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Optimizing Telecom Choices in Azerbaijan: By using Analytical Hierarchical Process Method

Abstract

Optimizing telecom choices in Azerbaijan is crucial for consumers and businesses to ensure they receive the best value and service quality. The Hierarchical Process (HP), often known as the Analytic Hierarchy Process (AHP), is a structured decision-making method that can effectively address this problem. The quickly expanding telecom industry in Azerbaijan provides a range of providers, each with unique advantages and disadvantages. The need for dependable connection and affordable prices is growing, making it difficult for enterprises and individual customers to choose the best supplier. It is necessary to carefully consider a number of variables that affect the overall performance and value of the service in order to make an informed decision. Conventional decision-making techniques could ignore important trade-offs, underscoring the need for a more methodical and impartial approach. This paper applies the HP method to evaluate and select the optimal telecom provider in Azerbaijan based on multiple criteria, including cost, coverage, quality of service, and customer satisfaction. By breaking down the decision-making process into a series of pairwise comparisons and using mathematical formulas to derive weights and scores, we provide a comprehensive and rational framework for making informed telecom choices. This approach ensures that all relevant factors are considered and that the final decision is based on a systematic and quantifiable analysis.

Keywords: *hierarchical process, comparisons, multi-criteria decision-making, customer satisfaction, telecommunications, Azerbaijan*

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Azərbaycanda telekom seçimlərinin optimallaşdırılması: analitik ierarxik proses metodundan istifadə etməklə

Xülasə

Azərbaycanda telekommunikasiya seçimlərinin optimallaşdırılması istehlakçılar və bizneslərin ən yaxşı dəyər və xidmət keyfiyyətini əldə etmələri üçün çox vacibdir. Tez-tez Analitik İerarxiya Prosesi (AHP) kimi tanınan İyerarxik Proses (HP) bu problemi effektiv şəkildə həll edə bilən strukturlaşdırılmış qərar qəbuletmə üsuludur. Azərbaycanda sürətlə genişlənən telekommunikasiya sənayesi hər birinin özünəməxsus üstünlükləri və mənfi cəhətləri olan bir sıra provayderlər təqdim edir. Etibarlı əlaqə və münasib qiymətlərə ehtiyac artır, bu da müəssisələr və fərdi müştərilər üçün ən yaxşı təchizatçı seçməkdə çətinlik yaradır. Məlumatlı qərar qəbul etmək üçün xidmətin ümumi performansına və dəyərinə təsir edən bir sıra dəyişənləri diqqətlə nəzərdən keçirmək lazımdır. Adi qərarvermə üsulları daha metodik və qərəzsiz yanaşmanın zəruriliyini vurğulayaraq, mühüm güzəştləri nəzərə almaya bilər. Bu məqalədə qiymət, əhatə dairəsi, xidmət keyfiyyəti və müştəri məmnuniyyəti daxil olmaqla bir çox meyarlar əsasında Azərbaycanda optimal telekommunikasiya provayderini qiymətləndirmək və seçmək üçün HP metodu tətbiq edilir. Qərar vermə prosesini ikili müqayisələr seriyasına bölmək və çəkilər və xalları əldə etmək üçün riyazi düsturlardan istifadə

etməklə biz məlumatlı telekommunikasiya seçimləri etmək üçün hərtərəfli və rasional çərçivə təmin edirik. Bu yanaşma bütün müvafiq amillərin nəzərə alınmasını və yekun qərarın sistematik və kəmiyyətlə ölçülə bilən təhlilə əsaslanmasını təmin edir.

Açar sözlər: *hierarxik proses, müqayisələr, çox meyarla qərarvermə, müştəri məmnuniyyəti, telekommunikasiya, Azərbaycan*

Introduction

Selecting the optimal telecom provider is a complex decision involving various criteria such as cost, coverage, quality of service, and customer satisfaction. The Analytic Hierarchy Process (AHP), developed by Thomas Saaty, is a widely used method in multi-criteria decision-making, offering a structured framework for such evaluations. There is a saying from his book such as: There are two possible ways to learn about anything – an object, a feeling or an idea (Saaty, 2008). The first is to examine and study it in itself to the extent that it has various properties, synthesize the findings and draw conclusions from such observations about it. The second is to study that entity relative to other similar entities and relate it to them by making comparisons. We will use some information from his books. The motivation for this work arises from the need to assist consumers in Azerbaijan in making informed telecom choices among a rapidly evolving market (Siekelova, Podhorska, Imppola, n.d.). The purpose of this paper is to apply the HP method to evaluate and select the best telecom provider in Azerbaijan based on key criteria. This structured approach ensures that all relevant factors are considered, providing a rational basis for decision-making. The structure of this paper is as follows: Section 2 explains the preliminary concepts and formulas used in the HP method. Section 3 presents a detailed statement of the problem, including the criteria and alternatives considered. Section 4 outlines the methodology and solution of the problem step-by-step using the HP method. Finally, Section 5 concludes the paper, summarizing the findings and implications (Amaitik, n.d.).

Research

In this section, we outline the mathematical formulas and concepts used in the HP method.

1. Pairwise Comparison Matrix: To compare criteria, we construct a pairwise comparison matrix A, where a_{ij} represents the relative importance of criterion *i* over criterion j.

$$A = \begin{bmatrix} 1 & a12 & a13 & \dots & a1n \\ 1/a12 & 1 & a23 & \dots & a2n \\ 1/a13 & 1/a23 & 1 & \dots & a3n \\ \dots & \dots & \dots & 1 & \dots \\ 1/a1n & 1/a2n & 1/a3n & \dots & 1 \end{bmatrix}$$

2. Normalization: To normalize the matrix, each element a_{ij} in a column is divided by the sum of its column. The normalized matrix A` is given by (Hati, Rahayu, 2024):

$$A` = \begin{bmatrix} a`11 & a`12 & a`13 & \dots & a`1n \\ a`21 & a`22 & a`23 & \dots & a`2n \\ a`31 & a`32 & a`33 & \dots & a`3n \\ \dots & \dots & \dots & \dots & \dots \\ a`1n & a`12 & a`13 & \dots & ann \end{bmatrix}$$

Where $a`_{ij} = aij/\text{Sum}(a_{ij})$ $i = 1, 2,\dots,n$

3. Weights calculation: The weights w_i for each criterion are the average of the normalized values in each row of the normalized matrix.

$$w_i = \text{Sum}(a_{ij})/n \quad j = 1, 2,...,n$$

Statement of the problem

In Azerbaijan's dynamic telecom market, consumers are presented with a variety of telecom providers, each offering distinct packages and services. This variety, while beneficial, also complicates the decision-making process for consumers who must balance multiple factors to select the most suitable provider. The primary problem is how to make an informed and optimal choice among these telecom providers given the following criteria (Ibrar, Kim, Lee, Rho, 2020):

1. Cost (C1): The overall expense of the telecom service, including monthly fees, call rates, data plans, and any additional charges. Consumers seek the most cost-effective option that fits their budget without sacrificing necessary services.

2. Coverage (C2): The geographical reach of the telecom provider's network. This includes the availability and reliability of the network in urban and rural areas, ensuring that consumers have access to services wherever they are.

3. Quality of Service (C3): The performance of the telecom services, including call clarity, data speed, network reliability, and customer support. High-quality service is critical for maintaining effective communication and internet usage.

4. Customer Satisfaction (C4): The overall satisfaction of customers with the telecom provider, which can include factors such as customer service, ease of communication, handling of complaints, and overall user experience. High customer satisfaction indicates that the provider is meeting or exceeding customer expectations (Onder, Dag, 2013).

Given these criteria, the challenge is to develop a decision-making model that allows consumers to systematically evaluate and rank the telecom providers in Azerbaijan. The Analytic Hierarchy Process (AHP) method is chosen for this purpose due to its effectiveness in handling multi-criteria decision-making problems (Saaty, Vargas, 2001).

The telecom market in Azerbaijan, characterized by several competing providers, each with its strengths and weaknesses in terms of cost, coverage, quality of service, and customer satisfaction. We will take as an alternatives three providers such as: Azercell, Bakcell and Nar.

Azercell: Known for extensive coverage and high-quality service but at a higher cost.

Bakcell: Provides a balanced mix of cost, quality, and customer satisfaction but has limited coverage in rural areas.

Nar: Offers competitive pricing and good customer satisfaction but has moderate coverage (Koksalan, Sagir, n.d.).

The four key criteria (Cost, Coverage, Quality of Service, Customer Satisfaction) are crucial in determining the best telecom provider. Each criterion must be carefully evaluated and weighted according to its importance to the consumer. After that we can determine the best provider using the AHP method (Kumar, Mitra, Shankar, 2014).

Solution of the problem

Step 1: We need to construct Pairwise comparison matrix for criteria.

Criteria	Cost	Coverage	Customer satisfaction	Quality of Service
Cost	1	2	5	2
Coverage	0,5	1	3	1
Customer satisfaction	0,2	0,33	1	0,33
Quality of Service	0,5	1	3	1

Step 2: Normalize the matrix and calculate Weights.

Criteria	Cost	Coverage	Customer satisfaction	Quality of Service
Cost	0,45	0,56	0,42	0,27
Coverage	0,23	0,28	0,25	0,55
Customer satisfaction	0,09	0,09	0,08	0,05
Quality of Service	0,23	0,07	0,25	0,14

Step 3: Compute the weights for each criterion by finding the average of criterion.

$$w = [0.43, 0.33, 0.08, 0.17]$$

COST: 0.43
COVERAGE: 0,33
CUSTOMER SATISFACTION: 0,08
QUALITY OF SERVICE: 0,17

Step 4: We need to evaluate alternatives based on these criteria.
For Cost:

Cost criteria	Azercell	Bakcell	Nar
Azercell	1,00	0,50	0,33
Bakcell	2,00	1,00	0,50
Nar	3,00	2,00	1,00

Cost criteria	Azercell	Bakcell	Nar
Azercell	0,17	0,14	0,18
Bakcell	0,33	0,29	0,27
Nar	0,50	0,57	0,55

$w = [0.16, 0.30, 0.54]$
For Coverage:

Coverage criteria	Azercell	Bakcell	Nar
Azercell	1,00	4,00	2,00
Bakcell	0,25	1,00	0,50
Nar	0,50	2,00	1,00

Coverage criteria	Azercell	Bakcell	Nar
Azercell	0,57	0,57	0,57
Bakcell	0,14	0,14	0,14
Nar	0,29	0,29	0,29

w = [0.57, 0.14, 0.29]
For Customer satisfaction:

Customer satisfaction criteria	Azercell	Bakcell	Nar
Azercell	1,00	2,00	3,00
Bakcell	0,50	1,00	2,00
Nar	0,33	0,50	1,00

Customer satisfaction criteria	Azercell	Bakcell	Nar
Azercell	0,55	0,57	0,50
Bakcell	0,27	0,29	0,33
Nar	0,18	0,14	0,17

w = [0.54, 0.30, 0.16]

For Quality of service:

Quality of service criteria	Azercell	Bakcell	Nar
Azercell	1,00	2,00	3,00
Bakcell	0,50	1,00	2,00
Nar	0,33	0,50	1,00

Quality of service criteria	Azercell	Bakcell	Nar
Azercell	0,55	0,57	0,50
Bakcell	0,27	0,29	0,33
Nar	0,18	0,14	0,17

w = [0.54, 0.30, 0.16]

Step 5: And finally, in the last step we need to Combine the criteria weights with the alternative weights for each criterion.

Azercell = 0.16*0.43+0.57*0.33+0.54*0.08+0.54*0.17= 0.391
Bakcell = 0.30*0.43+0.14*0.33+0.30*0.08+0.30*0.17=0.250
Nar = 0.54*0.43+0.29*0.33+0.16*0.08+0.16*0.17=0,368

Based on the overall scores, Azercell has the highest score (0.391), followed by Nar (0.368), and then Bakcell (0,250). Therefore, Azercell is the best choice according to the AHP method.

Conclusion

This paper demonstrates the application of the Hierarchical Process (HP) method to optimize telecom choices in Azerbaijan, considering criteria such as cost, coverage, quality of service, and additional features. By employing pairwise comparisons and mathematical formulas to derive criteria weights and alternative scores, a systematic and rational decision-making framework is established. This approach ensures a comprehensive evaluation of telecom providers, aiding consumers in making informed decisions. Future research could extend this work by incorporating additional criteria such as customer satisfaction, technological advancements, and environmental impact. Additionally, applying this methodology to other regions and comparing the outcomes could provide further insights into its versatility and robustness. By continuously updating the criteria and alternative evaluations to reflect market changes, the model can remain relevant and useful for ongoing decision-making.

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