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Analytical Hierarchy Process (AHP) Approach on Consumers' Preferences for Selecting Telecom Operators in Bangladesh

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Abstract
This study is designed for the analysis of the consumers' preferences for selecting the telecom operators in Bangladesh. This study includes an empirical analysis using AHP model based on some criteria of consumers' preferences. This study provides relevant ranking using AHP model rather than finding the causal relationship among the variables. The results of the empirical analysis shows that the respondents preferred the network criterion as most important criterion for their preferences, and also preferred two telecom operators Grameen Phone and Airtel under different criteria. Finally, the global weights of the AHP analysis show that the respondents preferred Grameen Phone most than all other telecom operators in Bangladesh.
Keywords: AHP Analysis, Telecom Operators, Consumers' Satisfaction.

1. Introduction

Telecommunication sector is one of the emerging service sectors in Bangladesh. At present there are six telecom operators are exist in Bangladesh such as Grameen phone, Robi, Teletalk, Banglalink, Airtel and City cell. Since introduction in the last decade, this sector plays a vital role in the economy of Bangladesh. Especially for the last few years this sector contributes to the economy through telecom services, collaboration in online banking, remittance, education and welfare services and so on. Besides these, this sector is now one of the major tax payers of Bangladesh Government. Fink et. al. (2001) states the vast growth opportunities of the telecom industries in 17 countries in Asian region including Bangladesh.

Like other service sectors consumer satisfaction and loyalty are essential for telecom operators. Therefore producing more loyal and satisfied consumers is important for the telecom operators as loyal customer pays less attention to the competitors' brand. Loyal customers are less engaged in decision making, for example, whether to buy a product or service among alternates (Rundle-Theile and Bennet, 2001) or whether they are willing to pay more for a particular brand (Reichheld, 1996). The concept of brand loyalty is comparatively more important for services sector, especially

for those who provide services with little differentiations and compete in dynamic environment i.e. telecommunication sector (Santouridis and Trivellas, 2010).

To produce loyal customers, the telecom operators of Bangladesh have to survey its customers to find out their perception and preference about the services provided by them.

However the services provided by the telecom operators now a days are more or less the same. So it is quite difficult to assess the consumers' satisfaction on a particular operator. All the telecom operators are highly concentrated on the consumer satisfaction in providing services. Therefore working on the assessment of consumer satisfaction in this industry is quite challenging.

This paper emphasizes on the assessment of the consumer satisfaction on selecting telecom operators in Bangladesh. As discussed earlier that the assessment of consumers' satisfaction is quite challenging, this paper uses AHP model to rank the telecom operators based on some criteria of consumers' satisfaction.

1.1 Objective of the study

The prime objective of this study is to rank the telecom operators using AHP model based on consumers' preference. The secondary objectives include

- Ranking of variables affecting consumers' preference
- Ranking of telecom operators under different criteria of consumers' preference.

1.2 Scope of the study

In consistent with the research objective, this study emphasizes on AHP ranking of alternatives rather than finding the causal relationship between consumers' satisfaction and service of telecom operators. Therefore, the empirical analysis on this study is done in the later part focuses on AHP model analysis and ranking.

2. Literature Review

Extensive studies have been made in the consumer satisfaction and service quality literature to identify the relationship between consumer satisfaction and its antecedents (Oliver 1977; Oliver 1980; Churchill and Suprenant 1982; Parasuraman, Berry and Zeithaml 1991; Anderson and Sullivan 1993). Over the years a good number of research works have been made on the consumer preferences of telecom operators. Of those studies several are being made on the consumers of Southeast Asian countries like Malaysia, Indonesia, India, and Pakistan and so on. The findings of those studies are more or less consistent in determining the variables affecting consumers' preference. In the area of business especially in the telecom business no one can run efficiently without maintaining competitive advantage over the competitors. To gain competitive advantage a business firm has to provide better service quality than the competitors. Zeithaml et. al. (1985) describe that the service Quality has been of utmost importance in actually coming upto the key drivers of driving the consumer buying behavior, in coming future the role of service quality in every sector will play an important role.

Service quality is marked as highly significant concept of services management and services marketing. Researchers have proven that "perception of service quality had a direct relationship with customer retention" (Clottey, Collier and Stodrick, 2008. p.37).

In the area of customers' preference we can develop some strand. One strand focuses that the service quality of telecom operators helped them to create competitive advantage by being an effective differentiating factors. Different service quality factors of telecom operators are essential and important to maintain loyal and profitable customers. (Leisen and Vance, 2001). Besides service quality factors branding and brand perception of the customers regarding the telecom operators affect the customers' preference for selecting telecom operators (Foxall et al., 1998).

According to Anckar and D'Incau (2002), besides voice call and network coverage the value added services (i.e., games, icons, ringtones, messages, web-browsing, SMS coupons, and electronic transaction) provided by telecom operators brought five values to the consumers namely- time-critical needs and arrangement, spontaneous needs and decisions, entertainment needs, efficiency needs and ambitions, and mobility-related needs Thus, mobile value-added services will become new opportunities for telecom service providers. Previous studies of relevant field also provide evidences that the enhancement of service quality, perceived value, and customer satisfaction is the key of corporate success and competitive advantage (Patterson and Spreng, 1997; Khatibi et al., 2002; Landrum and Prybutok, 2004; Wang et al., 2004; Yang and Peterson, 2004).

Rahman et al. (2011) mentioned some variables as important criteria for customers' perception in selecting mobile phone operators. These variables are service quality, price or call rate and brand image. Shah (2008) mentioned customer care service, per call charges, network, tariff schemes, Value Added Service (VAS), billing system, voice clarity as some of important variables that customer consider while developing their preference about any mobile phone operators.

Singh et al.(2011) mentioned quality of service, price and effectiveness of advertising and marketing campaign are the important variables that affect the customers preference for selecting telecom operators.

In their study kim et al. (2004) mentioned call quality, value added services and customer support are the important criteria for customer preference for selecting telecom operators. This study further categorizes service quality factors into four dimensions, including content quality, navigation and visual design, management and customer service, and system reliability and connection quality.

Chae et al. (2002) mentioned connection quality, content quality, interaction quality, and contextual quality as some of important variables that affect the Consumers' Preferences for Selecting Telecom Operators. Tama and Tummalab (2001) mentioned some criteria as vendor specific criteria for selecting mobile phone operators. These are quality of support services, supplier's problem solving capability, supplier's expertise, cost of support services, delivery lead time, vendor's experience in related products and vendor's reputation.

From the previous studies now we can draw a conclusion in a form of taking variables from these related studies:

Table-1: Variables of consumers' satisfaction from different research.

S.N	Variables of Consumers' Satisfaction	Author/s
1	Service quality; Price; Call rate; Brand image.	Rahman et al. (2011)
2	Customer care service; Per call charges; Network; Tariff schemes; Value Added Service(VAS); Billing system; Voice clarity.	Shah (2008)
3	Quality of service; Price; Effectiveness of advertising and Marketing campaign	Singh et al.(2011)
4	Call quality; Value added services; Customer support	Kim et al. (2004)
5	Quality of support services; Supplier's problem solving capability; Supplier's expertise; Cost of support services; Delivery lead time; Vendor's experience in related products; Vendor's reputation.	Tam and Tummala (2001)

3. Methodology

This study has designed to analyze the consumers' preferences for selecting telecom operators. The nature of the study is of descriptive type with an empirical analysis. For the analytical purposes ranking of the telecom operators are being made using the Analytical Hierarchy Process (AHP) model. The empirical analysis is being made just to rank the telecom operators based on some variables relating to consumer's preferences, not to identify the causal relationship among the variables. Therefore, this study is a descriptive research with some empirical evidences.

3.1 Sources of Data

Working with an AHP model using a good number of variables is quite challenging. The strength of the outcome depends on the reliability of the data. The required data for empirical analysis are collected from the primary sources

mainly from face-to-face interview of the consumers of different telecom operators. Relevant data for aiding the empirical analysis are collected from secondary sources like official websites of different telecom operators.

3.2 Sampling Design

For the purpose of the study and for empirical tests, forty respondents are selected using non-probabilistic judgmental sampling techniques. For sampling the respondents couple of factors are considered. Firstly, the respondents are of the age group of twenty to twenty six years because this age group has the experience of using different telecom operator services. Secondly, respondents those are using at least three operators' services and actively using at least two operators simultaneously. The sampling design is summarized below:

Table-2: Summary of sampling design.

Target Population	Elements: Customers of the telecom operators. Sample size: 40. Age group: 20-26 years. Sampling units: Telecom operators. Extent: Dhaka, Bangladesh. Time: 2012.
Sampling Technique	Non-probability; Judgmental Sampling.
Scaling Technique	AHP 1-9 scale.

3.3 Model Development

AHP model uses three stages for data hierarchy. First stage contains the research goals, second stage contains the criteria of ranking and third stage contains the alternatives. For empirical analysis eight criteria are being selected for ranking six telecom operators. The stages of AHP model are summarizes below

Table-3: Stages of AHP hierarchy.

Stage-1: Goal	Ranking of telecom operators based on consumers' preferences
Stage-2: Criteria	1. Network 2. Call Charge 3. Internet 4. Bill Pay 5. Free Talk-Time and SMS 6. Money Transfer 7. Balance Recharge 8. Customer Care
Stage-3: Alternatives	1. Grameen Phone 2. Robi 3. Banglalink 4. TeleTalk 5. CityCell 6. Airtel

3.4 Questionnaire Development

For data collection and empirical analysis a questionnaire has been developed using AHP 1-9 scale. For simplicity and ensuring reliability, data collections are being made on face-to-face interview with the respondents. The following AHP scale is used in the study:

Table-4: AHP 1-9 scale.

Intensity of Importance	Definition
1	Equal Importance
3	Moderate Importance
5	Strong Importance
7	Very strong Importance
9	Extreme Importance
2, 4, 6, 8	Compromises between the above

3.5 Data Analysis Tools and Techniques

Analyzing data in AHP model requires four steps of calculation. They are:

Step 1: Construct the hierarchy by stating the goal/objective and identifying the criteria and alternatives.

Step 2: Construct pair-wise comparison matrices for all the criteria and alternatives. The matrix is determined through a number of different career scoring experts in the relevant fields as follows:

$$A = \begin{bmatrix} a_{11} & a_{12} & \dots & a_{1n} \\ a_{21} & a_{22} & \dots & a_{2n} \\ \dots & & \dots & \dots \\ \dots & & \dots & \dots \\ a_{n1} & a_{n2} & \dots & a_{nn} \end{bmatrix}$$

Where $A = (a_{ij}),\ \ a_{ij} > 0$, and $a_{ji} = 1/a_{ij}$.

Step 3: Determine the weights of the criteria and Local weights of the alternatives from the above matrices by using Normalization Procedure. The criteria and local weight of the alternatives are determined by the following equations:

Calculating the sum of the data of each row, $\varpi_i = \sum_{j=1}^{n} a_{ij}, i = 1,2,\dots\dots n$ and normalizing the local weights,

$\omega_i = \dfrac{\sum_{j=1}^{n} a_{ij}}{\sum_{k=1}^{n}\sum_{j=1}^{n} a_{kj}}, i = 1,2,\dots\dots n$. The normalized local weighted vector is determined by

$w = [\omega_1, \omega_2, \dots\dots, \omega_n]^T$

Step 4: Obtain the Global weights of the alternatives by synthesizing the local weights,

$$B \times V == \begin{bmatrix} b_{11} & b_{12} & \dots & b_{1n} \\ b_{21} & b_{22} & \dots & b_{2n} \\ \dots & & \dots & \dots \\ \dots & & \dots & \dots \\ b_{n1} & b_{n2} & \dots & b_{nn} \end{bmatrix} \times \begin{bmatrix} v_1 \\ v_2 \\ \dots \\ \dots \\ v_n \end{bmatrix}$$

Matrix *B* represents the local weights of the alternatives and each column represents the local weight under each criterion. The *V* matrix represents transpose of the local weight of criteria. Global weight is determined by multiplying the matrices *B* and *V*.

Finally, the data analysis is being made using Microsoft Excel spread sheet and data consistency is being tested using Statistical Package for Social Science (SPSS) software.

4. Results of Empirical Tests and Interpretation

As per the procedures of AHP model at the initial stage a pair-wise comparison is made on the criteria of consumers' preferences. The summary of pair-wise comparison of the eight criteria is given below:

Table-5: Pair-wise Comparisons among criteria of consumers' satisfaction

Criteria	Weights	Ranking
Network	0.282975	1
Call Charge	0.122291	4
Internet	0.110082	5
Bill Pay	0.086692	6
Free Talk-Time and SMS	0.03749	7
Money Transfer	0.033025	8
Balance Recharge	0.162258	3
Customer Care	0.165187	2

Table-5 shows that respondents weighted network criterion as most important criterion for their satisfaction with 28.29% preference. Followed by customer care (16.52%), balances recharge (16.22%), call charge (12.23%), internet (11%), bill pay (8.66%), free talk time and sms (3.75%) and money transfer (3.3%).

Next stage pair-wise comparisons of six telecom operators based on each of the above mentioned eight criteria. The summary of the result is given in the Table-6:

Table-6: Pair-wise comparison of alternatives based on each criterion.

Telecom Operators	Criteria of Consumers' Preferences							
	Network	Call Charge	Internet	Bill Pay	Free Talk-time and SMS	Money Transfer	Balance Recharge	Customer Care
Grameen Phone	**0.43997**	0.21009	0.24521	**0.47525**	0.17959	**0.44714**	**0.24654**	**0.46342**
Robi	0.13308	0.12779	0.14842	0.16751	0.09236	0.14267	0.19145	0.18788
Banglalink	0.21542	0.12577	0.08962	0.20742	0.12121	0.27571	0.17145	0.18035
TeleTalk	0.02821	0.06152	0.03453	0.05517	0.04702	0.04659	0.07586	0.02772
CityCell	0.05224	0.19633	0.04320	0.04670	0.21965	0.04395	0.09593	0.07363
Airtel	0.13108	**0.27851**	**0.43902**	0.04797	**0.34017**	0.04395	0.21877	0.06701

The topped preferred alternative under each criterion is bolded in the Table-6. The results show that respondents preferred Grameen Phone in terms of network (43.99%), bill pay (47.53%), money transfer (44.71%), balance recharge (24.65%) and customer care (46.34%). The respondents also preferred Airtel in terms of call charge (27.85%), internet (43.9%), free talk-time and sms (34.02%). There is an important fact to be considered that the age group (twenty to twenty six years) selected for this study uses mainly the Grameen Phone and Airtel services. Therefore, they are more concerned in these two operators while comparing with other operators.

Finally the ranking of the alternatives is being made based on their respective global weight. Appendix-A detailed the calculation procedures of the global weights. The summary of the ranking is given in Table-7:

Table-7: Global weights of the alternatives and final ranking.

Telecom Operators	Global Weight	Ranking
Grameen Phone	0.35644	1
Robi	0.15442	4
Banglalink	0.17545	3
TeleTalk	0.04428	6
CityCell	0.08501	5
Airtel	0.18441	2

Table-7 shows that respondents preferred the Grameen Phone most than all other operators with 35.64% global weight. Followed by Airtel (18.44%), Banglalink (17.55%), Robi (15.44%), CityCell (8.5%), TeleTalk (4.43%).

Conclusion

Telecom sector plays a vital role in the economic development of Bangladesh. Over the years the telecom operators focused on the consumers' satisfactions as the consumers are more concerned about the services provided by different operators. This study is made to analyze the consumers' preferences on selecting telecom operators in Bangladesh

using AHP model. This study emphasizes on the AHP ranking of the telecom operators based on some criteria of consumers' satisfaction. Although this study is descriptive in nature, it has also included an empirical analysis in which different rankings have been made. The results of empirical tests show that the consumers preferred network criterion as most important criterion, and two telecom operators- Grameen Phone and Airtel under different criterion. Finally, the global weight shows that consumers preferred Grameen Phone most than all other operators. However, the empirical analysis also reveals that the selection of age group in between twenty to twenty six for sampling the respondent results in more preferences on two operators- Grameen Phone and Airtel because of the popularity of these two operators among that age group. Therefore, there is wide scope for future demographic researches on this topic. Nevertheless, AHP model used in this study provides a fair analysis for assessing the consumers' preferences in selecting telecom operators.

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Appendix-A: Calculation of the global weight using multiplication of matrices.

As discussed in the methodology section, the global weight is determined by multiplying the criterion-wise alternative matrix *B* and the local weight of the criteria matrix *V*.

Now from Table-6 we can develop the *B* matrix and from Table-5 we can develop *V* matrix in the following way:

$$B = \begin{bmatrix} 0.43997 & 0.21009 & 0.24521 & 0.47525 & 0.17959 & 0.44714 & 0.24654 & 0.46342 \\ 0.13308 & 0.12779 & 0.14842 & 0.16751 & 0.09236 & 0.14267 & 0.19145 & 0.18788 \\ 0.21542 & 0.12577 & 0.08962 & 0.20742 & 0.12121 & 0.27571 & 0.17145 & 0.18035 \\ 0.02821 & 0.06152 & 0.03453 & 0.05517 & 0.04702 & 0.04659 & 0.07586 & 0.02772 \\ 0.05224 & 0.19633 & 0.04320 & 0.04670 & 0.21965 & 0.04395 & 0.09593 & 0.07363 \\ 0.13108 & 0.27851 & 0.43902 & 0.04797 & 0.34017 & 0.04395 & 0.21877 & 0.06701 \end{bmatrix}$$

And

$$V = \begin{bmatrix} 0.282975 \\ 0.122291 \\ 0.110082 \\ 0.086692 \\ 0.03749 \\ 0.033025 \\ 0.162258 \\ 0.165187 \end{bmatrix}$$

Therefore, the global weight will be,

$B \times V$

$$= \begin{bmatrix} 0.43997 & 0.21009 & 0.24521 & 0.47525 & 0.17959 & 0.44714 & 0.24654 & 0.46342 \\ 0.13308 & 0.12779 & 0.14842 & 0.16751 & 0.09236 & 0.14267 & 0.19145 & 0.18788 \\ 0.21542 & 0.12577 & 0.08962 & 0.20742 & 0.12121 & 0.27571 & 0.17145 & 0.18035 \\ 0.02821 & 0.06152 & 0.03453 & 0.05517 & 0.04702 & 0.04659 & 0.07586 & 0.02772 \\ 0.05224 & 0.19633 & 0.04320 & 0.04670 & 0.21965 & 0.04395 & 0.09593 & 0.07363 \\ 0.13108 & 0.27851 & 0.43902 & 0.04797 & 0.34017 & 0.04395 & 0.21877 & 0.06701 \end{bmatrix} \times \begin{bmatrix} 0.282975 \\ 0.122291 \\ 0.110082 \\ 0.086692 \\ 0.03749 \\ 0.033025 \\ 0.162258 \\ 0.165187 \end{bmatrix}$$

$$= \begin{bmatrix} 0.35644 \\ 0.15442 \\ 0.17545 \\ 0.04428 \\ 0.08501 \\ 0.18441 \end{bmatrix}$$

These global weights of alternatives are given in the Table-7.