to unsatisfactory service delivery and service assurance.

Introduction:

It has been observed that an operator can increase the loyalty of his retailers by increasing their profit margins. However, in the process, the operator bleeds. Hence, this study was aimed at finding out alternative means in which cellular service providers can increase their respective retailers' loyalty towards them. Thus, the objective of this study was:

“To identify alternative means for increasing Retailers' Loyalty”

Methodology :

I. Data sources

1. Primary data -

Retailers and distributors were visited to gather the primary data regarding the problem. Zonal offices of the CSP in the cities of Aurangabad, Solapur, Satara & Kolhapur were visited to find the geographical distribution of the retailers.

Sample size: 264 retailers and 18 distributors

2. Secondary data -

The list of retailers and their respective distributors was sourced from the company itself.

II. Research approach

1. A deep analysis of the problem showed us that the best way to approach the problem was to conduct a market survey. The target cities for the purpose of market survey were **Aurangabad, Solapur, Satara & Kolhapur**. The market survey according to us was the best way to get answers to the various queries and information which we required to analyze the problem. The market survey comprised of various questions which targeted all the retailers of all classes. The questions were kept simple so that it would be easy for every person to answer them. Questionnaire was prepared for the retailers with consultation and approval of the faculty members of the institute and a team of one of the reputed CSP before approaching the market.

Contact method:

Most of the retailers were directly approached and interviewed. Over and above the planned visits, certain visits to other retailers were also made on random basis to increase the sample size. The distributors were directly approached by our team, and if some of the distributors were not available for interviews they were later called up on phone and were interviewed.

Data Analysis:

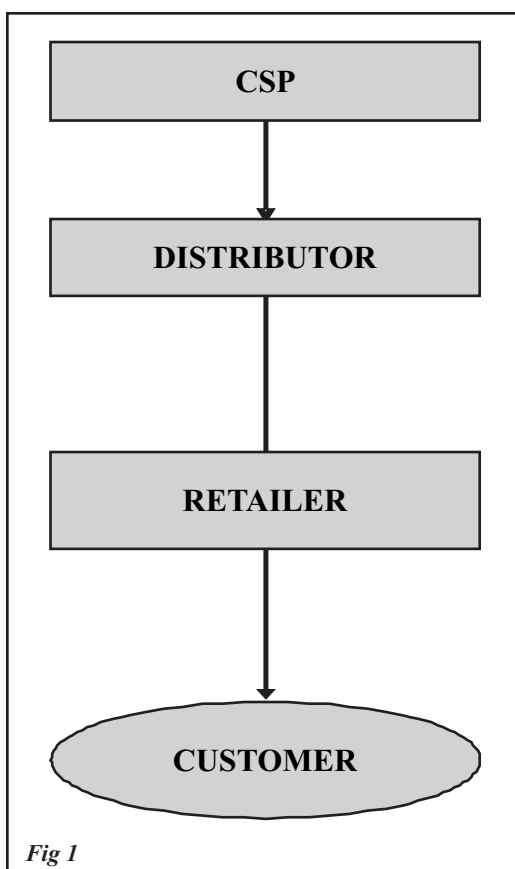
Thorough and Precise data analysis was done using Factor Analysis wherein the opinions of the retailers about a particular factor as obtained from the questionnaire were quantified into percentages and then sorted in decreasing order of their importance.

Key Findings and Recommendations:

- Today, most of the activations received by CSP are for LIFETIME SIMCARDS. Over the years, this shift has primarily been due lowering of the charges for a lifetime connection from Rs.999 to Rs.195 per new Lifetime connection. Let us understand the following scenarios with the help of an example, assuming the following facts:

As shown in Fig. 1, the amount invested by the retailer is Rs.195. He receives Rs 99 from the customer and Rs 135 from the CSP therefore the retailer's profit was $\text{Rs.}99+135-195=\text{Rs.}39$.

CASE I (Followed previously by the CSP)



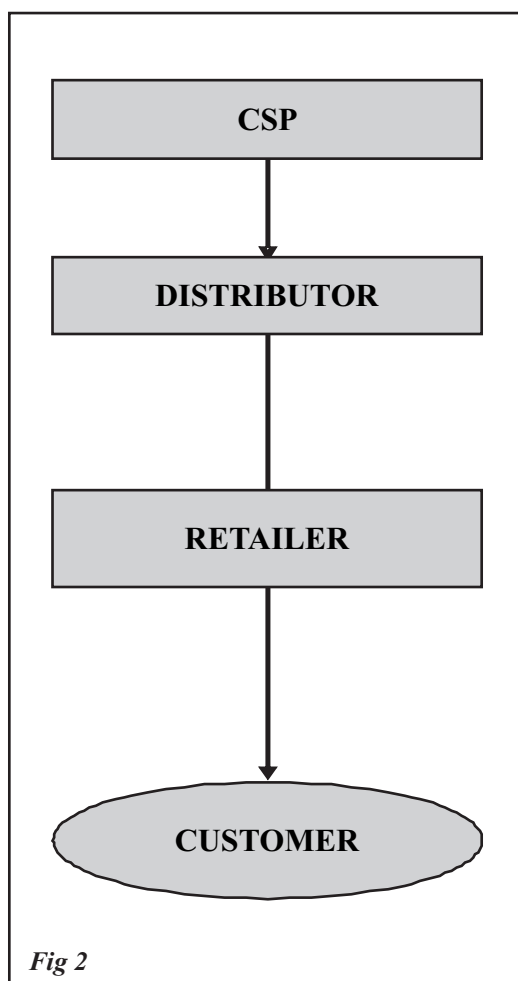
1. Gives the blank SIM card to the distributor
2. Allots him a budget of Rs.135 to be given to retailer after activation of the SIM card
3. Gives the blank SIM card to the retailer for sale
4. On receiving the request for activation of the SIM card from the retailer and on submitting the T&C to the company, the distributor receives Rs.135 from the company to be given to the retailer.

Rs. 99/-	From the customer
Rs. 60/-	Paid to the distributor
Rs. 39/-	Profit for the retailer

5. Recharges the blank SIM with Rs.195 to convert it to Lifetime validity plan
6. Sells the activated SIM card to the customer for Rs.99
7. Receives Rs.135 budget from the distributor

However, in the process, the retailer always claimed that the distributor never passed on the amount of Rs.135 given by the company to him (called as his CLAIM) and hence, he was unhappy.

CASE II (Also followed previously by the CSP) :



Here as shown in Fig. 2, this approach solved the problem of retailer investing Rs.195 along with the problem of not getting his CLAIM from the distributor. In fact, this increased the no. of activating counters from 33% to 72% in the Solapur, thus increasing sales. Problems with this approach: Here, the problem of retailer not getting his CLAIM (Rs.135) was solved as the recharge of Rs.195 is done by the distributor and not by the retailer, thus reducing the retailer's investment to zero. However, since Rs.195 are being invested by the distributor, if the distributor doesn't get all his activations done in the same month, his investments got stuck over for the next month, thus making the distributor unhappy.

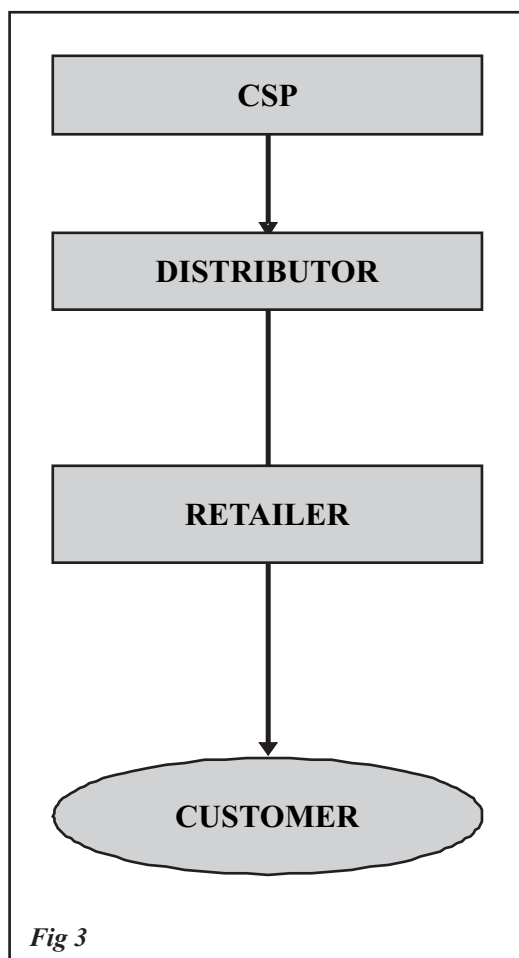
Rs. 99/-	From the customer
Rs. 60/-	Paid to the distributor
Rs. 39/-	Profit for the retailer

- 1 Gives the blank SIM card to the distributor
2. Allots him an amount of Rs.135 per activation
3. Recharges the blank SIM card with Rs.195
4. Gives the activated SIM card to the retailer
5. Obtains the documents (T&C) from the retailer and submits the same to the company
6. Receives Rs.135 as his budget from the company and collects Rs.195-135=Rs60 from the retailer. Thus the amount paid by the retailer=Rs.60
7. Sells the activated SIM card to the customer for Rs.99

This approach solved the problem of retailer investing Rs.195 along with the problem of not getting his CLAIM from the distributor. In fact, this increased the no. of activating counters from 33% to 72% in the city, thus increasing CSP's sales.

Problems with this approach: Here, the problem of retailer not getting his CLAIM (Rs.135) was solved as the recharge of Rs.195 is done by the distributor and not by the retailer, thus reducing the retailer's investment to zero. However, since Rs.195 are being invested by the distributor, if the distributor doesn't get all his activations done in the same month, his investments got stuck over for the next month, thus making the distributor unhappy.

CASE III (Being followed presently) :



As shown in Fig.3, this approach solves the problem of distributor investment of Rs.195 getting stuck over for the next month but is still a cause of concern for the distributor as his investment may get stuck over to the next month if the T& C documents for the present month's last date are not collected by him by the end of the day.

Rs. 99/-	From the customer
Rs. 60/-	Paid to the distributor
Rs. 39/-	Profit for the retailer

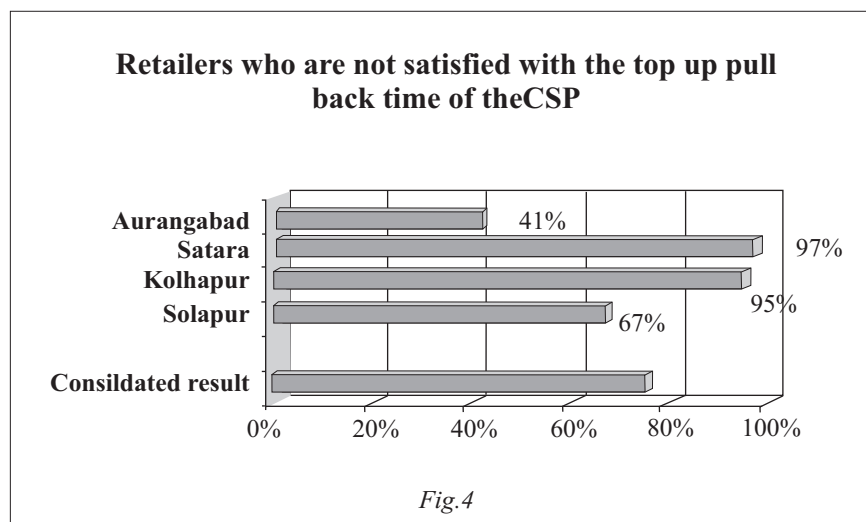
1. Gives the blank SIM card to the distributor
2. Allots him a budget of Rs.135 per activation
3. Gives the blank SIM card to the retailer
4. Recharges the SIM card with Rs.195 instantly (assuming that the T&C has already been received by the retailer)
5. Collects the documents at the End of Day immediately, submits them to the company and receives his budget of Rs.135 by the end of the month.
6. Sells the activated SIM card to the customer for Rs.99, collects the T&C from him and immediately calls the distributor for activating the SIM card by recharging with Rs.195.

This approach solves the problem of distributor investment of Rs.195 getting stuck over for the next month but is still a cause of concern for the distributor as his investment may get stuck over to the next month if the T&C documents for the present month's last date are not collected by him by the EoD (End of Day).

Data Analysis & key findings in order of priority according to the feedback from retailers

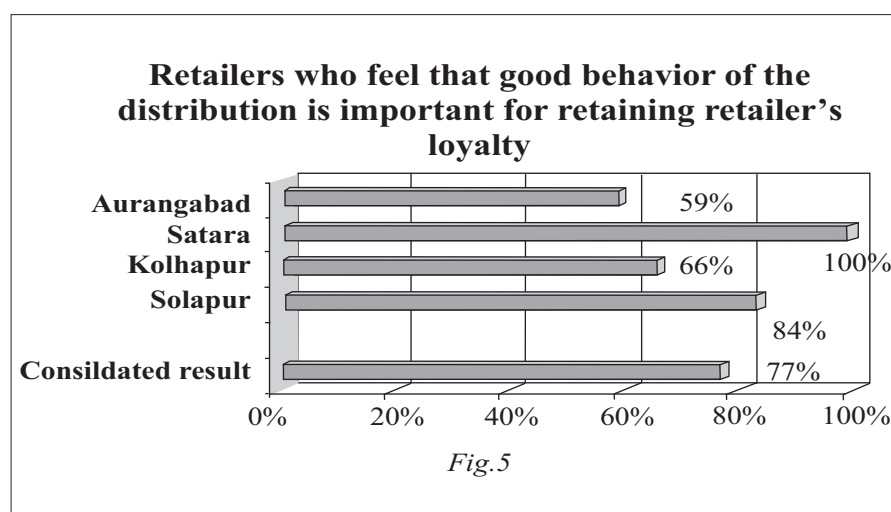
1. Top up Pull back time:

It is the time taken by an operator for reversing the wrong recharge amount back to the retailer. This is an important factor because considering the fact that the retailers get only 2.5% on RCVs, one wrong recharge can take away a retailer's entire day's profits. The CSP either took a long time in processing these requests or in many cases, did not process them at all. From the figure below we can see that about 80% of the retailers are dissatisfied with the pull back facility provided by CSP.



2. Good behavior of the distributor:

As is common knowledge today, everything boils down to the human touch. A total of 78% retailers said that distributors' behavior is an important factor which decides the retailers' loyalty.



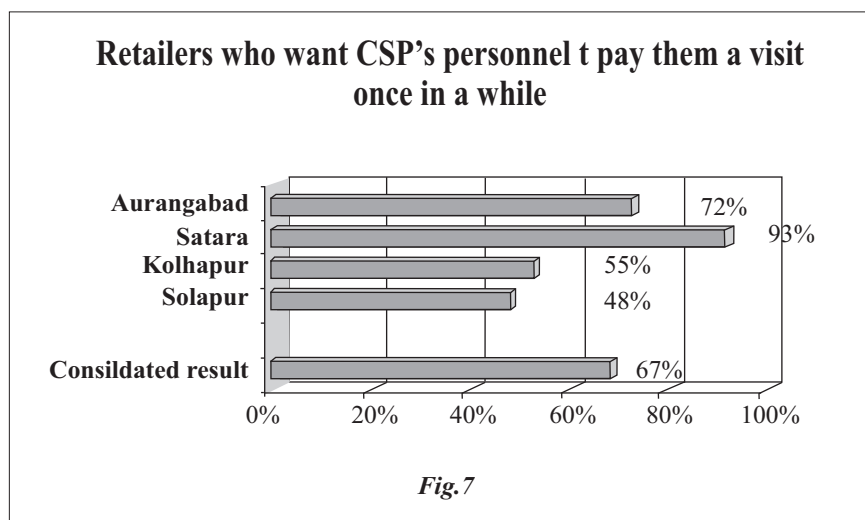
3. Good schemes:

Good and innovative schemes help the retailers a lot in attracting customers which ultimately leads to an increase in their loyalty towards that company. This fact is supported by about 70% of the retailers .



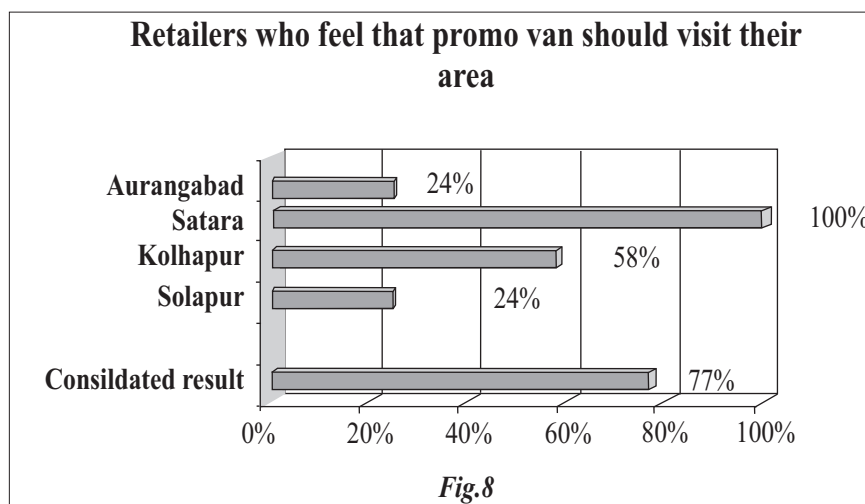
4. Number of retailers who want CSP's personnel to visit them once in a while to address their grievances:

67% of total retailers feel that regular visits by the CSP personnel's will affect their loyalty towards the company.



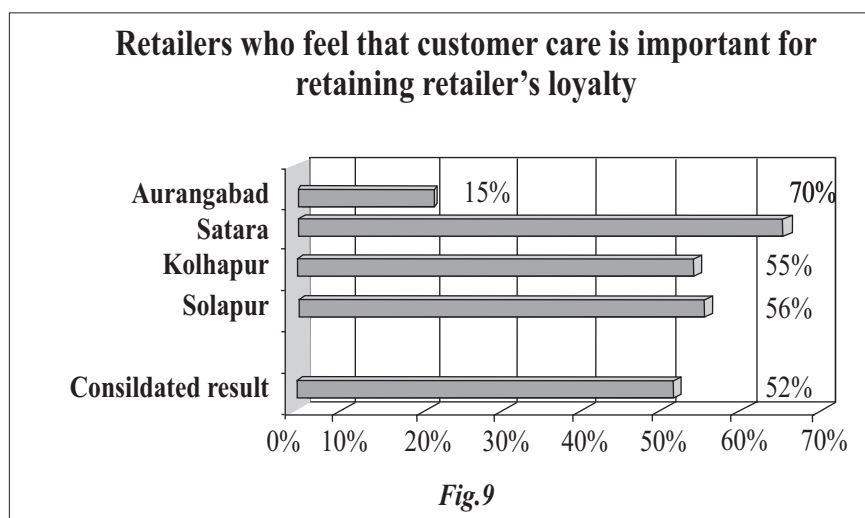
5. No. of retailers who want promo vans to visit their areas:

55% of the total no of retailers feel “Jo Dikhta Hai, Woh Bikta Hai” and so would like the CSP's promo vans to stand outside their shops on a regular basis.



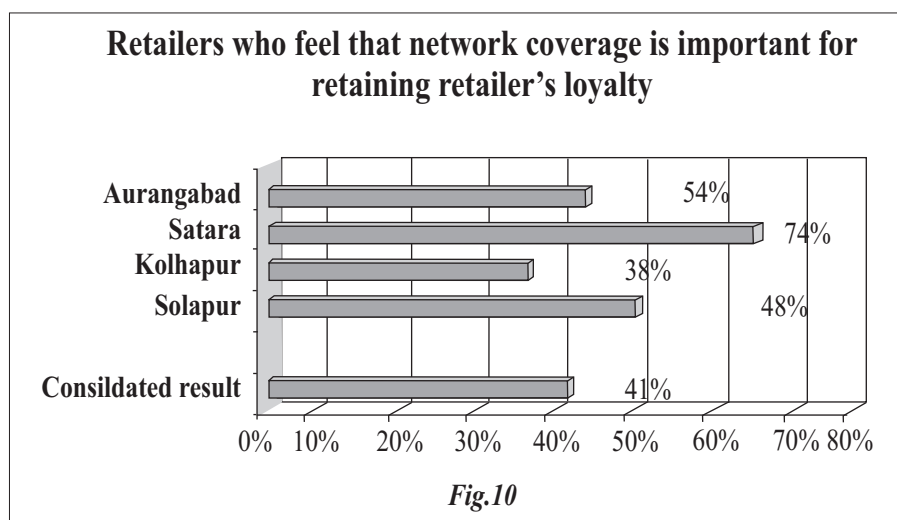
6. Good customer care:

The effectiveness of the operator's customer care has a positive effect on the loyalty of the retailers. A total of 52% of total retailers interviewed echoed this opinion.



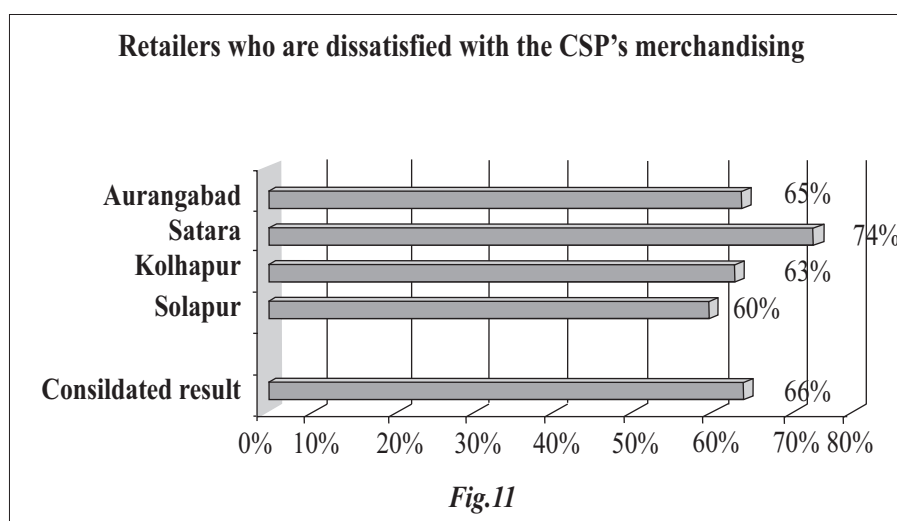
7. Better network coverage:

In all, a total of 41% retailers feel that better network coverage affects a retailer's loyalty towards the operator.



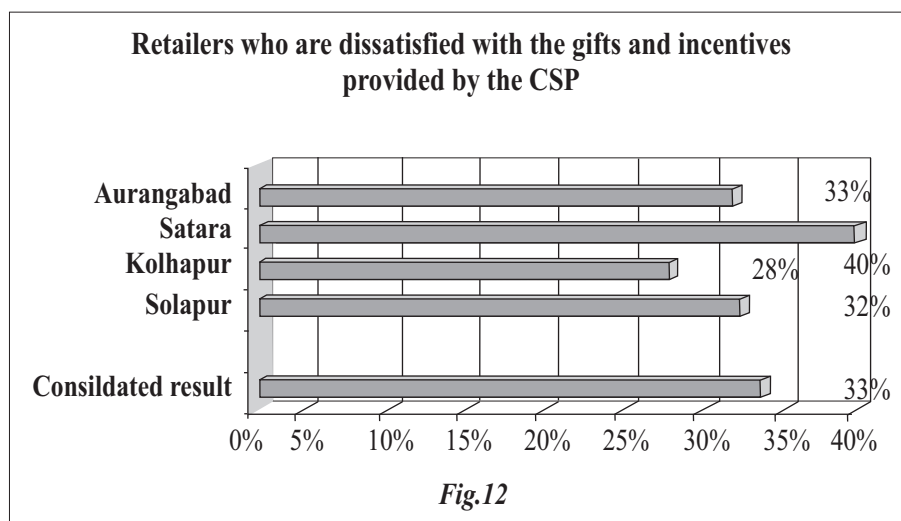
8. Visibility and Merchandizing:

The fact that merchandising helps in attracting and retaining customers is supported by 34% of total retailers visited.



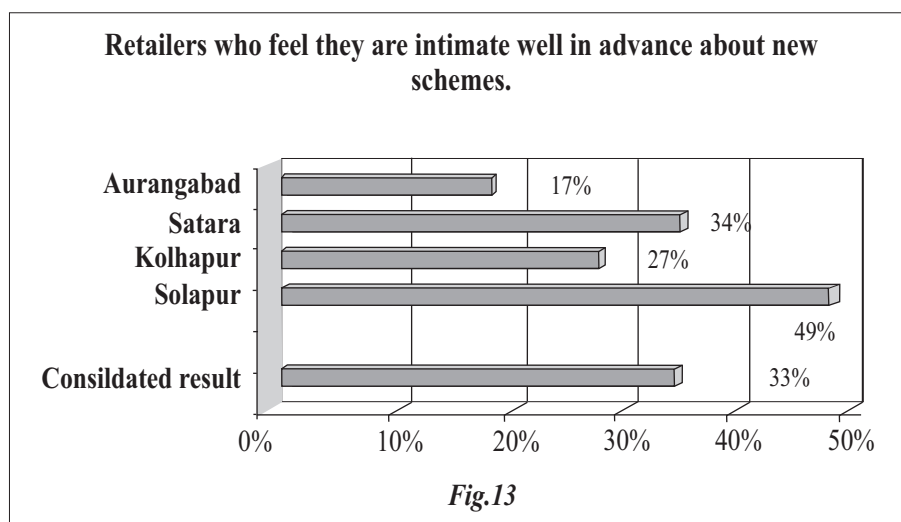
9. Incentives and gifts provided by the company to the retailers:

33% of total retailers feel that attractive incentives and gifts make them loyal towards the company.



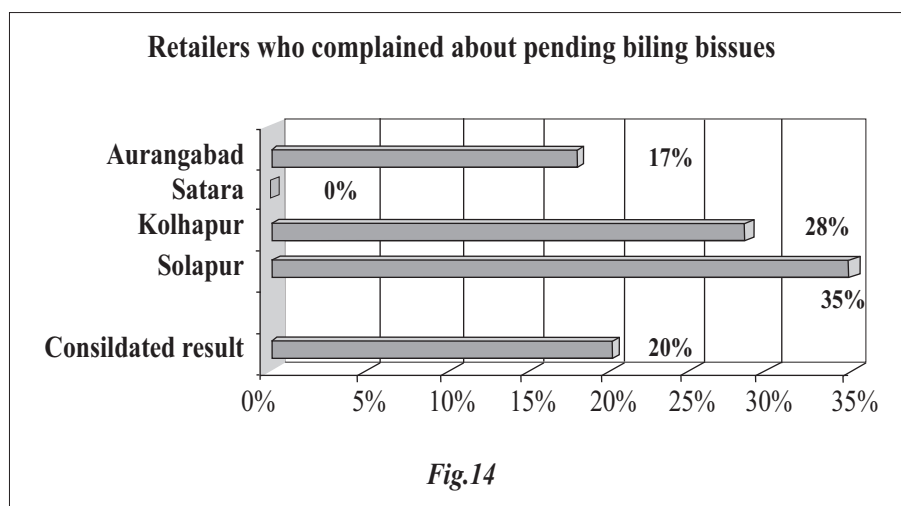
10. Prior information about the schemes launched by the operators:

It is important that a retailer should be informed of any new schemes that the operator is about to launch. Such information will not only help the retailer prepare for the new scheme but will also increase his loyalty towards the operator as he gets a feeling of belongingness towards the operator. Only 33% of total retailers said that they get information well in advance about the new schemes.



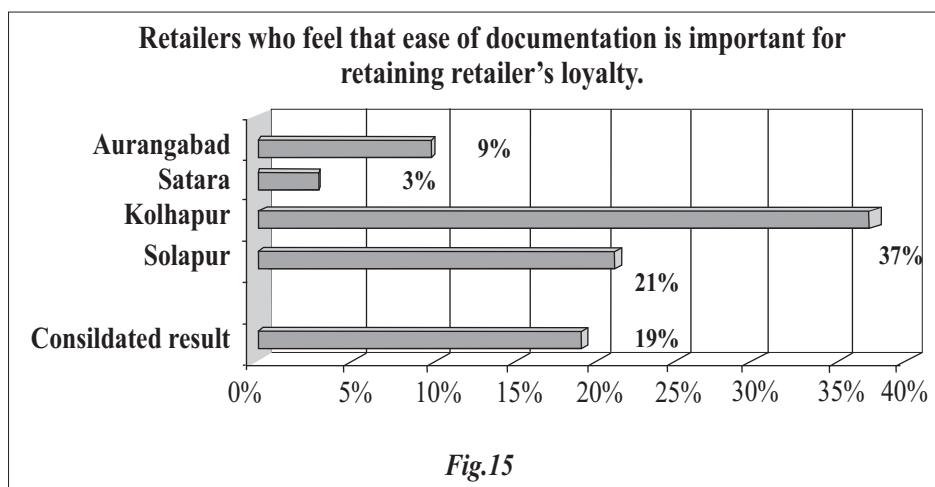
11. Pending billing issues:-

Any pending billing issues adversely affect retailers' loyalty .20% of the total number of retailers visited have pending billing issues with CSP making this factor a cause of worry for CSP.



12. Ease of documentation procedure:

In all, 19% of the retailers surveyed think that the ease of a company's documentation procedure goes a long way in increasing retailers' loyalty.



13. Malpractices:

It was also observed that certain distributors in certain cities were taking bribes from the retailers to give them adequate stocks of products which were high in demand in the market. Those retailers who did not give bribes to the distributors were completely ignored while giving the stock of these products to retailers, making them unhappy. This leads to the loss of confidence of the retailer in the company and its distributors thus adversely affecting his loyalty toward the company.

14. Many retailers were also disturbed by the fact that many customers were unhappy because the CSP had activated Value Added Services (VAS) for them without their approval and charged them for the same.
15. Many distributors were also unhappy with the targets they received by CSP. They felt that since they were the people who were working at the grass root level, they best knew the markets they operated in and hence were of the opinion that CSP should decide upon their monthly targets after consulting them.
16. Many retailers also complained that they faced problems in selling CSP's SIM cards because the talktime provided by the company on a particular recharge was less as compared to that provided by other operators.
17. Many retailers were also of the opinion that activating a new CSP's connection took a longer time as compared to others. This was because unlike others, CSP did not have an automated SMS based new connection activation system.
18. It was observed that most of the retailers were reluctant in selling VAS (even though it was more profitable than selling Recharge Vouchers (RCVs)) because selling a Value Added Service was a highly time consuming process for the retailers as it involved making calls to the CSP Customer Care, determining the code for that particular VAS and then activating that VAS for that particular customer.
19. Many retailers were also unhappy with the fact that in the recent past, CSP has been selling Value Vouchers to its customers through direct Interactive Voice Response (IVR) calls to the customers. This, they said, was taking away a pie out of their revenue.

Proposed Scheme for sale & activation of SIM cards:

The blank SIM card given by the company should be pre-activated by the company itself (This would eliminate the risk of investment by the distributor/retailer)

OR

Along with the blank SIM card being provided by the company, the company should provide a paper voucher of Rs. 195 within the SIM card package.

Recommendations:

1. As majority of the retailers are dissatisfied with the top pull back time mechanism, a faster top up pull back time mechanism should be put in place.
2. A sizeable number of retailers feel that good behavior of the distributor is important for retaining retailers' loyalty. Hence CSP should take an initiative towards improving the Distributor-Retailer relationship.

3. As most of the retailers are dissatisfied with the small number of visits by distributors and the CSP's personnel the CSP should encourage Distributors and its personnel to visit the Retailers regularly so that their grievances are addressed.
4. A large number of the retailers feel that good schemes are important for retaining retailers' loyalty. Hence CSP's should try to gain the first mover advantage by launching new and innovative schemes.
5. About 2/3rd of retailers are dissatisfied with CSP's merchandising. Hence CSP should take care that the merchandises reach the retailers on time and in enough quantities.
7. According to a half of the retailers interviewed the visit of promo-van increases the visibility of the CSP and hence if feasible the promo van should be sent in more areas.
8. If the CSP's customer care department solves most of the customer's problems the retailer will not be troubled by the customer's queries .Almost half of retailers said it will contribute towards increasing retailer's loyalty. Hence the CSP should put in place an efficient customer care practices.
9. AS per the retailers network coverage is important for retaining retailers' loyalty. Hence the CSP should arrange for better network coverage in the areas where it has weak network coverage.
10. About 2/3rd of the retailers are not intimated well in advance about new schemes. This leads to loss of business due to retailer's unawareness. Hence CSP should take care that more and more retailers are informed well in advance about the launch of new schemes and details associated with the scheme.
11. In order to attract more retailers and retain the older ones, CSP should provide more target based gifts and incentives.
12. Retailers have complaints about pending billing issues. Hence CSP should take care that these issues get resolved faster and easily.
13. The model being followed (Fig. 3) for selling and activating new SIM cards is very efficient as it prevents any blockage of the retailers'/distributors' funds. If distributor satisfaction level is also to be increased, the proposed model where the company provides pre-activated SIM cards should be followed.
14. Cellular service providers should check that malpractices such as bribes etc. are eliminated from the system.
15. Distributors' monthly targets should be decided after consulting the distributors.
16. It is recommended that CSP should also put in place an SMS based automated SIM Card activation system to speed up the activation process for a new connection.
17. The procedure for selling the VAS to the customer should be simplified so that it consumes lesser amount of time.

Conclusion

CSP'S like Idea, Airtel & Vodafone are having big market share & are among the top three players in Maharashtra. However, they still have a fair distance to go. Moreover, as the competition heats up, certain factors described above may lead to decrease in retailers' and distributors' loyalty towards CSP. The findings and the recommendations described above will help the company in understanding the mindset of the retailers and the distributors, thus helping the company to increase its retailer's loyalty and hence the customer base.

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Appendix

The questionnaire used for the survey

1. Which of the following are the operators whose SIM cards you sell/stock?
 - a. Airtel
 - b. Idea
 - c. Vodafone
 - d. Reliance
 - e. Tata Indicom
 - f. BSNL
2. Which operator is more popular here?
 - a. Airtel
 - b. Idea
 - c. Vodafone
 - d. Reliance
 - e. Tata Indicom
 - F. BSNL

3. What are the daily sales for different operators?

	Airtel	Idea	Vodafone	Reliance	Tata Indicom	BSNL
SIM Cards						
RCVs						
VAS						
TOTAL						

4. What motivates you to sell the products of a particular operator? Choose from the following list and arrange them in decreasing order of preference:

- i. Good behavior of the distributor
- ii. Market pull
- iii. Supply push
- iv. Better network coverage
- v. Good schemes
- vi. Hassle free settlements
- vii. Innovativeness of the operator in launching new schemes

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____
- f. _____

5. List the operators in decreasing order of preference on the basis of the ease of their documentation procedure.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

6. List the operators in decreasing order of preference on the basis of their network coverage and network congestion (QoS) in your region.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

7. List the operators in decreasing order of preference on the basis of the customer care service offered by various operators.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____

8. List the operators in decreasing order of preference on the basis of the clarity of schemes offered by them.
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____

9. How frequently does your distributor or his sales personnel visit you? Are you satisfied with the number of visits?
 - a. Less than 2 times a week
 - b. 3-4 times a week
 - c. 5-7 times a week
 - d. More than 7 times a week

10. List the operators in decreasing order of preference on the basis of the behavior of their distributors. (Ex. The operator whose distributor is most polite occupies the top-most position)
 - i. Politeness
 - a. _____
 - b. _____
 - c. _____
 - d. _____

 - ii. Cooperativeness
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____

 - iii. Rudeness
 - a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____

iv. Arrogance

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

11. List the operators in decreasing order of preference on the basis of your relationship with the distributors of various operators.

- A. _____
- b. _____
- c. _____
- d. _____
- e. _____

12. List the operators in decreasing order of preference on the basis of pending billing issues with its distributor. (Ex. The operator whose distributor has the most number of pending billing issues with the retailer occupies the top-most position)

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

13. List the operators in decreasing order of preference on the basis of how well in advance the operator informs you about the latest schemes offered by him.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

14. Do you have enough stock of RCVs and SIM cards of various operators? If yes, how much? If not, how much would you like it to be?

	Yes/No.	Airtel	Idea	Vodafone	Reliance	Tata Indicom	BSNL
SIM Cards							
RCVs							

15. List the operators in decreasing order of preference on the basis of customer's preference.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

16. List the operator most preferred by the following age groups. Also state the reason for the same.

Age Group	Preferred Operator	Reason
15-25 Yrs.		
25-40 Yrs.		
40-60 Yrs.		
>60 Yrs.		

17. List the operators in decreasing order of preference on the basis of the attractiveness of their in-shop/outdoor visibility and merchandizing schemes.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

18. List the operators in decreasing order of preference on the basis of their top-up pull back time.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

19. List the operators in decreasing order of preference on the basis of the attractiveness of their gifts on achieving a particular target.

- a. _____
- b. _____
- c. _____
- d. _____
- e. _____

20. Are you aware of any differences (if any) in the rates of new SIM cards in nearby regions? If yes, which are the operators who follow differential pricing?
- a. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
21. Which operator's marketing personnel visit your shop regularly and spend time helping you out with the sales? List the operators in decreasing order of preference.
- A. _____
 - b. _____
 - c. _____
 - d. _____
 - e. _____
22. Would you like to have an operator's mobile promotion van in front of your shop once in a while?
- a. Yes
 - b. No
23. Subjective remarks by the retailer:
- _____
- _____
- _____
- _____
- _____
- _____
- _____

Retailer Details:

- Name:
- Education: • Age:
- Store address:
.....
.....
- Mobile # Landline #
- E-mail id:
- Primary Business Own/ Assistant
- e-recharge(through the mobile)/Paper recharge vouchers
- Description of area
.....
- Other observation:
.....
.....
- Date: Signature & stamp

“TURNKEY SOLUTIONS IN MOBILE INFRASTRUCTURE - MARKET ANALYSIS, FEASIBILITY STUDY & EVALUATION OF IMPLEMENTATION STRATEGY”

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Abstract:

Infrastructure Sharing as a stand-alone business model is at an inflection point as far as the Indian telecom industry is concerned. The roots of Infrastructure Sharing go way back to the mid 90's where operators mutually shared cell sites in order to enhance their coverage capabilities. However a more planned and thought out structure of Infrastructure Sharing started only from the year 2006 when the DoT started its ambitious “Project MOST”.

Infrastructure Sharing has become more prominent in the last few years and many IP-1 companies have started operations and have rolled out tens of thousands sites amongst them. However, they find themselves at a crossroads as most operators are coming together to form tower companies of their own (Eg. Indus Towers) or are hiving off their own infrastructure arms to make their telecom business model asset light and subsequently increasing their own valuations (Eg. Reliance Infratel) and unlocking shareholder value, hence the need for newer business opportunities is more dire for IP-1 companies than ever before, as they suddenly find that very little business is coming their way from the operators.

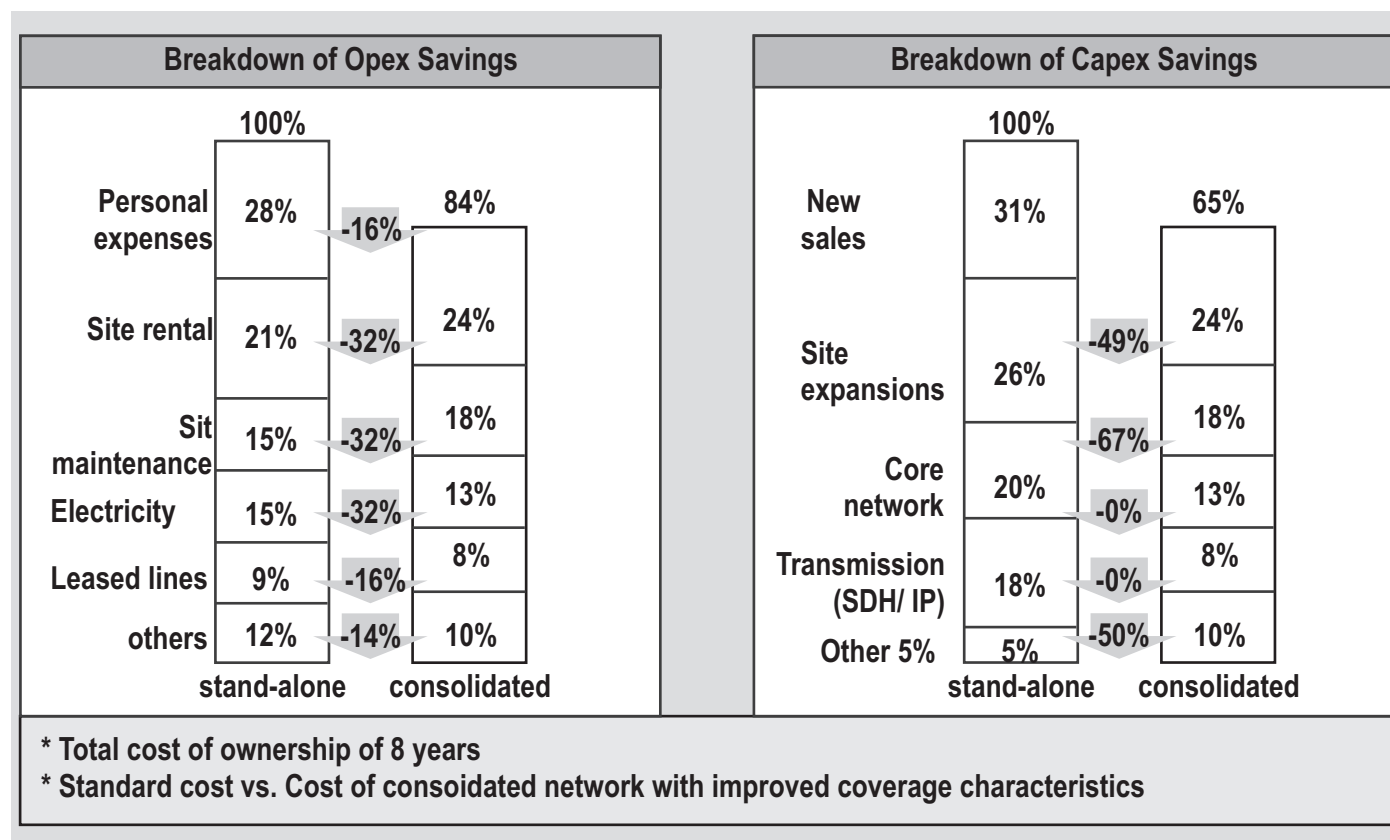
Amongst the various options that the IP-1 players have to enhance their business opportunities, the most promising seems to be that of the Turnkey Solutions space as these companies have already built up their scales w.r.t commissioning of cell sites and maintenance of the same.

Need for Infrastructure sharing: In 2006, when the Department of Telecom started the infrastructure sharing project named as “Project MOST”, a lot of players were attracted to what seemed to be a very alluring business proposition: That of commissioning cell sites for operators and leasing them out for an extended period of time, the minimal lock in period being that of 10 years. This suited the operators as well, as it reduced CapEx substantially and OpEx was also shared amongst multiple operators. To add to it, there were no overheads such as maintaining staff for the routine Operations and Maintenance activities.

Thus a few IP-1 license holders (passive infrastructure license) that gained prominence in this period included GTL Infrastructure Ltd., The SREI Finance backed Quippo, Essar Telecom Infrastructure Limited and a few other players such as Aster, TVS-ICS etc. They were very quick in obtaining Master Service Agreements (MSA's) with all the operators. The companies here desired to follow the examples which were already set in more matured telecom markets.

Following is an illustration which explains why infrastructure is sharing such an attractive option:

As illustrated above, infra Sharing presents itself as a compelling case for operators. However in many of the markets, there are regulatory constraints due to which operators have been unable to exploit this option to the fullest. For instance, in India, it has been indicated that spectrum sharing will never be allowed. However, active



infra sharing is coming in, primarily through the sharing of backhaul and feeder cables.

The growth in wireless mobile subscribers in last one year has been phenomenal and over 7 million new mobile customers are being added every month. Due to intensive growth, intra-site distance of base units are reducing drastically and the formation of such cluster of base units opens a new opportunity of sharing the infrastructure which could be passive as well as active. The benefits or pay off are listed as under-

- To reduce the capital expenditure.
- Quick rollout of the network and thereby inflow of revenue.
- To reduce the operating cost.
- To improve the city skyline.
- Optimum utilization of national resources and hence improved economic efficiency.

Thus, to start with, infrastructure sharing promised to start a whole new industry. However they hit a major stumbling block when operators decided to turn their infrastructure units, which till then were a cost centre, into a profit centre by hiving them off and valuating them independently.

A fitting example would be that of WTTIL, the hived of passive infra arm of Tata Tele Services Limited. Initially, TTSL's towers were valued on the basis of a single operator (TTSL's CDMA services). However, as Tata Communications are all set to launch their Wi-Max services and TTSL is about to launch GSM services, the

valuations of these towers have suddenly tripled. This is the kind of exponential growth in valuations that the operators are now getting, which enabled WTTIL to offload a 49% stake to Quippo at unheard of rates.

Turnkey Solutions for Infrastructure Roll out :

Therefore, the scenario that is being faced by most IP-1 players is a very complex one. On one hand, established operators have stopped giving the IP-1 players business owing to their own infrastructure arms blooming well and aiding them in raising more capital, hence the proverbial cash cows are no longer supplanting them as their cash cows, on the other, there are new operators coming up, but their roll outs will be limited as they spreading nationwide would be a laborious and a time consuming process. With BSNL planning their entire infrastructure roll out based on the BOOL model, this is another opportunity for the IP-1 players, however, they still need to grow beyond their traditional revenue generator Passive Telecom Infrastructure (Tower, Shelter, DG etc)

Hence a need to evaluate new business models which are easily scalable within the organization. In other words, entering new businesses where the company's natural/acquired skill sets can be employed to grow the existing business beyond self imposed boundaries. One of these is providing operators a Turnkey Solution for Infrastructure Roll-Out. This includes all activities from RF survey of the site to obtaining clearances such as SACFA and culminating with the actual commissioning of the sites.

The other opportunities that IP-1 players are considering exploring are In-Building Solutions and Operations and Maintenance.

In-Building Solutions

It has been estimated that about 70% of all calls originate and terminates indoors. Hence there is a pressing need for enhancing coverage indoors; this is done by installing repeaters and antennae throughout the building at certain points.

There are about 700 malls/multiplexes/hospitals that are coming up in the top 20 cities in the country. They will need a solution where multiple operators could come in and enjoy the benefits of enhanced coverage. This access point will be set up by the IP-1 player and the operators will connect their backhaul to the same. In turn the IP-1 player will charge a fixed rental to each operator.

The need for IBS is due to the following reasons:

- Every operator has a separate network with it's own identity in each service area/circle.
- The operator's subscribers in his own service area are captive to his network alone and cannot latch on to any other operator's network in the same service area.
- When a subscriber from any network/service area/circle goes on roaming in other network/service area/circle, no matter to which operator he originally belongs to, he will latch on to the best network in the roaming area.
- In order to ensure that all roamers coming from outside (referred as 'In Roamers') latch on to his network, each Operator wants to ensure that his coverage is the strongest.
- If 70% of the calls are being originated from inside the buildings then the 'In Building Coverage' of the operator needs to be very strong. Hence the 'In Building Solutions'
- On the other hand by providing a good IBS the operator also ensures that all his local Subscribers also remain satisfied.

Hence this is the dual aim of the operator through an IBS.

Operations and Maintenance Contracts

This is the easiest way for the IP-1 player to expand. The reasons for this are the following

- 1) Operators already have their own installed sites, hence have a functioning O&M team already in place in each and every circle that they operate in.
- 2) In the age of outsourcing, Operators are looking at outsourcing most of their non core operations to third party vendors; hence the IP-1 players have a willing customer to start with.
- 3) Clients are easily accessible as the IP-1 players have an inroad made already due to their BOOL operations.
- 4) It can be considered an extension activity for their Turnkey Solutions business (Provided they already have one in place).

Turnkey Solutions: An Overview

India, it is estimated, will need 300000 cell sites by 2010, which is approximately double the number of sites that we now have. This project mostly explores the opportunities that Essar Telecom Infrastructure Pvt. Ltd can have in this space.

As explained earlier, Turnkey Solutions are provided to the operators for building passive infrastructure at a pre-determined (mostly) rate of profit and hence reduce the number of personnel and processes that the operator has to otherwise employ in order to create the passive infrastructure.

Components of Passive Infrastructure:

Passive infrastructure has two important components

- 1) Product Components.
- 2) Service Components.

Product Components:

Some of the Product Components include

- Pole/Mount
- Tower
- Tower Accessories (Cable, Aviation Lamp & Cables, Horizontal Cable Tray, Template & Foundation Bolt)
- Diesel Generator
- Shelter (As per sizes given in tech, specs) 3X2.5X2.7 Mtrs
- PIU for three phase 15KVA with PS Switch
- SMPS 48V/50A, (2+1)
- Battery Bank 300AH*2
- Air - Conditioners 2 nos of 0.9 TR & Common Controller (considered domestic AC)
- Fire Extinguisher

These typically are sourced from vendors, except for some critical components such as the basic tower construction which are largely made in house.

Service Components:

Apart from the product components, there are many services that are required to be done before the site construction can actually start. These typically entail

- Soil Testing
- Site Acquisition
- Statutory Clearances
- Liasoning with state electricity boards.
- Project Management
- Warehousing and Logistics

These costs are to be factored in while commissioning sites in the TSP model.

7.2 Business Scenario

There are a few companies which have been playing in the TSP space for almost the last 10 years. Most prominent amongst these is GTL, which is probably the most well known amongst the companies providing Network Solutions. As all IP-1 players realize that there is substantial revenue to be earned in the TSP model, almost everyone is entering this space. The other prominent names include Aster, TVS-ICS and Xcel Telecom.

Most of the interest in this business arises due to the fact that India needs about 200,000 towers by 2010 and at least half of these will be rolled out by Operator backed Infrastructure companies and by Active Infrastructure providers like Nokia-Siemens and Erricson.

Scope of the study and Methodology:

The Following were the objectives of the study:

- 1) Demand estimation in all circles for the requirement of creation of new infrastructure.
- 2) Determine the number of towers to be rolled out in BOOL mode, Towers to be created by active infra providers and the towers to be erected by the operators themselves.
- 3) Competitive landscaping of the existent TSP players (GTL, Aster) in terms of market share and project execution capabilities.
- 4) Determining which other players are present and operating in the market for TSP.
- 5) Making a basic commercial proposal.

The following methodology was adopted to gather the data:

- 1) To gather the primary data, contact was established directly with the operators through the Key Account Managers that Essar employs in each of the circles it operates in.
- 2) Competitor mapping was attempted through two routes Secondary data available on the internet was used evaluate the competition and then a survey was sent across to attempt and gather primary data. However no one from the competition was forthcoming and hence no primary data was collected.
- 3) Essar has a strong line up of suppliers and hence can offer the operators an attractive price point for both Roof Top Towers as well as Ground Based Towers. For this purpose, supplier data was analyzed and a financial proposal was drafted, considering the best quotations and keeping one eye on the desired quality standards.

The surveys were carried out in the following circles:

Madhya Pradesh, Mumbai, UP East, UP West, Andhra Pradesh, Gujarat, Tamil Nadu, Bihar and Jharkhand, Kerala, Maharashtra, Orissa, Karnataka, Rajasthan.

A snap shot of the data gathered for towers being commissioned by Non-BOOL means was as follows:

Vodafone	Airtel	TSL	Idea	BSNL	Airtel
23560	37100	14550	20900	19700	5270

These roll outs will be done in FY 2009 by a combination of operator owned infrastructure companies as well as active infrastructure providers.

As has been in the news off late, Multi-billion dollar contracts have been awarded to vendors such as Nokia, Erricson, Huawei and to a lesser extent to Motorola. Alcatel-Lucent also has some contracts, mainly in the CDMA domain.

These players typically bid for entire network solutions. Their scope of work includes everything from RF-Surveys to Site Acquisition to commissioning. The passive side of the infrastructure is not their expertise and hence is often outsourced to third party service providers.

These represent a huge potential for getting the business from, as the number of sites they are rolling out are huge and no single player can fully meet their demands.

For ETIPL, there is an added advantage as Essar is already into the Operator space through BPL Mobile and Loop Telecom and its holding in the Vodafone Essar JV, which ETIPL can leverage for garnering contracts.

ETIPL, it can be said, is almost a late mover in the TSP space as many other players are already well entrenched here. But, due to its strong brand presence, and its excellent rapport with all operators, it still can hope to garner 15% to 20% of the total Turnkey Solutions Market in each of the circles.

GTL Limited:

GTL Limited, The flagship company of the Global group, is the oldest player in the Telecom Networks industry in India. It is the biggest competitor in terms of numbers and market share and is a very well entrenched player.

A primary data survey was attempted with GTL, however it did not elicit any response from them.

The company is strong in Maharashtra & Goa, Gujarat, Madhya Pradesh, Rajasthan, Karnataka, Kolkatta, UP (E), Punjab, West Bengal, UP (W), Haryana, Bihar, Andhra Pradesh, Assam and Tamil Nadu and has rolled out networks across India.

It is also gearing up for active infrastructure sharing in alliance with Vanu Inc. and most importantly, has a tie up for turnkey solutions with Erricson for Turnkey Solution Provisioning.

The most interesting aspect about GTL though is that, at the time of carrying out this project GTL and ETIPL were engaged with an eye on marriage. The due diligence had started, however the deal did not go through, as

ETIPL, with the highest occupancy ratio at 1.9 is valued at around 6500 crores with approximately 3500 towers occupied and a few more whose status is RFIEE. Also, Loop telecom is starting operations in new circles in about 6 months time, wherein ETIPL's network roll out expertise will be invaluable. Also, the Essar brand motivated many of the employees to resist the aforementioned merger.

Aster Teleservices:

Aster Teleservices is another major company which has an edge in terms of manufacturing capabilities. It is also a well entrenched player and has international roll out experience as well.

Its proven skills include

- Site Construction Services including Civil, Structural & Electrical works
- Supply and Erection of Towers
- Installation and Commissioning of BTS Equipment
- Installation and Commissioning of Microwave Equipment
- Operation and Maintenance of OFC Networks
- Project Management Consultancy

It has tie ups with several operators and is especially strong in the southern part of the country.

It is also well established in the Turnkey Solutions space and has worked with most Active/Passive Infrastructure providers.

It has international exposure in countries such as Mauritius, Sri Lanka, Afghanistan and Cambodia.

Xcel Telecom:

Xcel Telecom is a company recently founded by an ex executive of BPL mobile. The company has received funding from foreign VC funds and is quite cash rich.

The company's Turnkey Services Bouquet include

- 1) Architectural and engineering
- 2) Capacity planning & expansion
- 3) Co-location services
- 4) Legal & regulatory compliances for the site
- 5) Project management services for installation & commissioning of radio equipment & other electronics
- 6) Built to Suit Solutions

It operates out of ten circles, which are Maharashtra and Goa, Assam, Andhra Pradesh, Bihar, Mumbai, Kolkata, Rajasthan, Punjab, Orissa and Karnataka.

It is a relative new comer and has had an excellent growth rate in the past year.

Spanco Telesystems and Solutions Limited :

Spanco is also a well established name in the telecom industry. Though not as big as GTL or Aster, it is still a formidable competition in some of the circles that it operates in.

The circles in which it operates are Mumbai, Maharashtra, Haryana, Punjab, Andhra Pradesh, Chhatisgarh, Madhya Pradesh, UP (E&W), Orissa and Rajasthan.

It's Services Include Designing, acquisition, procurement and building of the passive infrastructure for the Cell sites (GBT & RTT).

TVS ICS:

TVS ICS belongs to the TVS group and is headquartered in Bangalore and has manufacturing facilities in Madurai.

TVS also has a presence in some active components such as connectors and certain cables. It also designs and manufactures telecom components.

They have tie ups with many operators. Its bouquet of turnkey services include

- 1) Site Survey - including planning regulations and landlord negotiations leading to acquisition
- 2) Permissions-Satisfying all the Government, legal and Statutory permissions
- 3) Construction - including vendor selection, logistics, installation and commissioning
- 4) Operation : including network monitoring, reactive and planned preventative maintenance
- 5) Programme Management
- 6) Operation and Maintenance

Ramboll Telecom:

Ramboll Telecom is an exceptional case to the normal competitor profiling.

Ramboll designs a special type of tower known as the Ramboll Tower, which is of a lighter weight and is well suited to be raised over buildings which are not very structurally sound.

Ramboll works with all companies, Operators, IP-1 players, Turnkey Solution providers and even Active infrastructure providers.

Others:

Nexus Connexions is another turnkey solutions provider but seems to be heavily concentrated in West Bengal only.

Laxman Televentures operates in UP East, UP West, Haryana and Rajasthan and has tie ups with operators and active equipment providers.

Financials:

Most financial information used to derive the financial proposal was confidential in nature and hence cannot be shared in this paper.

However the broad guidelines upon which the proposal was based is provided here.

The 2 basic types of towers are Roof top towers and Ground based towers. On an average, the height of a RTT is 24m and that of a GBT is 50m and all assumptions are based on the materials required for the same.

A typical site houses about four operators (i.e Anchor + three sharers). All material requirements, shelter size and the wattage of the diesel generator are based on this assumption.

The cost components consist of the product part as well as the service parts. The major heads have been considered here, though some of these may differ from circle to circle.

Product	Approximate Cost (in Rs.)	
	RTT	GBT
RTT/GBT Tower		
Tower	190000	820,000
DG - 15 KVA three phase	240000	240000
Shelter	100000	100000
PIU for three phase 15KVA with PS	160,000	160,000
SMPS 48V/50A, (2+1)	55,000.00	55,000.00
Battery Bank 300AH*2	190,000.00	190,000.00
Air - Conditioners 2 nos of 0.9 TR & Common Controller	40000	40000
Others	54000	54000
Total	1,029,000	1,659,000

Service	Approximate Cost (in Rs.)	
	RTT	GBT
Soil Testing & Design		7,500
Structural Analysis & Design	10000	
Foundation, Erection and Commissioning (Tower, DG and Shelter)	184000	615,000
Electrical Work	155000	220000
Guard Room		65000
Boundary Wall (With Wall, fence and Gate)		125000
Project Management (excluding Warehouse & Logistics) Urban	50000	50000
Project Management (excluding Warehouse & Logistics) Rural	75000	75000
Warehouse & Logistics Management	1800	1800
Statutory Clearances + Liasoning Charges	65000	65000
As Built Drawing	5000	5000
Total	5,45,800	12,29,300

Cost Components - Services:

Final Costs:

Final Cost (Approximate)

For RTT: Rs. 15,74,800.

With a 20% profit margin, the Turnkey Solution cost for an RTT would be Rs. 19 lacs (approximated)

For GBT: Rs. 28,88,300

With a 20% profit margin, the Turnkey Solution cost for a RTT would be Rs. 35 lacs (Approximated)

Conclusion:

As has been deliberated throughout the article, Passive Infrastructure players need to extend their horizons in order to survive and grow. The least risk-prone way of doing so is to diversify in areas where the companies already have resources in place. Hence turnkey solutions are such an attractive business proposition for IP-1 companies.

As has been projected, the addition of towers over the next couple of years is going to be over 150000. This fits in well with the plans of the IP-1 players who have the necessary resources in the circles that they operate in. However, the business has dried up due to active infrastructure providers (such as Nokia-Siemens and Huawei) and Infrastructure companies hived off by the operators are doing much of the commissioning. The fact remains that creating passive infrastructure is not the core-competence of the active equipment providers and hence a large chunk of contracts can be outsourced by these companies to IP-1 firms who already have economies of scale due to their existing operations.

Even if an IP-1 firm aims for 20% share of this market, it would result in the company augmenting its revenues substantially while maintaining its focus on their core business, that is creating sites to be shared by 2 or more operators.

Glossary:

IP-1 : Infrastructure Provider -1
BOOL: Build Own Operate and Lease.
RTT: Roof Top Tower
GBT: Ground Based Tower
MoST: Mobile Operator Shared Tower
CapEx: Capital Expenditure
OpEx: Operational Expenditure
WTTIL: Wireless Tata Tele
SACFA: Standing Advisory Committee for Radio Frequency Allocation
IBS: In-Building Solution
O&M: Operations and Maintenance
SMPS: Switched Mode Power Supply
TR: Tonnes of Refrigeration

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Infra Sharing paper by Booz Allen Hamilton

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Mobile/ Utility Payments: Life Made Easy

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Abstract

“Consumer is the king” is something which everybody knows. With the increasing disposable income and consumer confidence, the demands of customers are increasing day by day. The niche segments are eaten up by customization of products and services as well. It was a big challenge for technology to keep pace with customer's requirements.

In today's scenario customer needs everything at his doorsteps or finger tips. The companies need to innovate in order to survive in market. With innovation newer segments are created and one such new segment created is for one stop payment solutions. The market is in its nascent stage and there are various major players already and many more are waiting to jump in the bandwagon.

There are various distribution channels; like EDC terminals, Web based and mobile phone based. Each of these channels is further classified into various other modes. For e.g. mobile based services can be accessed from WAP sites, sms and by installing mobile based applications like Mobibuzz. Some companies are reaching through a network of retailers, while some are adopting direct mode by empowering the end customer to interact directly with their mobile phone. Airtel has come up with mChek for providing bill payment solution from their mobiles itself to its subscribers in South India. The market is new and will expand with time. So there is lot more to achieve. Services like water bill payments, house tax payments and specifically all transaction via cash are in great demand in market. Targeting a customer is also as important as targeting a retailer. So advertising and promotions are very important to aware the people for these services.

OVERVIEW: What's happening in the market?

Today the market is crowded with EDC (electronic data capture) terminals. One can find them on any retail shop. But most of the retailers are not happy with the bundled services offered by the service providers. Those who are happy do now know how to operate the device. So, there are still some gaps in the market which are required to be filled to obtain operational efficiencies.

There are various companies which have jumped on to this bandwagon are as follows:

EasyBill, Oxigen, PineLabs, Suvidha, Mchek, Obopay, Vodafone, Paypal, Ngpay

The list of competitors shown above includes competition from various segments. It includes organizations operating purely on EDC terminals, online transactions, transactions from mobiles, WAP, SMS etc. These organizations are targeting different segments of customer according to their strategy. But some organizations are covering almost all of the possible segments. However it seems that they are slowly heading towards the mobile mode of transactions that is empowering each customer to make his transactions and payments by his mobile. Some organizations are targeting the tourist segment by providing each service in the tourism chain. Some aggressive global players have not entered in the Indian market yet. But in future they have plans to cash down the potential of Indian market.

The terminal available in the market has following features/ specifications:

- CDMA Voice/Data Modem - Which provides it mobility as the retailer can move it to any location.
- Graphic LCD Display (Gray Scale, 72mm W x 48mm H) - The LCD display makes the usability easy for retailer. It looks just like a small PC screen and is very easy to use.
- Analog Telephony SLIC (Parallel Phone) - The terminal also provides a port which can be used as an extension if the retailer wants to use it as a normal extra phone.
- Hearing aid compatible Handset, Speaker Phone - The terminal is installed with handset and a speaker phone option as well. This makes it a completely integrated system. It can also be used to send or receive SMS.
- Hybrid Magstripe and ISO 7816 Smart Card Reader - This option helps to receive payments from customers by credit/smart cards.
- USB Interface - The terminal has a USB port as well. This helps whenever software up gradation of any extra feature to be installed. In this case a normal pen drive can be used to import data. There is no need to carry the terminal.
- Access Security for different levels of users (Level 1 and Level 2 users) - The terminal provides a great deal of security by various passwords and authentication processes which makes business through this terminal completely safe.
- Powered by external 12V DC Supply - The terminal is powered with a 12V DC supply which can be provided by an adapter.

Features (existing)

There are companies which are already serving different segment of customers. They are providing customized set of features depending upon the locality of the retailer. In other words the features are geographically segmented. In some cases the retailers themselves opt out some features which they think would not be fruitful to them. Some retailers are very margin conscious. They subscribe only those features which offer more margins and require lesser investment of time in executing those services of features.

There is a huge list of feature existing in the market. And as said earlier they differ from retailer to retailer. The various features existing in the NCR region (Delhi, Noida and Gurgaon) are listed below:

- Mobile payments
- Mobile recharges
- Railways ticketing
- Bus ticketing
- Airline tickets
- Hotel Bookings
- Tour packages
- Satellite TV subscription and recharge vouchers
- Movie tickets
- Corporation taxes
- Insurance premiums
- Payments for credit card bills
- Utility bills Electricity bills, Landline bills, Indraprastha Gas bills
- STD, ISD, PCO bills

N.B: The above mentioned services are provided in a customized format. The partners in mobile and utility bills vary from retailer to retailer. Some retailers are even unaware of the services provided by respective companies

Features Missing-cum-services Demanded By Retailers

Apart from various existing feature there is a mammoth list we discovered during our research. The retailers say that there are features which the customers coming to them demands and these features are not provided by any of the existing player in the market. However they do mention on there respective websites that they offers some of these features. But they are not found in the market in reality.

The list shows that there is still a great opportunity for the companies to increase the revenue and to increase there respective product portfolios. Out of the various demanded features by the customers the most in demand is Water bills. There are some features for which the payment can be made only by a specific mode for e.g. the electricity bills in the region can be paid only by demand drafts. While the customers wanted to pay it in cash. So this is also an important factor in determining the customer base of a service provider.

The list of the features demanded by customers in the market is given below:

- Water bills
- Provision of Electricity bills to be accepted in cash.
- House tax payments.
- STD bills of MTNL.
- MTNL accepts payments one day before last date.
- Facility of payment via all modes of all services.

- Services of Virgin mobile and Dolphin.
- Retailers not in favor of flat margins.
- In some cases retailer has to pay even to call the customer care in case of any fault in the transaction.
- In some cases after every 20 transactions a local call is charged to the retailer, because he has to make a call to update the bill payments which, obviously is not acceptable to retailers.

Margins Offered (major Players Only)

After studying the market it was found that different companies offer different margins to different retailers but most of the fall in the same range, which is as follows:

- Mobile prepaid recharge - 2% to 2.5%
- Railway tickets around Rs 15 (retailers are free to charge any amount)
- Airline tickets 5% to 7%
- Utility bills Rs 3 to Rs 5 per bill.
- STD, ISD, PCO 10% to 12%

Security Amount Paid By Retailers (major Players Only)

Oxygen

- Rs 5000 only. This is refundable and is interest free.
- Only few shops have boards that too very small in size to be recognized from a distance.

Easy Bill

- Rs 50,000 as refundable security. On which interest is paid quarterly at bank rates.
- Rs 10,000 to 15,000 for the board which the retailer had to place on his shop

PayWorld

- Rs 1000 as non refundable security.
- No board is provided. But the retailer had to invest in form of PC, printer and internet connection

Daily Collections From Retailers

For Oxygen

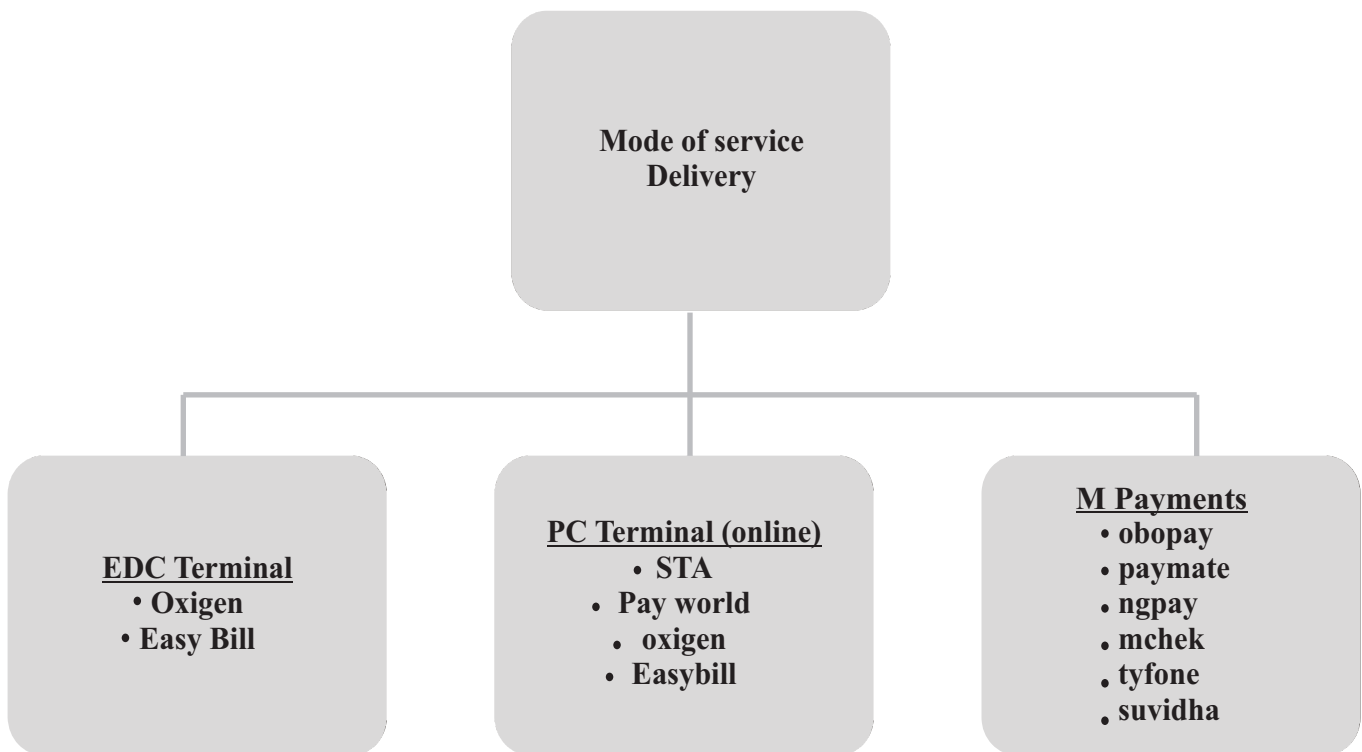
- DELHI
Vary from Rs 10,000 to Rs 25,000 per day
- NOIDA
Rs 1500 to Rs 3500 per day
- GURGAON
Rs 1200 to Rs 4000 per day

For Easy Bill

- DELHI
Vary from Rs 5000 to Rs 20,000 per day.
- NOIDA
Rs 1250 to Rs 5500 per day
- GURGAON
Rs 1000 to Rs 4000 per day

Modes Of Service Delivery

There are various types of modes available in the markets which are used to deliver the service. There are EDC terminals, PC terminals and even facilities to pay from mobile phone itself. In case of EDC terminal a small interface terminal is provided to each retailer with a small display provided with a keyboard and a printer integrated in it as well. These types of terminals can print the receipts instantaneously.

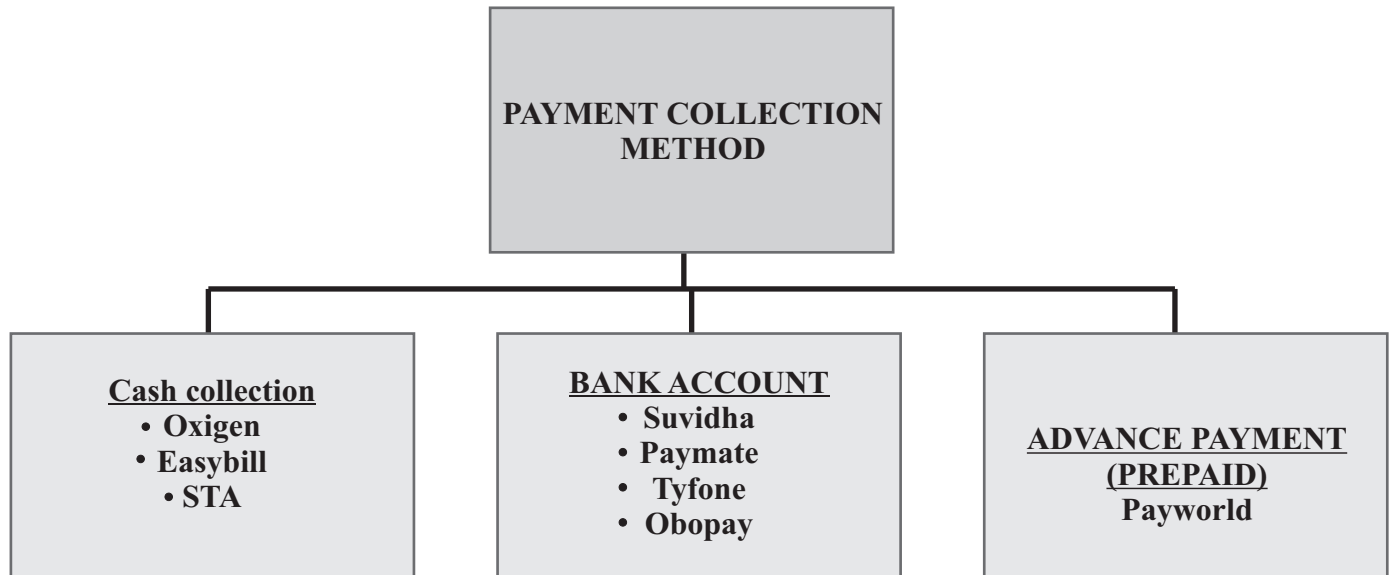


In PC terminals all the transactions are done online. The retailer is required to have a Pentium 3 computer, a broadband connection and a laser printer as well. All the railway ticketing is done by this method by the competitors.

On the other hand the facilities to pay from mobile phone are new in the market. There are two ways of making payments from mobile. Either the customer has to link his credit card with his mobile number or has to buy prepaid cards provided by the companies in the market. mChek has come up with Airtel to launch its services in south India for the Airtel customers to pay their phone bills. The service providers provide the facilities on mobile phones by WAP sites and Application programs.

Payment Collection Method

Various companies have their own modes of collection. Initially the retailer has to pay some refundable security in turn of the terminal they receive from the company. Some companies like Easy Bill also charge Rs 10,000 to retailers for the boards they provide for promotions and to increase visibility.

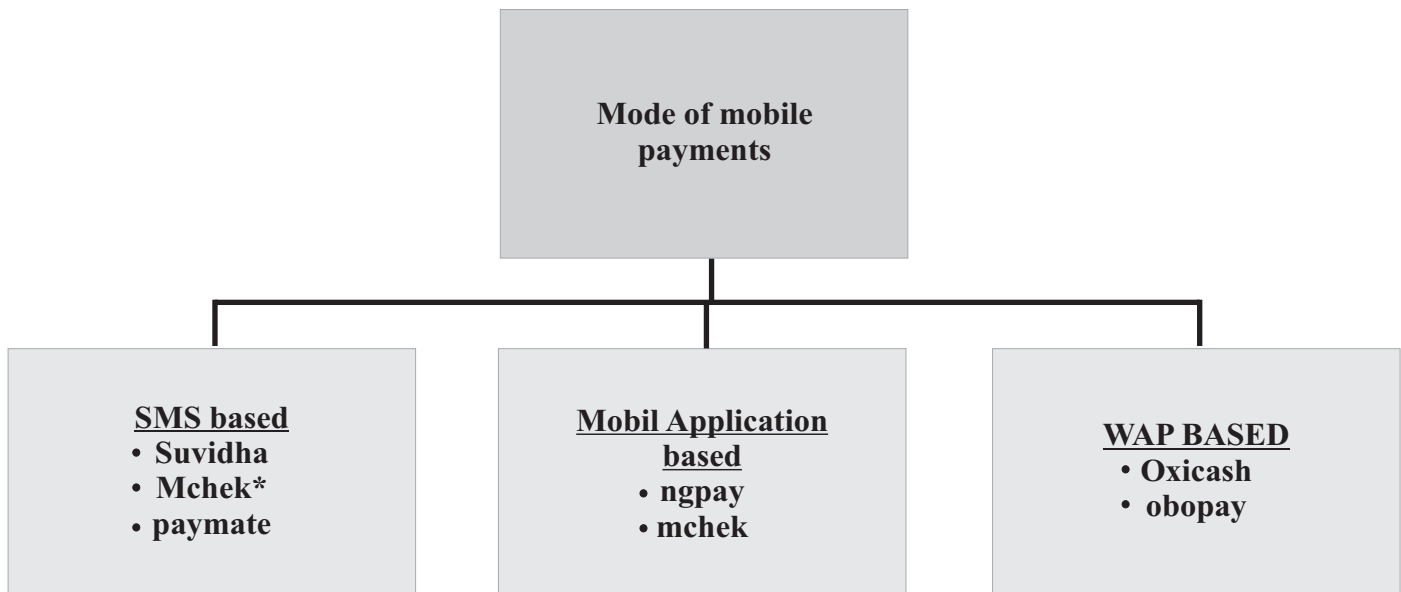


While the companies providing services through PC based terminals requires their retailers to open a bank account with a specified bank and maintain a minimum balance. There are also modes of making payments by prepaid cards for e.g. facility of making railway ticketing by ITZ cash card.

But the most widely used and well accepted method is cash collection method. In this method the company outsources the payment collection. The company receives calls from retailers telling about the cash they have accumulated. Accordingly the company forms a route plan and handover it to the cash collector executives (outsourced), who visits personally to retailers and collects the cash from the retailers and deposits in company the same day.

Payments From Mobile Phones

In case of payments through mobiles the credit card comes in to play directly, which shortens the complete transaction cycle and reduces the extra cost incurred due to middle man.



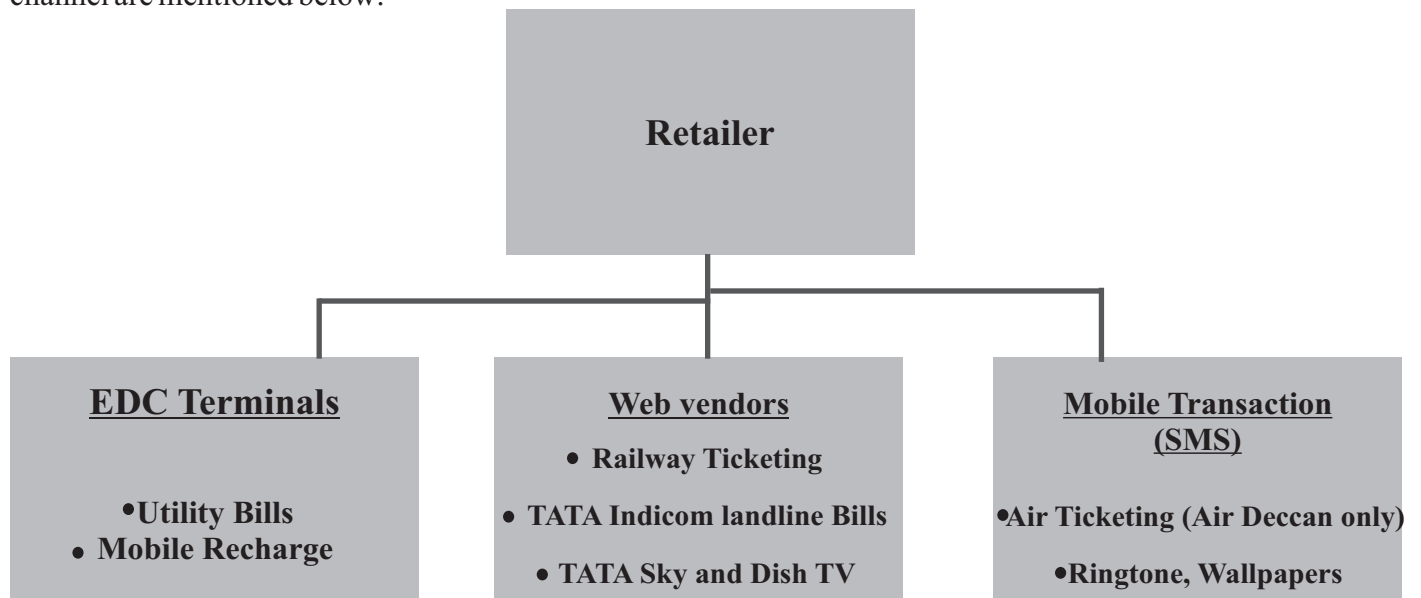
There are three ways to make a payment by using mobile phone. Suvidha provides a service to make payments of MTNL bills via sms. In this case the customer has to link his mobile number with his bank account or credit card; in turn he is issued a password from the company, which can be changed later. This provides an extra layer of security to credit card based transactions. In this case even the cheapest available mobile phones can be used to avail this service. There is no compatibility problem as the transaction will be guided by a sms. This mode covers broader section of customers.

While on the other side the payment facilities provided via Mobile applications and WAP based are compatible with only few handsets which limits the number of target segment. Company specific prepaid cards can be used to make payments on mobile based application programs like Mobibuzz and other services like downloading ring tones etc.

The MOBILE BASED PAYMENT will be the future. So the existing major players are slowly drifting towards this mode. While some companies are happy with the revenue they are generating by EDC terminal mode.

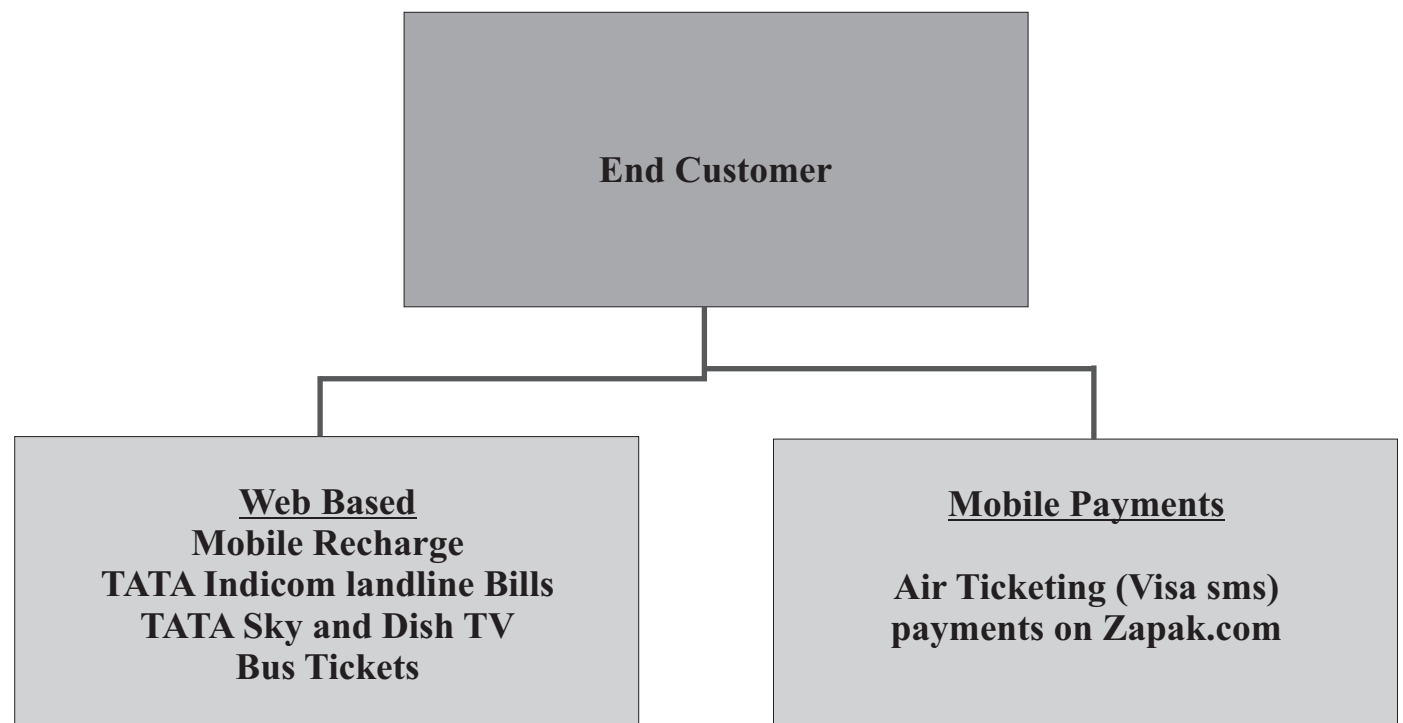
Ways Of Availing Services

The retailers have three modes of becoming clients. They can avail services by EDC terminal, Web based and Mobile based. They can also choose to have all of these channels. The various services they can provide by each channel are mentioned below:



The retailers can do the transactions directly by using EDC terminal and web based transactions by cash and demand drafts. But the payments from mobile can be made only by prepaid cards and ITZ cash card.

The following services can be used by the end customer directly from internet or mobile.



The payments for these services can be made by using credit cards or prepaid cards provided and accepted by the company.

Market Survey

A detailed market survey was conducted in the NCR area (Delhi, Gurgaon and Noida). In this survey a detailed questionnaire was used and retailers were administered/ asked to fill it. (Sample size: 100 retailers)

Observations

- Major players offer very less from what they claim on their websites.
- Most of the retailers are existing medical, stationery or telecom shops.
- Goodwill and credibility of retailer plays an important role for sales.
- (Customers drop their bills and collect the receipts later.)
- Some retailers have multiple franchises. (More than one company)
- Retailers are not aware of complete range of services.
- Some retailers use the SMS mode for mobile top ups as they get more margins on that, despite being a franchisee
- Retailers have complaints regarding flat margins.
- Companies provide a very small signboard. (No visibility)
- Retailers do not prefer to operate these devices without electricity. However they can work on battery or with any other power backup.
- Earlier companies were giving 1% of the annual transaction money as incentives to the retailers. Which they have stopped now.

Major Findings

Cash Collection Method Related

Whole NCR area is divided in segments. Each cash collector is assigned with a segment. He daily receives a route plan provided by company (a printed slip). The route plan is made according to the calls received by the retailers or by looking at the amount left in their respective accounts.

The cash collectors get a salary of Rs. 7000 including conveyance.

Other Relevant Findings

- Retailers are ready to change there services provided better margins, services offered and less investment.
- Only those retailers should be targeted as prospective client who have a goodwill and are very old in there respective areas.
- In some cases there are problems related to late payment of bills by the company even after the bill was paid well on time by the customer at counter.

CRM Related

- No competitor has the feature of CRM maintenance. Neither inbuilt nor external.
- They do have a feature of MIS but that is limited only to the cash collection and balance status enquiry, though with anytime option.

Customers' Complaints

- End customers come with WRONG PIN complaint; the frequency is 1 in 100, which is quite high. And there is no customer care directly for the end user.
- Customers get irritated in case of server not responding, busy and downtime.

Other Problems At Retailers' End

- Poor troubleshooting and other software/hardware help from companies' side
- Poor printing problem
- Chargeable customer care call and recharging method.
- Problems in getting the refundable security back (contributing negative mouth to mouth publicity)

Gap Analysis

- 4-step Gap analysis showed that there is a huge gap in what competitors claim and what they actually offer and deliver.

- I. Assessing the major players' products, services and features.
- II. Comparing the major players' products, services and features
- III. Assessing the areas for creating technological/services differentiators.
- IV. Assessing the feasibility of implementing those differentiators.

- The Gap was in services as well as product features.
- Terminals were not user-friendly for some retailers
- All range of possible services was not offered because of various reasons (Deposit, technology etc)
- EDC Terminals have credit card swiping option, but service of payment through Credit Card is not offered
- Details of retailers on some websites are not updated and correct.
- All payment modes were not allowed.
- Retailers were not really excited about this whole concept based on their experiences with the competitors
- 45% retailers are not satisfied with their current service providers.
- 30% retailers are on a neutral status.
- 25% retailers are satisfied with the service providers and the margins they are getting.
- Large chunk of end customers is almost unaware of this type of bill payment/ recharge facility. Residents of metros and tier 1 cities are more aware of such convenient options. For e.g. People of New Delhi were more aware and using such options as compared to people of Gurgaon and Noida.
- Most of the companies are focusing on B2B (retailer) marketing and hence missing out on informing end customers (individuals) about such concept. Though companies providing services through mobile phones are targeting individual customers as well.
- The market will be a Hornet's Nest in near future because of stiff competition. The one who will create technological, services and contemporaneous features with innovations will lead the market.
-

- Around 15 companies have already ventured or are on the verge of launching their services. Lot many other companies from abroad are also lined up and can possibly enter the Indian market in next 12 to 15 months.
- 95+ % market of all services is still untapped and is under the traditional ways. This surely is tempting enough with huge exponential growth on anvil.
- ***Industry is in nascent stage and hence future is scintillating.***

Conclusion

Utopia, the world (read word) which we all dream of is literally possible in terms of all our monthly bill payments. With advent of EDC terminals, virtual/ plastic money this experience is getting convenient day by day. How about one-stop payment experience (that too with various payment mode options) for all payments (utility bills/ school fees/ mobile bills/ various taxes/ travel bookings/ credit card payments/ hotel bookings/ satellite TV vouchers etc)?

Companies in this domain surely will materialize this much-needed idea on pan-India basis with congenial accordance of all stakeholders of the value chain. So, just sit back and relax, as this technology is here to stay and will surely make our lives pretty much easy!

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Business Viability Analysis and Technological Study: WiMax

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Abstract

With the increase in the subscribers' demand for higher bandwidth, the service providers are venturing into new technologies that will not only deliver greater bandwidth but also utilize the spectrum efficiently. As they don't have the technical expertise in these new upcoming technologies, system integrators come into the picture.

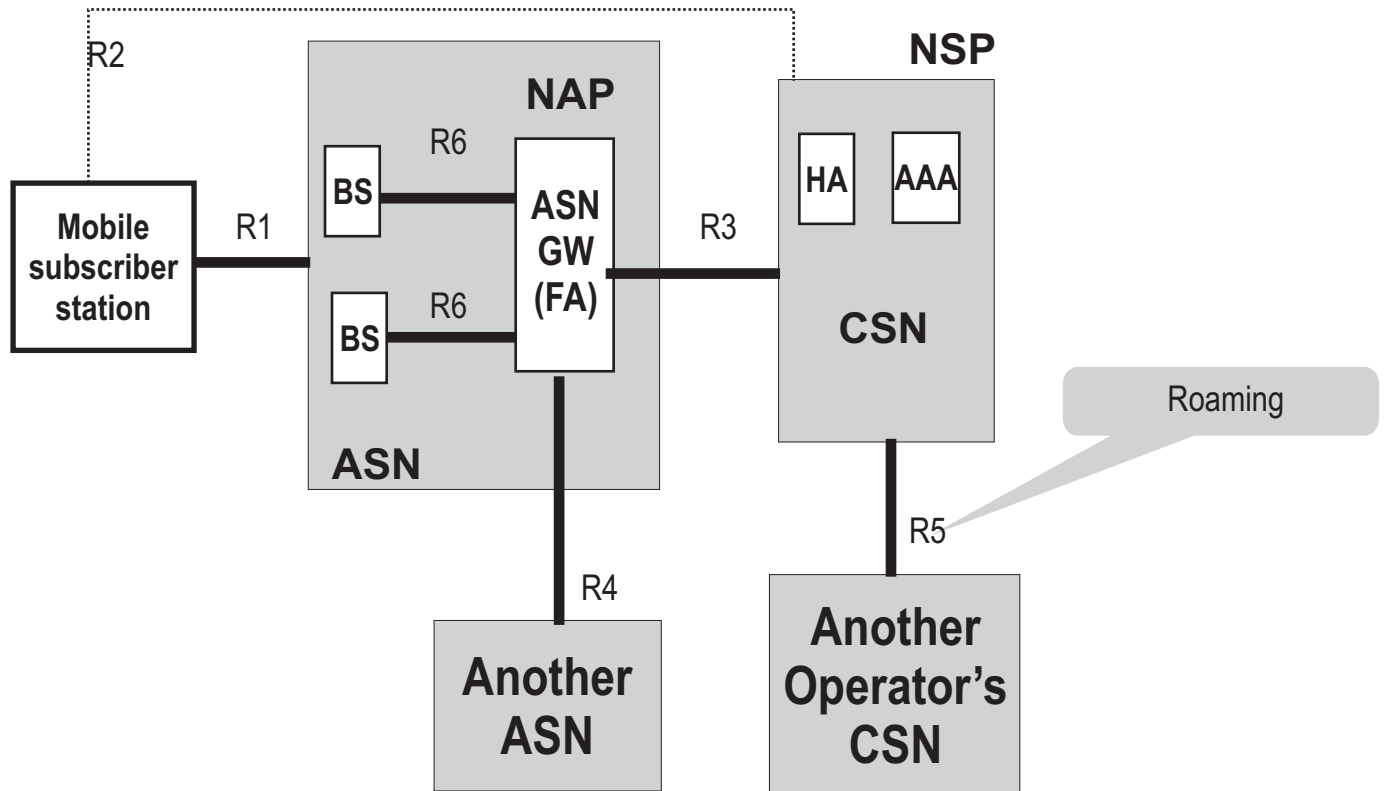
For a system integrator it is very critical to know the business viability of a particular technology, on the basis of which they can decide as to which business should get into. This paper discusses the technical aspects of WiMax and the analysis related to the business viability. For this purpose four main parameters: OPEX, CAPEX, customers, and revenue have been considered.

What is WiMax?

Worldwide Inter-operability for Microwave Access (WiMax) is a generic name for a wireless digital communications system, also known as IEEE 802.16, which is intended for wireless "Metropolitan Area Networks." It covers both fixed point to point, fixed point to fixed multi-point and fixed point to mobile multi-point. It covers a whole range of operating frequency bands, both licensed and non-licensed), operating powers and modulation techniques. WiMax can provide broadband wireless access (BWA) up to 50 km for fixed (point to point) stations, and 515 km for mobile stations. In contrast, the WiFi/802.11 wireless local area network standard is limited in most cases to only 30100m. WiMax is complementary to all fixed line delivery interfaces (fiber, coaxial cable, twisted pair, etc.) and also to wireless and copper LANS. In addition, a point to mobile multi-point service can be implemented which will mean that "Broadband without Wires" can become a reality. WiMax can be used for wireless networking in much the same way as the more common Wi-Fi protocol. WiMax is a second-generation protocol that allows for more efficient bandwidth use, interference avoidance, and is intended to allow higher data rates over longer distances. The IEEE 802.16 standards define the technical features of the communications protocol. The WiMax Forum is an industry group dedicated to fostering the development and commercialization of the technology. It consists of representatives from a large number of organizations and companies which have come together to agree on standards and set up a certification facility for inter-working of different hardware. The standards are becoming accepted worldwide, resulting in their adoption by most countries. Since the standards are open and are being accepted as national standards (with

some slight local frequency licensing regulations) then their use is guaranteed. As new techniques and technologies develop then the standards can be changed to include these.

Network Reference Model (NRM)



ASN - Access Services Network
 CSN- Core Services Network
 BS- Base Station
 FA- Foreign Agent

NAP- Network Access Provider
 NSP- Network Services Provider
 HA- Home Agent
 AAA- Authentication, Authorization, & Accounting

Fig 1 Network Reference Model

Ref: [santos.ee.ntu.edu.tw/mobile/Speech/ WiMAX %20 Network%20 Architecture.pdf](http://santos.ee.ntu.edu.tw/mobile/Speech/WiMAX%20Network%20Architecture.pdf)

The WiMAX network reference model is composed of three logical parts:

- **Mobile Stations (MS)** comprises all user (subscriber) mobile devices, such as cell phones, PDAs, and wireless laptops, and software needed for communication with a wireless telephone network.
- **Network Access Provider (NAP)** Provides radio access functionality. Contains the logical representation of the functions of a NAP. Some of the functions included in the NAP are: access service network (ASN), 802.16 interface with network entry and handover, ASN-GW (gateway), base stations (wireless towers), foreign agent (FA), QoS and policy enforcement, and forwarding to a selected CSN. A NAP may have contracts with multiple NSPs.

- Network Service Provider (NSP) Provides IP connectivity services. Contains the logical representation of the functions of the NSP. Some of the functions included within the NSP are: connectivity service network (CSN), home agent (HA), visited and home AAA servers (VAAA or HAAA), connectivity to the Internet, IP address management, authentication, authorization, and accounting, and mobility and roaming between ASNs. An NSP may have a contract with another NSP and may also have contracts between multiple NAPs. Reference points (for example, R1 or R2) are conceptual links that connect two functional entities. Reference points represent a bundle of protocols between peer entities (similar to an IP network interface). Interoperability is enforced through reference points without dictating how vendors implement the edges of those reference points.

Table 1. Reference network model interfaces

R1	Interfaces between the MS and the ASN. Functionality air interface.
R2	Interfaces between the MS and the ASN. Functionality AAA, IP host configuration, mobility management.
R3	Interfaces between the MS and the CSN. Functionality AAA, IP host configuration, mobility management.
R4	Interfaces between the MS and the ASNs. Functionality mobility management.
R5	Interfaces between CNS. Functionality internetworking, roaming.
R6	Interfaces between BTS and ASN gateway. Functionality: IP tunnel management to establish and release MS connection.

Table 1 Reference Network Model Interface

WiMax Features

The WiMax standard has been developed with many objectives in mind. These are summarized below:

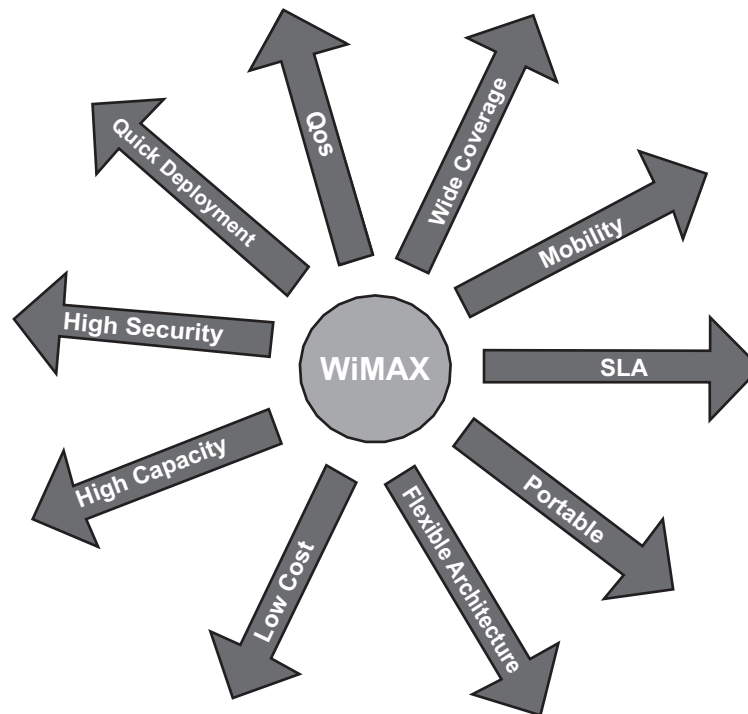


Fig 2 Features of WiMax

Source: http://www.redlinecommunications.com/news/resourcecenter/whitepapers/Can_WiMAX_Address_Your_Applications_final.pdf/ Wimax Forum

Flexible Architecture: WiMax supports several system architectures, including Point-to-Point, Point-to-Multipoint, and ubiquitous coverage. The WiMax MAC (Media Access Control) supports Point-to-Multipoint and ubiquitous service by scheduling a time slot for each Subscriber Station (SS). If there is only one SS in the network, the WiMax Base Station (BS) will communicate with the SS on a Point-to-Point basis. A BS in a Point-to-Point configuration may use a narrower beam antenna to cover longer distances.

High Security: WiMax supports AES (Advanced Encryption Standard) and 3DES (Triple DES, where DES is the Data Encryption Standard). By encrypting the links between the BS and the SS, WiMax provides subscribers with privacy (against eavesdropping) and security across the broadband wireless interface. Security also provides operators with strong protection against theft of service. WiMax also has built-in VLAN support, which provides protection for data that is being transmitted by different users on the same BS.

Quick Deployment: Compared with the deployment of wired solutions, WiMax requires little or no external plant construction. For example, excavation to support the trenching of cables is not required. Operators that have obtained licenses to use one of the licensed bands, or that plan to use one of the unlicensed bands, do not need to submit further applications to the Government. Once the antenna and equipment are installed and powered, WiMax is ready for service. In most cases, deployment of WiMax can be completed in a matter of hours, compared with months for other solutions.

Multi-Level Service: The manner in which QoS is delivered is generally based on the Service Level Agreement (SLA) between the service provider and the end-user. Further, one service provider can offer different SLAs to different subscribers, or even to different users on the same SS.

Interoperability: WiMax is based on international, vendor-neutral standards, which make it easier for end-users to transport and use their SS at different locations, or with different service providers. Interoperability protects the early investment of an operator since it can select equipment from different equipment vendors, and it will continue to drive the costs of equipment down as a result of mass adoption.

Portability: As with current cellular systems, once the WiMax SS is powered up, it identifies itself, determines the characteristics of the link with the BS, as long as the SS is registered in the system database, and then negotiates its transmission characteristics accordingly.

Mobility: The IEEE 802.16e amendment has added key features in support of mobility. Improvements have been made to the OFDM and OFDMA physical layers to support devices and services in a mobile environment. These improvements, which include Scaleable OFDMA, MIMO, and support for idle/sleep mode and hand-off, will allow full mobility at speeds up to 160 km/hr. The WiMax Forum-supported standard has inherited OFDM's superior NLOS (Non-Line Of Sight) performance and multipath-resistant operation, making it highly suitable for the mobile environment.

Cost-effective: WiMax is based on an open, international standard. Mass adoption of the standard, and the use of low-cost, mass-produced chipsets, will drive costs down dramatically, and the resultant competitive pricing will provide considerable cost savings for service providers and end-users.

Wider Coverage: WiMax dynamically supports multiple modulation levels, including BPSK, QPSK, 16-QAM, and 64-QAM. When equipped with a high-power amplifier and operating with a low-level modulation (BPSK or QPSK, for example), WiMax systems are able to cover a large geographic area when the path between the BS and the SS is unobstructed.

Non-Line-of-Sight Operation: NLOS usually refers to a radio path with its first Fresnel zone completely blocked. WiMax is based on OFDM technology, which has the inherent capability of handling NLOS environments. This capability helps WiMax products deliver broad bandwidth in a NLOS environment, which other wireless product cannot do.

High Capacity: Using higher modulation (64-QAM) and channel bandwidth (currently 7 MHz, with planned evolution towards the full bandwidth specified in the associated IEEE and ETSI standards), WiMax systems can provide significant bandwidth to end-users.

Fixed vs. Mobile WiMax

Mobility Management and Hand Offs

The simplest explanation for the difference between the fixed and mobile variants of WiMax boil down to the fact that the mobile variant enables a hand-off from one base station to another as the user, in one session, moves from the coverage zone of one base station to another. This is also known as “mobility management”. To make this happen, vendors must engineer the mobility management technology into their base stations at considerable cost over the fixed WiMax technology. Service providers should assess what portion of their target market requires the mobility management piece when weighing fixed vs. mobile. From a high view, “mobile” means the service functions at 70 MPH while performing competent hand-offs. Service providers should assess what percentage of their subscribers will require that level of service.

OFDM vs. SOFDMA

Orthogonal Frequency Division Multiplexing (OFDM) breaks the wireless carrier into 256 sub-carriers (or little waves). This has a number of advantages over single carrier technologies, but the two greatest advantages are: a) it mitigates inter symbol interference (also known as multipath) and b) improves propagation of the signal, especially in non-line of sight (NLOS) coverage zones. Fixed WiMax uses OFDM. Orthogonal Frequency Division Multiple Access (OFDMA) breaks the carrier into even more sub carriers (up to 2048 sub carriers). The mobile variant of WiMax uses SOFDMA. Scalable Orthogonal Frequency Division Multiplexing Access (SOFDMA) is the flexible channelization scheme used in the IEEE 802.16e standard, to support mobility applications. The advantage of this is better propagation and potentially improved building penetration (although other factors such as frequency and power come into play here as well) relative to OFDM. The use of OFDMA should also enable the use of smaller, less costly subscriber devices including PC cards and USB devices. Service providers would do well to compare vendor propagation charts to determine which technology provides the best coverage for the money.

Quality of Service : The fixed variant of WiMax provides four categories for prioritizing traffic. This means that time sensitive traffic such as voice and video get priority over non-time sensitive traffic such as data. Again, the service provider should weigh this in their infrastructure decision-making as the added category for prioritizing traffic may not prove that valuable in comparison to a fixed (predictable) environment using external subscriber devices.

Compatibility : Operators seeking to make a WiMax investment must first recognize that 802.16e is not backward compatible with 802.16d. While some 802.16d vendors propose base station equipment with additional hardware complexity or software programmability to allow a switch to 802.16e, this will not impact any 802.16d end-user devices already deployed. These 802.16d end-user devices will not operate within an 802.16e network and the imperative for low cost end-user devices makes it prohibitive to introduce additional hardware to attempt an upgrade to 802.16e compliance. Adding upgrade capability to the base station may also result in a large cost penalty. Many of the 802.16d deployments are expected to follow a Frequency Division Duplexing (FDD) frequency plan driven by the 802.16d WiMax profiles. The prioritized profiles for 802.16e are expected to follow a Time Division Duplexing (TDD) frequency plan. This will add complexity to any potential migration path as TDD and FDD in the same spectrum allocation will have severe interference issues. Additionally, an operator who deploys 802.16d and then attempts to roll in 802.16e equipment at a later date will be disadvantaged by having to split the available licensed spectrum between the two technologies. Without a true upgrade path from 802.16d to 802.16e and the necessity to preserve spectrum to support network growth, 802.16e provides the best long term protection for an operator's WiMax investments.

Lower cost : As the broadband wireless market continues to grow, the industry should expect to benefit from cost reductions enabled by volume deployments and economies of scale. Portable and mobile applications have a very strong track record for accelerating volume. Mobile deployments of 802.16e will bring cost points down below solutions engineered solely for fixed applications using 802.16d. Additionally, major chipset manufacturers such as Intel have announced publicly that 802.16e will be the premier standard for WiMax applications, pointing to a substantial embedded base of consumer products with 802.16e support. These same chipsets used in laptops and PDAs can be leveraged in the manufacture of indoor and outdoor fixed customer premise equipment. It becomes quickly apparent that 802.16e offers the critical advantage of allowing the operator to ride a downward trending cost curve.

Vendor Mapping

In the following sheet, vendor mapping showing some of the vendors, OEMs in the vertical axis while mobile WiMax ecosystem solution products in the horizontal axis is shown.

As in the legend, product information is shown by a different colour with 1 showing product availability and 0 showing absence of product.

Fig 3 Product vendor Mapping

Name of company	Mobile WiMax Solution													
	RF Solution		CPE				NMS	EMS	Base Station		ASN	CSN	Fixed WiMax	Mobile WiMax
	PtP	PtMP	Indoor	Outdoor	SB dongle	PCMCIA			Antenna	BTS				
Aperto	1	1	1	1	0	0	0	1	0	1	0	0	1	1
Telsima	0	0	1	1	0	1	1	0	0	1	1	0	1	1
Redline Communications	0	0	1	1	0	1	0	1	0	1	0	0	1	1
Soltek	0	0	0	1	0	0	0	0	0	1	0	0	1	1
Airspan Networks	0	0	1	1	0	0	1	0	0	1	1	0	1	1
Solka Telecom	0	0	0	1	0	0	1	0	0	1	0	0	1	0
WiNetworks Inc.	0	0	1	1	0	1	1	0	0	1	1	1	0	1
Alcatel-Lucent	1	1	0	0	0	0	1	1	1	1	1	1	0	1
Promix Wireless	0	0	1	1	0	0	0	0	0	1	0	0	1	1
Motorola	0	0	1	1	0	1	0	0	0	0	1	0	1	1
WiChorus	0	0	0	0	0	0	0	0	0	0	1	1	1	1
Nortel	1	1	1	1	1	1	1	1	1	1	1	1	1	1
Cisco + Navini	0	0	1	1	1	1	1	1	1	1	1	1	0	1
Nokia Siemens Networks	0	0	0	0	0	0	1	1	1	1	1	1	0	1
Alvarion	0	0	1	1	0	0	0	0	0	1	0	0	1	1
Tranzo Wireless Technology Inc	0	0	1	1	0	0	0	0	0	0	0	0	1	0
ZTE	0	0	1	1	0	1	1	1	1	1	1	1	0	1
Tecom	0	0	1	1	1	1	0	0	0	1	0	0	0	1
Huawei	1	1	1	1	0	1	1	0	0	1	1	1	0	1
Accton Wireless Broadband Corp	0	0	1	1	1	1	0	0	0	0	0	0	1	1
Bridgewater Systems	0	0	0	0	0	0	0	0	0	0	0	1	1	1
SONA	0	0	1	0	0	0	0	1	0	1	0	0	0	1
Samsung	0	0	1	0	1	1	0	0	0	1	1	0	0	1
Axxcelera	0	0	1	1	0	0	0	0	0	0	0	0	1	1
Selex	1	1	1	1	0	0	0	0	0	1	0	0	1	1
Aptilo	0	0	0	0	0	0	0	0	0	0	0	1	0	1
Zyxel	0	0	1	0	0	1	0	0	0	0	0	0	0	1
	0	Product Available												
	1	Product not Available												

Business Case

a. Scope of Work

Deployment of Mobile Wi-Max solution in project area: It involves a non-exclusive commercial deployment for coverage of MTNL's PROJECT area with a target of 2,00,000 customers for wireless broadband services.

Equipped capacity to be designed as per roll out plan. Initial equipped capacity to be installed in the core network should be 1,25,000 customers in first 12 months and should be scalable to 2,50,000 customers in 18 months after issue of the purchase order. The system should be designed keeping the traffic requirement of 2,00,000 customers. The deployment will be designed such that all subscribers will have access to all services offered by the system, including high-speed data and various additional enhanced services.

The roll out plan is as below

- | | |
|--|---|
| a. Business plan | 1 Month |
| b. Planning and System Design: | 1 Month |
| c. Installation of ASN and Core Network: | 4 Months |
| d. Roll out plan is as below : | |
| Area to be covered in 6 months: | New Delhi Municipal Council (NDMC) Area |
| Area to be covered in 9 months: | Trans-Yamuna (TY) area of Delhi |
| e. Availability of at least 10000 CPE of all mix: | 6 months |
| f. The bidder has to include in his proposal the number of BTS required to be installed to cover the entire region. However the minimum roll out plan for BTS shall be as below: | |
| No of minimum BTS in 6 months: | 30 |
| No of minimum BTS in 12 months: | 50 |
| No of minimum BTS after 12 months: | As per requirement |

Key Responsibilities

The Bidder will provide following items at its own cost and risk:-

- Core Network Elements
- Base stations to cover PROJECT area of Delhi
- All types of CPEs to end customers i.e. indoor CPE, outdoor CPE, PCMCIA card, USB Dongles etc.
- Cabling, antennae, Installation material and misc. connectors/cables.
- Survey, Engineering and RF planning, installation and commissioning.
- Second line requirement at customer premises.
- MTNL uses an in-house billing system called CSMS and it is also migrating to convergent billing system using Peoplesoft CRM and Intec billing system. The successful bidder is expected to interface with both the system as per MTNL's requirement.
- Training to MTNL's staff and officer to cover aspects technology, O&M, installation, customers etc.
- Integration with the existing services/network of MTNL for the purpose of billing, customer care, technical assistance etc.
- Expansion & up gradation of the system as per the requirement & prevailing market conditions.
- SACFA clearance

MTNL will provide the following: -

- Backbone
- Internet Bandwidth.
- Space for cell sites subject to availability, tower space, industrial power/-48V DC power supply facilities for the BTSs and core network.
- Spectrum

Now for formulation of a business plan Opex , capex, customer ramp up, ARPU has to be considered.

Calculations:**Capital Expenditure :**

Equipment	Prices Rs.	Quantity	Total Cost(Rs)
BTS	1200000	80	96000000
EMS	20000000	1	20000000
ASN	40000000	1	40000000
CSN	40000000	1	40000000
LAN Switch			
Type-1	1000000	1	1000000
Type-2	300000	80	24000000
Billing System	80000000	1	80000000
BTS Installation			
Material	80000	80	6400000
Other Installation			
Material	30000	1	30000
Other Software	10000000	1	10000000
3-sector Antenna	40000	80	3200000
			32,06,30,000

Operational Expenditure:

	Year 1				
		Q1	Q2	Q3	Q4
Advertising & Sales					
	Radio	16000	4000	0	0
	Print	22500		0	0
	Canopy		9000	0	9000
	Pamphlets	1800	600	0	0
Administrative Expenses					
	Stationary	9000	9000	9000	9000
	Lighting	75000	75000	75000	75000
	Water	13500	13500	13500	13500
	Transportation	27000	27000	27000	27000
	Telephone Charges	22500	22500	22500	22500
	Salaries	2190000	2190000	2190000	2190000
	Overhead Commission	46250	46250	76250	100000
	Wages	45000	45000	45000	45000
	License fees	9000	9000	9000	9000
O &M					
	1-1.5% CAPEX	60000	50000	60000	60000
Liasoning		50000	40000	0	50000
Contingency		5%		5%	5%
Net OPEX		2555050	2550850	2527250	2610000
Total OPEX (in Rs)		26,82,802.5	26,78,392.5	26,53,612.5	27,40,500

Operational Expenditure:

	Year 2				
		Q1	Q2	Q3	Q4
Advertising & Sales					
	Radio	0	4000	0	0
	Print	0	0	0	0
	Canopy	0	9000	0	9000
	Pamphlets	0	600	0	0
Administrative Expenses					
	Stationary	9000	9000	9000	9000
	Lighting	75000	75000	75000	75000
	Water	13500	13500	13500	13500
	Transportation	27000	27000	27000	27000
	Telephone Charges	22500	22500	22500	22500
	Salaries	2518500	2518500	2518500	2518500
	Overhead Commission	116250	146875	187500	231250
	Wages	45000	45000	45000	45000
	License fees	9000	9000	9000	9000
O & M					
	1-1.5% OF TOTAL CAPEX	60000	60000	60000	60000
Liasoning		0	30000	0	40000
Contingency		5%	5%	5%	5%
Net OPEX		2895750	2965375	2967000	3059750
Total OPEX(in Rs)		30,40,537.5	31,13,643.75	31,15,350	32,12,737.5

Operational Expenditure:

	Year 3				
		Q1	Q2	Q3	Q4
Advertising & Sales					
	Radio	0		0	0
	Print	0		0	0
	Canopy	0	9000	0	9000
	Pamphlets	0		0	0
Administrative Expenses					
	Stationary	9000	9000	9000	9000
	Lighting	75000	75000	75000	75000
	Water	13500	13500	13500	13500
	Transportation	27000	27000	27000	27000
	Telephone Charges	22500	22500	22500	22500
	Salaries	2896275	2896275	2896275	2896275
	Overhead Commission	295000	336250	387500	422500
	Wages	45000	45000	45000	45000
	License fees	9000	9000	9000	9000
O & M					
	1-1.5% OF TOTAL CAPEX	60000	60000	60000	60000
Liasoning		0	30000	0	30000
Contingency		5%	5%	5%	5%
Net OPEX		3452275	3532525	3544775	3618775
Total OPEX		36,24,888.8	37,09,151.25	37,22,014	37,99,713.8

Subscriber Break-up for various services

The weight assigned to the service suggests the likelihood of the consumer subscribing to that particular service in comparison with other services.

Sr No.	Services	ARPU(Rs)	Weight Assigned	Weight ARPU(Rs)
1	IPTV	100	6	600
2	VoIP	2663	2	4793
3	VPN	10959	0	0
4	WiFi	269	15	4042
5	Broadband	608	75	45600
6	Mobile TV	900	2	1980
				57015
Total		2583	100	570

Customer Ramp Up Analysis

Year 1: 2800

Year 2: 6800

Year: 11500

Revenue Calculations:**ARPU Analysis**

Revenue sharing is done in 70:30 ratio with 70% of the revenue going in favor of system integrator

	1st year			
	Q1	Q2	Q3	Q4
Customers	1100	3700	6100	8000
ARPU	Rs 1,500	Rs 1,500	Rs 1,500	Rs 1,500
Revenue from ARPU	Rs 1,650,000	Rs 5,550,000	Rs 9,150,000	Rs 12,000,000
Registration Charges	0	0	0	0
Total Revenue (quarter wise)	Rs 1,650,000	Rs 5,550,000	Rs 9,150,000	Rs 12,000,000
Revenue after Sharing	Rs 1,55,000	Rs 3,885,000	Rs 6,405,000	Rs 8,400,000
OPEX	Rs 2,682,802.50	Rs 2,678,392.50	Rs 2,653,612.50	Rs 2,740,500.00
CAPEX	Rs 320,630,000.00	Rs 0.00	Rs 0.00	Rs 0.00
Profit	Rs 322,157,802.50	Rs 1,206,607.50	Rs 3,751,387.50	Rs 5,659,500.00
Breakeven		-Rs 32,09,51,195	-Rs 31,71,99,807.50	-Rs. 31,15,40,307.50

	2nd year			
	Q1	Q2	Q3	Q4
Customers	9300	11750	1500	18500
ARPU	Rs 1,500	Rs 1,500	Rs 1,500	Rs 1,500
Revenue from ARPU	Rs 13,950,000	Rs 17,625,000	Rs 22,500,000	Rs 27,750,000
Registration Charges	0	0		0
Total Revenue (quarter wise)	Rs 13,950,000	Rs 17,625,000	Rs 22,500,000	Rs 27,750,000
Revenue after Sharing	Rs 9,765,000	Rs 12,337,500	Rs 15,750,000	Rs 19,425,000
OPEX	Rs 3,040,537.50	Rs 3,113,643.75	Rs 3,115,350.00	Rs 3,212,262.50
CAPEX	Rs 0.00	Rs 0.00	Rs 0.00	Rs 0.00
Profit	Rs 6,724,462.50	Rs 9,223,856.25	Rs 12,634,650.00	Rs 16,212,262.50
Breakeven	-Rs 30,48,15,845	-Rs 29,55,91,988.75	-Rs 28,29,57,388.75	-Rs 26,67,45,076.25

	3rd year			
	Q1	Q2	Q3	Q4
Customers	23600	26900	31000	33800
ARPU	Rs 1,500	Rs 1,500	Rs 1,500	Rs 1,500
Revenue from ARPU	Rs 35,400,00	Rs 40,350,000	Rs 46,500,000	Rs 50,700,000
Registration Charges	0	0	0	0
Total Revenue (quarter wise)	Rs 35,400,000	Rs 40,350,000	Rs 46,500,000	Rs 50,700,000
Revenue after Sharing	Rs 24,780,000	Rs 28,245,000	Rs 32,550,000	Rs 35,490,000
OPEX	Rs 3,624,888.75	Rs 3,709,151.25	Rs 3,722,013.75	Rs 3,799,713.75
CAPEX	Rs 0.00	Rs 0.00	Rs 0.00	Rs 0.00
Profit	Rs 21,155,111.25	Rs 24,535,848.75	Rs 28,827,986,.25	Rs 31,690,286.25
Breakeven	-Rs 24,55,89,965	-Rs 22,10,54,116.25	-Rs 19,22,26,130.00	-Rs 16,05,35,843.75

Conclusion

After the final analysis, it has been found out that bidder should not bid for the project as the break even is not achieved even after 3 years.

Hence, we are suggesting the bidder not to bid for the project due to following reasons:

1. Number of customers is very less.
2. ARPU is low.
3. Area to be targeted is pretty small to earn a good profit.
4. Breakeven not achieved in starting 3 years of operation.
5. CAPEX cost is very high.
6. CPE cost is high.
7. Brand image of MTNL is not very high for subscribers to avail this service.
8. Risk-sharing is minimal for front-bidder in this revenue share arrangement.

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Common Man's guide to Radio Frequency Spectrum

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Frequency range	Usage				Wavelength
30KHz-300KHz (LF)	Used mainly for Maritime and Aeronautical Mobile and radio-navigation				10Km - 1Km
0.3MHz-0.535MHz- 0.600MHz-3.0MHz. (MF)	Radio Medium Wave Sound broadcasting				1000 - 100 m
3.0MHz- 5-6-7 MHz-9-11-15 MHz-1 9-21 MHz-30MHz (HF)	Long distance International Telecom				100m -10m
30MHz-88-108 MHz -174-230MHz (VHF Band)	30MHz TV Ch-4	88-108 MHz FM channels	174-230MHz TV Band -III	10 m -1m	
300MHz-3GHz (UHF Band)	470-610 MHz TV Band IV	800-1000 MHz 2G Mobile	2 GHz 3 G Mobile	2.3/2.5 GHz Wimax	2.4 GHz Wi-Fi*
3 GHz -30 GHz (SHF Band)	3.3/3.5 GHz Wmax	5GHz 4G Mobile	12 GHz DTH	10cm -1cm	

*- Refers to the license free Industrial Scientific & Medical (ISM) band of 2.4 GHz in which most of the Wi-Fi networks operate

Spectrum for 2G & 3G Mobile Services

By

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Abstract:

Ever since the introduction of Cellphone Mobile service in the country in 1995, acute frequency spectrum shortage was a continuing problem for the 2 G service providers. A brief background to this scenario and an overview of the sustained actions by the TRAI and the Govt., for finding more spectrum and related policy actions which facilitated growth towards a vibrant Pan India mobile network, are presented. In spite of spectrum shortage and other handicaps, it is to the credit of the Indian service providers to take India, recently to the stage of the fastest growing mobile market and the second largest mobile network in the world. This spectacular performance is however seems to be negated by the lack of focussed, early action by the Govt. in completing 3 G spectrum auction.

1. Spectrum's Unique Properties & Indian Scenario :

- 1.1** Radio Frequency Spectrum (RFS) is the basic infrastructure required for any wireless technology deployment. RFS is a natural, non- depleting resource, available to all countries in equal measure, unlike other physical, natural resources like minerals, water etc. If not used or if not used judiciously .it is wasted.
- 1.2** In view of its universal nature, propagation of radio waves beyond geo- political borders and large area coverage of earth's surface by satellite signals ; the RFS use needs to be shared and well coordinated by all countries . The forum for this is the International Telecommunication Union (ITU) , a specialized agency of the United Nations , established in 1885.
- 1.3** In the Table of Frequency Allocations (9 KHz to 400 GHz) of the Radio Regulations of the ITU, the spectrum use by different radio services , 40 nos., on exclusive and /or shared basis has been outlined for guidance and / or compliance by member countries. In India , the spectrum usages are mainly upto about 18 GHz .The total spectrum needs of cellphone mobile services are in the range of about 200 300 MHz only , which a very small fraction of the entire RFS . However due to factors indicated later in this article , finding adequate, vacant spectrum for Cellular Mobile Service Providers (CMSPs) in India continues to be a difficult and time consuming process, even from the launch of this service in 1995 till presently for launch of new 3G service.
- 1.4** No such difficulty for finding spectrum was encountered for intra city and inter-city of links of Cellphone Mobile Service Providers (CMSPs). Specific channels as per international channeling plans for their fixed , point- to- point , links could be assigned to CMSPs , in conventional microwave bands in 3 4 , 7.4 7.7 , 10.5 10.68 , 14.5 15.35 , 17.7 19.7 and 21.2 23.6 GHz bands. To minimize frequency coordination problems with the microwave links of the BSNL, MTNL & Railways; 10, 14 & 21/23 GHz bands, mentioned above , were preferred for intra-city links esp. in major cities . Spectrum for CMSPs for this application, therefore, not dealt with further, in this article.

2. National Frequency Spectrum Allocation Process:

- 2.1** Under the provisions of the Section 4 of the Indian Telegraph Act, 1885 ; the monopoly of the Central Government over all forms of telecommunication including “wireless use “ can be relaxed by of grant of licenses by the Govt. This responsibility for spectrum allocation and its use is handled by the Wireless Planning and Coordination (WPC) Wing, established in 1950s in the Ministry of Communications, Deptt. Of Telecom (DoT).
- 2.2** Keeping the ITU's Table of Frequency Allocations in the backdrop, the WPC had evolved and updated, since 1960s, the National Frequency Allocation Plan (NFAP). The NFAP indicates likely spectrum segments for different radio services viz., Fixed Links, Mobile networks, Broadcasting, Satellite- communication, Space Research etc of major govt. departments and organisations. This, helps the major national spectrum users -- which are primarily govt. entities like the Defence services, Railways , Police and paramilitary , BSNL / MTNL , AIR , Doordarshan, ISRO, Public Utility organisations etc.to plan for their equipment standards for procurement, indigenous manufacture, import. etc. It also simplifies frequency assignment process by the WPC, for specific application in a given area or location. The NFAP review & revision is done after elaborate consultation process with all national stake holders in spectrum use. To account for changes in ITU's Radio Regulations, emergence of new technologies and national needs.

National Frequency Allocation Plan (NFAP) with the relevant frequency bands

Frequency Range	Remarks
VHF (170 to 240MHz)	Terrestrial TV stations of Doordarshan
450.5- 457.5 MHz paired with 460.5- 467.5 MHz	Induction of wireless access systems (fixed/mobile) telecommunication services may be considered for coordination on case by case basis in the frequency band 450.5- 457.5 MHz paired with 460.5- 467.5 Mhz Recommended by TRAI for 3G spectrum auction.
824-844 MHz paired with 869-889 MHz	Frequency band 824-844 MHz paired with 869-889 MHz has been earmarked for CDMA wireless access systems (fixed/mobile) for telecommunication services. Initial allocation per operator was 2.5 +2.5 MHz for start of service which could be increased to 5 + 5 MHz , in steps of 1.25 MHz , on the basis of subscriber base and roll out Recommended by TRAI for 3G spectrum auction.
890-902.5 MHz paired with 935-947.5 800 / 900 MHz band	Frequency band 890-902.5 MHz paired with 935-947.5 MHz has been earmarked for GSM cellular mobile telephone systems. The original allocation of 4.4 + 4.4 MHz per operator was expanded to 6.2 +6.2 Mhz based on subscriber- density criteria. 1.6 + 1.6 MHz in for their dedicated GSM- R network along railway routes.
902.5 - 915 MHz paired with 947.5 - 960 Mhz. 1800-1880 MHz 880-1900 MHz 1885-2025 MHz paired with 2110-2200 MHz 3.4 , 7.4 7.7 , 10.5 10.68 , 14.5 15.35 , 17.7 19.7 and 21.2 - 23.6 GHz bands 11- 18 GHz ku Band 10, 14 / 21/ 23 GHz	Additional requirements up to 6.2 + 6.2 MHz for GSM cellular mobile telephone systems may be coordinated on a case-by-case basis in the frequency band 902.5 - 915 MHz paired with 947.5 - 960 Mhz. 4th Cellular Service operator in 1800 MHz GSM cellular mobile systems (fixed/mobile) for telecommunication services, in the frequency bands 1710-1785 paired with 1805-1880 Mhz on a case-by-case basis. Requirements of micro cellular wireless access systems (fixed/mobile) like CorDect for telecommunication services based on TDD access techniques, especially indigenously developed technologies, capable of coexistence with multiple operators will be considered in the frequency band 1880-1900 MHz on a case by case basis. Requirements of IMT-2000 (3G) applications in the frequency bands 1885-2025 MHz paired with 2110-2200 MHz may be coordinated with existing users initially for 1920-1980 MHz paired with 2110-2170 Mhz (FDD mode) and 2010-2025 MHz (TDD mode), 2500-2690 MHz depending on the market needs and availability, as far as possible. Assigned to Cellular Mobile Service Providers their fixed & point- to- point links in conventional microwave bands Direct to Home Satellite operators(DTH) Microwave links of the BSNL , MTNL & Railways

3. Initial Phase of Spectrum Allocation to 2G Mobile service in 4 Metros :

- 3.1** Major revision of the earlier national frequency plan(s) was needed after ITU's 1979 global conference, in which vast changes in international radio regulations were made. The NFAP, finalised in 1981 after extensive consultations with spectrum users, allocated the 610 to 960 MHz band to Fixed (FX) , Mobile (MO) and Broadcasting (BC) services and the band 1700 to 2100 MHz to Fixed and Mobile services. Based on this and other provisions of the Plan, the Defence planned import as well as commissioned indigenous manufacture of equipments in these bands for FX , MO applications of all the three defence services. Segments of 800 / 900 MHz band were initially adopted by E.U. countries for the GSM Cellphone standard. The then Deptt. of Telecom had also used some parts of these bands for its FX , multi-channel links for public telecom network facility. Small chunks of 800 MHz were also occupied by FX, MO networks of many other govt. entities , in line with easy availability of equipment as per international standards .

Thus, right from the start, the GSM spectrum allocation was dependant by spectrum vacation by existing occupants.

- 3.2** The expansion of terrestrial TV in the country was slow and it did not result in more than two TV stations of Doordarshan in a service area . VHF band TV spectrum proved adequate for this need. With the spread of Cable TV in 1990s and recent introduction of Direct to Home Satellite (DTH) TV by Doordarshan and licensed players like TataSky , DishTV and BigTV etc. using Ku Band; use of this 610-960 MHz ,UHF TV band for TV Broadcasting should not arise in future also. From TV Broadcasting interests, there was no claim for spectrum in the 800 / 900 MHz bands, which simplified the situation to some extent.
- 3.3** The GSM technology for mobile services was evolved by the Western European nations. It was standardized to work in the frequency bands 890 915 MHz (Mobile set transmit) paired with 935 960 MHz (mobile handset receive) . This was extended later on to additional spectrum viz., 880 890 MHz paired with 925 935 MHz , called the extended GSM band.
- 3.4** For introduction of Cellular Mobile Service in the country, a tender was floated in early 1990s for service provision by two private players in each of the 4 metro cities in the country . GSM technology was specified and the availability of spectrum of only 4.5 + 4.5 MHz per operator was indicated in the tender in 800 / 900 MHz GSM band. At that stage , there was no clear commitment by then existing occupants in the band like the Defence etc. reg. vacation of their operations to make room for GSM CMSPs. Discussions in this regard could not be done with conviction as many other technologies like TACS, CDMA, D-AMPS, Japan PDC , working in different spectrum segments , were also doing lobbying. After vigorous coordination efforts of a few years, by the WPC wing, Defence etc. finally agreed to vacate spectrum of about 12.5 + 12.5 MHz, just a few days before the first GSM operator in Kolkatta was ready to launch service in 1995. This paved way for frequency allocation of 4.4 + 4.4 MHz for each of the two operators in a metro area enabling a GSM CMSP to have 44 frequency channels, spaced at 200 KHz for a base station. The third chunk of 4.4 +4.4 MHz was kept reserved for later entry of the BSNL/ MTNL, in this service.
- 3.5** Thus, even at the launch of 2G cellular service in India, there were serious hurdles in finding vacant spectrum chunks for the CMSPs. They could be allotted only relatively small segments of GSM band. In 1981 when the NFAP was adopted, cellphone service and telecom liberalization in the country could not be foreseen. In India, the spectrum needs of Defence services are also unique as they have to keep the options open for induction of equipments, for various applications, from both the Western and Eastern blocks. This leads to Defence claiming stakes in overall, larger spectrum

allocation. For vacating any chunk of spectrum, the defence services, need to carry out elaborate exercises as regards its impact on their operational readiness. Careful balancing of civil and defence needs for spectrum is thus continuous process.

4. Spectrum for Pan India 2 G Expansion

- 4.1** After the 4 Metros, licencing by the DoT for cellphone service to most of the remaining parts of the country was initiated. Gradually, Defence services were also able to release additional chunks in 800 / 900 MHz band and in 1700 to 1900 MHz band for increased spectrum for metro CMSPs and for induction of additional CMSPs in the same service area. With lowering of cellphone tariff, the introduction of the “Called Party Pays” regime on the basis of the recommendations of the TRAI and significant drop in the prices of the handsets to affordable levels to a common man; led to unprecedented, rapid expansion of cellphone service in the country esp. in metro & urban areas. The original allocation of 4.4 + 4.4 MHz per operator was expanded to 6.2 + 6.2 MHz, based on subscriber-density criteria, in a service area.
- 4.2** In 1999, the Govt. made all the licenses “technology neutral”. The incumbent i.e. Govt. companies BSNL & MTNL were also allowed in 1999 as the third CMSP, for whom the spectrum chunk was kept “reserved” as mentioned in para 3.4, earlier.
- 4.3** In the year 2001, the Govt. auctioned the 4th Cellular Service license in 1800 MHz band. The possibility of extending the allocation to 6.2 + 6.2 MHz from 4.4 + 4.4 MHz, when necessary was also indicated in the conditions of auction.. The spectrum range identified was 1710 1785 MHz (Mobile Transmit) paired with 1805 1880 MHz (Mobile Receive) after the possibility of its coordination / availability for small chunks, on a case-by-case basis was agreed to by the govt. agencies esp. by the Defence. These bands were also identified for additional spectrum chunks to existing three service providers.
- 4.4** In addition, it was also decided to allocate the Indian Railways, chunks of 1.6 + 1.6 MHz in 800 / 900 MHz band for their dedicated GSM- R network along railway routes.
- 4.5** In another landmark action, in 2001; Basic Telecom Service provision was also thrown open to competition to BSNL / MTNL as guided in National Telecom Policy 1999. These licences were available on “First come-First Serve” basis and these BSO licencees were permitted to provide “limited mobility “ services by using Wireless Local Loop technology. For this WLL (M), channels in frequency bands 824 844 MHz paired with 869 889 MHz (FDD) & 1880 1900 MHz (Micro-cellular technology based on TDD) were made available. Initial allocation per operator was 2.5 + 2.5 MHz for start of service which could be increased to 5 + 5 MHz, in steps of 1.25 Mhz, on the basis of subscriber base and roll out. This also increased the pressure on spectrum availability to primary CMSPs. At the end of this phase of licencing in 2001, 2G / 2.5 G Cellular Mobile Service was being provided on GSM platform while WLL (M) was on CDMA technology.
- 4.6** In 2003, based on TRAI recommendation, Unified Access Service Licence (UASL) was introduced which permitted other service providers also the entry into mobile phone service. With the advent of this regime, there were 5-8 Cellular Service Providers in most of the service areas in the country. Of these 3-4 were on GSM and 2-4 on CDMA platforms.

5. DOT Guidelines for Additional Spectrum: Subscriber based Criteria

In view of serious constraints of spectrum availability for allocation to CMSPs , the DOT in Dec., 2004 adopted guidelines for additional spectrum allocation based on subscriber population . These were updated in March 2006 and are briefly summarized as below:

- For GSM CMSPs: Subscriber number linked Spectrum Allocation

Subscriber base in Lakhs	MHz
3	6.2+6.2
6	8+8
10	10+10
16	12.4+12.4
21	15+15

- For CDMA CMSPs : Subscriber number linked Spectrum Allocation for 3rd ,4th ,5th & 6th CDMA operator.

Subscriber base in Lakhs	MHz
3	3.75+3.75
10	5+5
16	6.25+6.25
21	7.5+7.5

6. International Comparison of Spectrum Availability

- 6.1** The large no. of CMSPs licensed for a given service area, other policies and rapid increase in subscribers resulted in increased efforts to find more spectrum by vacation of existing users. The results in this regard were slow and not sufficient.
- 6.2** The Telecom Regulatory Authority of India's (TRAI's) Consultation Paper issued in May, 2004 highlighted that as against typical, total, international standard spectrum availability indication for Cellphone service of about 255 +255 MHz in the segments of 800 / 900 / 1800 /1900 MHz bands; the Indian spectrum availability was only a total of 140 +140 MHz.
- 6.3** Following data brings out the sharp contrast on spectrum availability to Indian CMSPs vis a vis their counterparts in other countries.

Region/ Country	Operator
European Union (avg) 67 MHz per country	18 MHz per operator
Asia Pacific 52 MHz per country	13.4 MHz per operator
World Average (excluding India)	17 MHz per operator
India (3-4 on GSM platform and 2-4 on CDMA platform)	4.4 MHz at most locations

7. Critical Situation on Further Spectrum Vacation

- 7.1** In its Recommendations (May , 2005) on Spectrum related issues , the TRAI confirmed the immediate additional spectrum needs upto 2007 and also outlined strategy for additional spectrum for the long term growth of mobile services. It concluded that the entire 1800 MHz band (75 + 75 MHz) and the entire International Mobile Telecommunications (IMT) 2000 band , 60 + 60 MHz viz., 1920 1980 MHz paired with 2110 2170 MHz will have to be allocated to mobile operators. It therefore urged the Govt. to take action on a war footing to finalize a step by step roadmap to vacate spectrum by Defence etc. for mobile service. The Govt. constituted a Group of Ministers (GoM) for this purpose in 2007 This Group could meet very rarely with no specific conclusions. The issue is still dragging on Defence, is reported to have insisted on provision by the DOT , of an Optical Fibre Cable network, costing more than 4400 crores to enable them to shift their operations using the desired spectrum. DoT alleges changing of network demands by the Defence, leading to cost escalation to about Rs. 14,000 crores.

7.2 Recent , news items in the last week of Feb.,2009 mentioned again an inclusive meeting of another, newly , in 2008 , constituted GoM to finalize on 3 G spectrum availability , auction process and allied matters. There is a reported move to combine the two GoMs , headed by the same Minister , to finalise a MoU between the DoT and Defence , as regards spectrum vacation by Defence for the CMSPs, timeframe etc . It is reported that the DOT had asked for vacation of 45 MHz spectrum for 2G and 3G services but any vacation beyond 10 MHz , may not be immediately feasible by the Defence.

7.3 With the Lok Sabha election, due in April /May 2009 , it looks unlikely that the political leadership will have the time and inclination to sort out this problem , which is now dragging on for years.

8. Spectrum Valuation & related Controversy

8.1 The CMSPs pay one time high entry fee for service provision licence plus annual licence renewal fee. The Govt. has also levied Service Tax on cellphone service . In addition , the CMSPs , pay annual fee for “spectrum” use which increases with network expansion. The initial method of levy of spectrum fee based on traditional approach was replaced in Aug. 1999 by a more rational , percentage share of “Adjusted Gross Revenue” (AGR) basis . This stipulated 2% of AGR as spectrum fee 4.4 + 4.4 MHz, progressively increasing to 6% of AGR for 15 + 15 MHz spectrum. Scaling down this was 4 % has been recommended by the TRAI. The Cellphone service has become a major source of annual revenue for the Govt., and is continuously increasing , running into thousands of crores . In general , spectrum use contributes to more efficient activity and the growth of the GDP.

8.2 The “ Spectrum Scarcity “ paradox has resulted , in many countries high valuation of spectrum for 2G and 3G services , in recent years. Different methods of Spectrum Pricing approaches have been analysed High auction bids in USA and European countries for 2G and 3G service spectrum , in recent years raised billions of dollars bringing in the auction process in the limelight. Some of the “high bidders”, later on faced the 'winner's curse", as they failed to gather enough business as anticipated to sustain high bids.

8.3 The Spectrum Pricing Methods, Spectrum Auction Processes , Permitting Spectrum Trading by operators are complex issues warranting detailed treatment, in each case.. These subjects are particularly important in the context very high revenues being generated for the govt., even from small spectrum chunks used by mobile services. Govt. guidelines in Feb., 2004 also dealt with spectrum aspect after Merger & Acquisition of companies to specify a cap of 15 + 15 MHz for Metro and Class “A” service area. Consideration of any of these important spectrum issues is beyond the scope and limit on the length of this article.

8.4 Against the backdrop of spectrum shortage for the CMSPs , the decision by the Minister of Communications , in early 2008 to issue , fresh 120 Unified Access Sewrvice License (UASL) licences , with start up spectrum as 4.4 + 4.4 MHz each , for a cumulative licence fees of Rs. 8,966 crores , evoked surprise and criticism not only from spectrum scarcity angles but also from financial and procedural angles. The justification for this action was stated as rapid expansion to rural areas and more competition.

8.4.1 The Ministry of Finance placed the valuation of these new 120 licences at Rs. 31,452 crores on the basis of revenue growth since 2003 and the spectrum auction data in USA . The Central Vigilance Commission (CVC) endorsed the Ministry of Finance view of the loss of revenue to the tune of 22,000 crores and questioned the DoT as to why “auction “ process was not held in grant of these licences . The DoT's reply citing “ legal difficulties “ and then changing it to “ practical difficulties” , did not appear to satisfy the CVC, as per many new items appearing in recent months. In addition , two of the new UASL licencees who got the licences by paying about Rs. 1,600 crores each as fee , did sell , by end

2008, their 45 to 60 % stakes, within a few months, at a price of Rs. 4,500 & 6120 crores each. This confirmed the concern of the CVC and the MoF on significant loss of revenue to the exchequer. . Some political parties alleged of a “Spectrum Scam “, demanding full investigation. The matter, now in cold storage , may get revived after the Lok Sabha election.

9. Third Generation (3 G) Mobile Services Spectrum Matters :

- 9.1** 3G or IMT 2000 standard Services are specified to provide data speeds of 2 Mbps for stationary application, 384 Kbps for Pedestrian use , and 144 Kbps for Vehicular application. Other salient features include global roaming, high quality multimedia capability, Triple play services, greater capacity , efficiency etc. 3G uses 5 MHz Channel Carrier.
- 9.2** In spite of spectacular rise of 15 million new cellphone users in a month by Jan. 31 , 2009 ; taking the total no.to 362.30 million users , the Average Revenue Per User (ARPU) has remained low and stagnant over the years . Subscriber base to 500 million by 2010 is projected. The industry, therefore, sees 3G as a major opportunity for growth in Value Added Services, new business in mobile content , leading to growth in the ARPU .
- 9.3** ITU-R Recommendation M.1036 specifies the following for 3G Spectrum i.e. 1885 2025 & 2110 2200 MHz as finalised at WARC-1992 conference and 806-960,1710-1885, 2500-2690 MHz as decided at WRC- 2000 conference. Other Bands as per a country's choice are not ruled out.
- 9.4** As of now in more than 120 countries , 3G service has been introduced and in some developed countries more than 50 % mobile users are on 3 G platform. In the Indian context,3G will benefit rural areas also by providing various e-initiatives, like e-governance, e-education , telemedicine etc. to bridge the digital divide by providing superior connectivity to those who have no access to landlines.
- 9.5** The Govt. sought TRAI's recommendations on 3G spectrum allocation and pricing which were expeditiously provided by the TRAI in Sept. 2006 of which the following were the main features .
 - 3G Spectrum, not to be continuation of 2G spectrum allocation
 - 450 MHz (for Rural areas) 800, 2100 MHz bands to be used for 3G
 - PCS 1900 MHz band is near future possibility, based on trials and vacation by incumbent users.
 - 25 + 25 MHz Spectrum to be used for allocation in blocks of 5+5 MHz
- 9.6** On Spectrum Pricing , fee basis approach was suggested for 450 / 850 MHz band and for 2.1 GHz band Simultaneous Ascending Auction with Reserve Price. 1% of AGR as Spectrum Fee after 1 year has been advocated. It also suo moto recommended a no. of frequency bands for Broadband Wireless Access systems which are complementary to the development of 3G service.
- 9.7** There was much hype and expectations since then about the introduction of 3G service in India. However, serious divergence of views amongst govt. organisations emerged , as reported , at periodic intervals , in various newspapers and business publications esp. since Jan., 2008 about the details of the process of 3G introduction. The DOT differed with TRAI's 3G licence norms and the latter raised legal concerns. Differences arose over permitting foreign / global players in 3G spectrum auction . Finance Ministry wanted the reserve price for the spectrum to be doubled to Rs. 4,040 crores for a pan India 3G licence. Anomalies in the auction process were pointed out by the CVC and the bidders sought a no. of clarifications. Pre-bid conference also evinced lukewarm response from global players. GSM lobby alleged favourable conditions to CDMA providers. As a result, the auction , planned for in Oct. 2008 was postponed to 16th Jan.,2009 . The GoM (constituted in 2007) meeting, in Dec. 2008 , for spectrum

release by Defence was postponed . Lack of conclusions on issues , within the Govt. led to the further postponement of Jan.,2009 auction date. Whether it will be held in March, 2009 as per latest announcements by the Minister for Communications, is a matter of conjecture in view of general election in April / May, 2009.

- 9.8** In the Interim Budget presented by the Finance Minister , he estimated collection of revenue of Rs. 20,000 crores as against Rs. 40,000 crores projected by the Telecom Minister in Aug., 2008 . This is the price being paid for delays and flip flops in execution of 3 G auction , which may not be possible before July-Oct.,2009. The global economic recession and uncertain spectrum availability will be great dampners in securing high bids. The second largest mobile network in the world is thus loosing its image in the eyes of international telecom market due to inordinate delays in 3 G service launch.
- 9.9** The govt. companies , BSNL & MTNL , had the freedom to introduce 3G service in some cities in the countries in Feb.,2009 as they are not subjected to competitive bidding for 3 G spectrum . This, in one view, negates the Govt.'s responsibility to provide a level playing field to all players , in a competitive , liberalised telecom industry.

Conclusion :

Ever since the introduction of Cellphone Mobile service in the country in 1995 , acute frequency spectrum shortage has been a continuing problem for the 2 G service. In spite of these constraints , it is to the credit of Mobile service providers in India that we have as on 31st Jan. 2009 , about 360 million subscribers , surpassing USA , to become the second largest network after China and the fastest growing mobile network , surpassing China with monthly additions of about 15 million subscribers in a month. Sustained actions by the TRAI and the Govt., for finding more spectrum and related policy actions facilitated this growth towards a vibrant Pan India mobile network. This spectacular performance , however, seems to be negated by lack of focussed , early action by the Govt. in completing 3 G spectrum auction which would take the service to next higher level for country's benefit.

Mobile Base Station Antenna: a Health Hazard?

By:

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Abstract :

Government of India has finally adopted the norms prescribed by Non-Ionizing International Commission on Radiation Protection (ICNIRP) for conforming to the limits/ levels for antennae (base station emissions) for general public exposure. However the order leaves it to the Cellular mobile phone Service Provider to conduct audit and provide self-certificates annually as per procedure that will be prescribed by Telecommunication Engineering Centre (TEC)

What are these ICNIRP norms? It is necessary for the general public as well as Telecom professionals to understand these norms and more importantly, the implications of the “Self Certification” procedure.

This article reviews the whole problem from an objective perspective and recommends that planning and expansion of sites for base stations needs to be treated by the local authority as an infra-structure of a city like roads, water supply and drainage.

1. Introduction

A non-government organization (NGO) had filed a public interest litigation in the Supreme Court of India in the year 2005 pointing out that radiations from the antennas of cellular mobile phone services and also the radiation from the mobile phone itself constitute a health hazard and that the Government of India had not laid down any norms for maximum permissible radiation intensity. The Supreme Court had directed the Government of India to fix these norms as soon as possible.

The Department of Telecommunication (DoT) had carried out negotiations with cellular mobile service providers (CMSP) and prepared a draft recommendations in this respect in 2006. Unfortunately the industry did not accept these norms and after protracted negotiations finally the DoT issued an order¹ to all the CMSPs that ICNIRP (International Commission on Non Ionizing Radiation Protection) norms as they may be amended from time to time will have to be followed. However the task of checking that the radiation intensities are within these norms has been left to the CMSPs themselves. The procedure for checking the norms has yet to be finalized by the Telecommunication Engineering Centre of the DoT. The relevant order by DoT is reproduced as annexure I to this article.

It is thought that at a later stage, the government may set up a conformity assessment body (CAB), which will measure radiations and provide certifications. Till then, operators themselves will have to do the job. But according to press reports industry is opposing setting up of CAB as this will be a hindrance in the expansion of their network.

2. Effects of Radiation

According to various studies, there are two types of effects of radiations -- thermal (rise in body temperature) and non-thermal, which includes behavioural effects. Some of these effects are sleep and hearing disorders, memory disturbances and cognitive disorders. However, there is no concrete evidence of health hazards and it is widely felt that more concrete studies on the matter are needed. The World Health Organization (WHO) has recommended that national authorities should adopt international standards to protect their citizens against adverse levels of radiations. Various studies have been done in developed countries to find out the effects of the radiations on human health and updates on these studies are provided by some organizations from time to time. While some researchers claim to have found that radiations from base station antennas can cause harmful effects on human health their critics point out deficiencies in their methodology and say that their results are not statistically significant. Other researchers say that the studies carried out so far do not conclusively show any bad effects on human health which can be definitely attributed to base station radiations. Thus an impression is created that investigations so far have not been conclusive and there is need to carry out further research to obtain conclusive results.

Ministry of Health of the Government of India has proposed India's first large-scale, multi-centric study involving 40,000 participants, over the a period of 5 years to assess the health hazards of RF radiation. The study will be carried out jointly by Jawaharlal Nehru University (JNU) School of Environmental Sciences and the All India Institute of Medical Sciences (AIIMS). It is hoped that these data will help in the understanding of the effects of mobile phones on human physiology.

3. Background

In May 2000 Mobile Phones & Health was the topic recommended for world wide discussion on the occasion of World telecom Day (17th May) by the ITU (International Telecommunication Union). I had studied the subject in great detail at that time and delivered a lecture on the subject before Institution of Engineers (India) in Mumbai. Medical Evidence on the subject was inconclusive then² and remains so after 9 years.^{3,4} What should be the action plan during the long waiting period of 5 to 10 years? Opinions differ even on this interim arrangement.

4. Research Methodology

Why does it take so long to establish conclusively the effect of radiation? It appears that most of the research is by way of collecting data. These data cannot be large and is bound to have some shortcoming or the other.

There are basically three methods:

(1) One of the most common methods is to carry out controlled tests on rats .These rats are specially bred. Inspite of this, the research results of different workers do not agree. If the results of research on rats are conclusive they can be carried out on humans. Whether the results on rats can be scaled up to humans is an open question.

(2) Human laboratory studies are carried out on volunteers to study comparatively less harmful effects like **Cognitive functions**. The sample sizes are very small and are from a particular region. The conclusions can at best be true for that community.

Human laboratory studies on **Cognitive functions**

In Finland, 32 children (10-14 years old) performed a battery of cognitive tests. In the UK, 18 children

10-12 years of age were tested In France tests were carried on 55 male and female volunteers. No effect was found for any of the tests. These samples are really very small but even to carry out research on such a small scale involves lot of expenditure and effort.

- (3) Epidemiological Studies **are resorted to in order to decide whether** c radiation could lead to cancer etc. Two groups of people are selected. One living near the base station and the other away from it. If the proportion of cancer patients in the first group is, **statistically speaking , significantly higher** than in the second, then the risk is said to exist.

A report on cancer risks in people living near mobile phone base stations has been published⁵. This is a study on a small population of 622 people in a neighbourhood in Israel where a base station was erected in 1996. While the calculated rates were higher than those in both the comparison neighbourhood and the nation rates, the findings were not acceptable to the experts who found several faults.

5. Safety Concerns on Building Rooftops

When base station antennas are installed on terraces or roof tops of a building the radiation level up to certain distances close to the antenna may exceed safe limits. It is therefore necessary for building owners and managers to have a clear idea where the radiation levels may exceed the Maximum Permissible Exposure (MPE) levels for both Occupational /Controlled areas and for General Population / Uncontrolled areas.

Once potential hazard areas have been identified they have to be marked. It is necessary to install signs and perhaps physical barriers, such as chains and fences. The big problem with rooftops is the large number of people who may require access. For example, lifts repair people, painting contractors, building maintenance, and overhead tank cleaners. Most of these people have little or no knowledge of radiation. When multiple antennas are located on rooftops, combined level may exceed the ICNIRP limits in some areas of most rooftops.

6. Legal Issues

What is the potential result of overexposure to radiation? Under certain conditions, it is possible to become ill or, even worse, suffer prolonged health effects. In today's litigious society, building owners and managers may have to face lawsuits even when there is no proof of permanent biological damage. Just having someone prove (or claim) that they were exposed to radiation levels that exceed the limits may be more than enough to start costly legal battles. The invisibility of radiation becomes a weapon for litigation.

In USA norms prescribed by FCC (Federal Communication Commission) have to be followed. According to an article published in Journal of Property Management (JPM), July/August 2001 "Building owners and managers, must develop a safety plan and implement it. The safety program must be communicated to the employees and they must understand the work rules, procedures, and policies that they are expected to follow. For rooftops, the simplest training is to have first-time visitors watch a 20-minute video and a handful of slides that explain the rules specific to the site. Then, have them sign a document that states that they understand and promise to follow the rules. Only then are these people should be allowed to go onto the rooftop."

In India when cellular Mobile Service Provider company issues a self certificate building owners and managers can put the onus on the company and make it sign an indemnity bond for any law suits. It is also necessary to make the company legally bound to clearly mark potential hazard areas.

7. Recommendations

Since use of mobile phones is predominantly the most important mode of communication it is necessary to provide all facilities for its smooth growth. This implies that the growth must be consistent with safety aspects. Since the government of India is unable to tame the CMSPs it is for the local bodies i.e. Municipal Corporations to insist on ICNIRP standards and make it mandatory to carry out proper measurements to ensure compliance.

References

- 1 DoT order dated 4th Nov 2008 (reproduced in Annexure 1
- 2 “FAQ on Mobile Phone (Cell Phone) Base Stations and Human Health” Moulder John , Professor of Radiation Oncology, Medical College of Wisconsin, Milwaukee, Wisc, U.S.A. March 2006
- 3 “Health Hazards of Mobile Phones: An Indian Perspective” Mukta Kapdi, Sumedh S Hoskote, Shashank R Joshi JAPI (Journal of Association of Physicians of India) Nov 2008
- 4 “An Epidemiological Review of Mobile Telephones and cancer” Sumedh S Hoskote, Mukta Kapdi, Shashank R Joshi JAPI Dec 2008
- 5 “Increased incidence of cancer near a cell-phone transmitter station.” Wolf and Wolf International Journal of Cancer Prevention 1:123-128. 2004
- 6 “RF Safety Concerns on Building Rooftops” Richard Strickland Journal of Property Management (JPM),USA July/August 2001

Annexure 1

Order issued on 4th Nov 2008 by the Department of Telecommunications of the government of India regarding maximum permissible radiations from base station antennas of Cellular Mobile phone services

Government of India

Ministry of Communications and IT

Department of Telecommunications

(AS-II Cell)

Sanchar Bhavan , 20 Ashok Road, New Delhi 110117

NO.842 998/2008 (AS IV) /14

Dated : 4th Nov 2008

To,

All Cellular Mobile Telephone Service Licensees to whom CMTS licenses issued in 2001 or thereafter

Subject : Amendment to the Cellular Mobile Telephone Service License/Agreement issued in 2001 or thereafter

In exercise of the power vested in the licensor under clause 5.1 of cellular mobile telephone service (CMTS) license issued in 2001 and thereafter inter alia reserving the right to modify at any time the terms and conditions of the license in public interest, security of the nation or proper conduct of the service, the licensor hereby inserts after clause 46.5 of the said license agreement with immediate effect the following clause, namely:

46.5 a) Licensee shall conduct audit and provide self-certificates annually as per procedure prescribed by Telecommunication Engineering Centre (TEC) or any other agency authorized by licensor from time to time for confirming to the limits/ levels for antennae (base station emissions) for general public exposure as prescribed by Non-Ionizing International Commission on Radiation Protection (ICNIRP) from time to time.

The present limits levels are reproduced as detailed below:

f = frequency in MHz

Frequency Range	E Field Strength (Volts/m)	H field strength Amp/meter (A/m)	Power Density Watts per square meter (W/sqm)
400 MHz -2000MHz	$1.375 f^{1/2}$	$0.0037f^{1/2}$	$f/200$
2GHz - 300 Ghz	61	9.16	19

Note : The compliance in the form of self certificate shall commence six months after the date of issue of prescribed test procedure by TEC or any other agency authorized by licensor.

Sd/-B.L.Panwar
Asst Director General (VAS-II)
Tel : 23710506

Copy to :

1. Secretary, TRAI New Delhi.
2. Wireless Advisor, WPC Wing , New Delhi.
3. Sr. DDG, TEC, New Delhi : A detailed test procedure may kindly be issued on priority
4. Sr. DDG (WPF), DoT, New Delhi.
5. DDG (Security) DDG (AS-I) DDG (LF) DoT New Delhi
6. DDG (C & A) for posting on the DoT website

This order is available on the DoT website www.dot.gov.in under Archives @ Sr No. 81

Guidelines For Submission Of Papers/Articles

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

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

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

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

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

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

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About Research at SITM

Telecom Business Research Cell

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

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

The major research initiatives undertaken under TBRC are:

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

SITM Research Committee

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

The members of **SITM** Research Committee:

Mr. Virender Kapoor, Director, SITM
Mr. Prasanna Kulkarni, Professor(Finance) SITM
Mr. Avinash Aslekar, Associate Professor(IT), SITM
Dr. P.J. Joglekar, Telecom Consultant (Former Professor, IIT Delhi)
Mr. A.V. Chirputkar, Assistant Professor(Finance) SITM
Mr. Giri Hallur, Assistant Professor (Telecom), SITM



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